Rio Tinto

Rio Tinto
Company number 719885

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COMPANIES HOUSE

Our purpose

As pioneers in mining and metals, we produce materials essential to human progress

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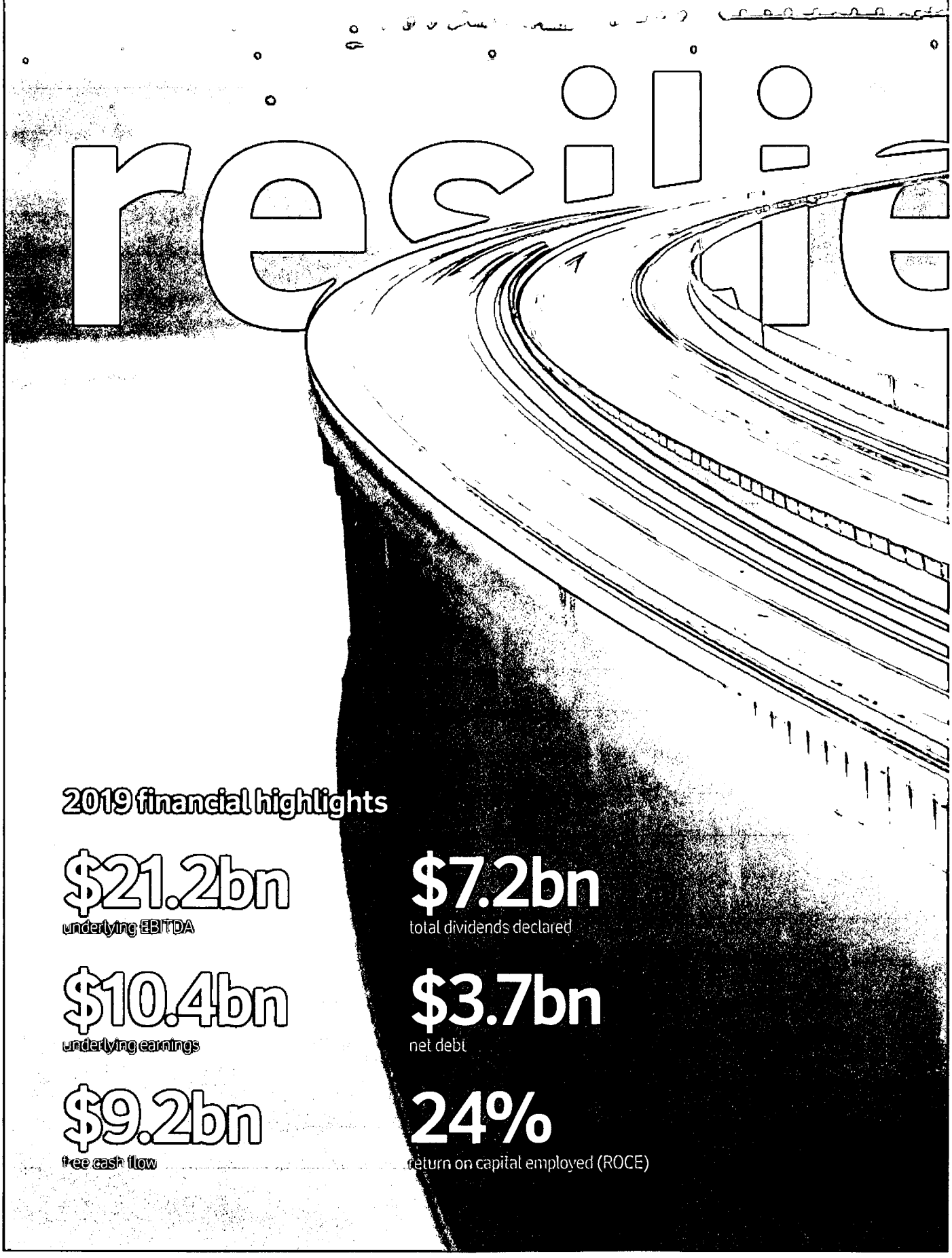
Our strategy is to create superior value for shareholders by meeting our customers' needs, maximising cash from our world-class assets and allocating capital with discipline.



2019 financial highlights

$21.2bn
underlying EBITDA

$10.4bn
underlying earnings

$9.2bn
free cash flow

$7.2bn
total dividends declared

$3.7bn
net debt

24%
return on capital employed (ROCE)

nce

Strategic report

Our business

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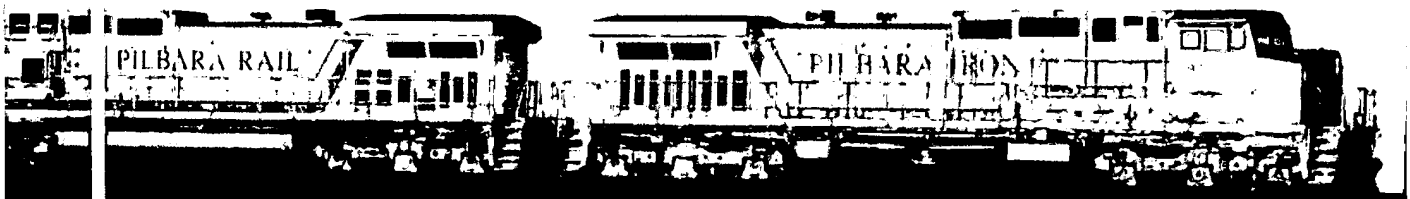
strength



Group highlights

$14.9bn
net cash generated from operating activities
(2018: $11.8bn)

50%
total shareholder return (% over five years)
(2018: 33%)

636 US cents
underlying earnings per share
(2018: 512 US cents)

0.42
[illegible]
(2018: 0.44)

443 US cents
total dividend per share
(2018: 550 US cents)

46%
reduction in absolute emissions
(since 2008, managed operations)

Fe

Iron Ore

Iron ore is the primary component of steel. In the Pilbara region of Western Australia, we have a world-class, integrated portfolio of iron ore assets as well as certain salt assets; we are one of the leading contributors to the seaborne market. Our quality product suite, including our flagship Pilbara Blend™ of iron ore, is well positioned to benefit from continued demand across China, Japan and other markets.

$24.1bn (2018: $18.7bn)

$16.1bn (2018: $11.4bn)

Pilbara managed iron ore operations

16	4	1,700 km	4
mines	ports	rail network	power plants

Production* (100% basis)

326.7mt
iron ore
(2018: 337.8mt)

Al

Aluminium

Aluminium is one of the world's fastest-growing major metals. Lightweight and recyclable, it is found in everything from jet engines to electric vehicles to smartphones. Our vertically integrated aluminium portfolio spans from high-quality bauxite mines to alumina refineries to smelters which, in Canada, are powered entirely by clean, renewable energy and located in the first decile of the cost curve.

$10.3bn (2018: $12.2bn)

Managed and non-managed operations

4	14	4	7
mines	smelters	refineries	hydro power plants

Production* (our share)

55.1mt
bauxite
(2018: 50.4mt)

3,171kt
aluminium
(2018: 3,231kt)

Cu

Copper and Diamonds

Copper plays a key role in electrification and power generation, including in renewable energy and electric vehicles. Our operations span the globe, from Mongolia to the US, and occupy various stages of the mining lifecycle. Our two diamond mines in Australia and Canada make us one of the largest producers, and our white and coloured diamonds are some of the world's most sought-after gems.

$5.8bn (2018: $6.5bn)

$2.1bn (2018: $2.8bn)

Managed and non-managed operations

5	1	3
mines	smelter	power plants

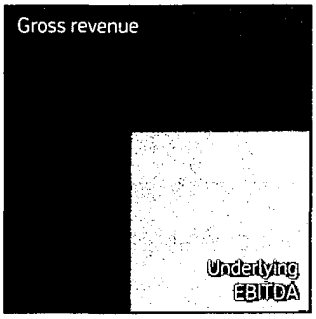
Production* (our share)

577kt
mined copper
(2018: 608kt)

Ti, B, Fe

Energy and Minerals

Our Energy and Minerals product group comprises materials essential to a wide variety of industries, including renewable energy and agriculture. We produce titanium dioxide, borates, high-grade iron ore pellets and concentrate and uranium. Our Ventures division is also exploring growth opportunities in battery metals.



$5.2bn (2018: $5.5bn)

$1.8bn# (2018: $2.1bn)

Managed operations

6	7	5	3
mines	processing facilities	ports	projects

Production* (our share)

1,206kt
titanium dioxide slag
(2018: 1,116kt)

10.5mt
iron ore pellets and concentrates
(2018: 9.0mt)

* To allow production numbers to be compared on a like-for-like basis, we have excluded production from asset divestments completed in 2018 from our share of prior year production data. The financial data above includes the results of divested assets up to the date of sale.

\# Year on year decrease attributable to divestments.

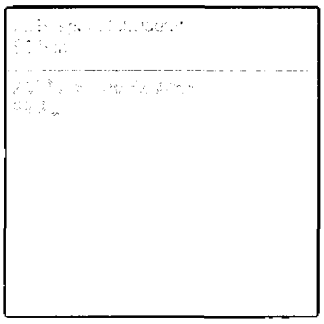
"We aim to achieve and maintain industry-leading safety and sustainability performance, operational excellence, capital discipline and the financial strength to invest throughout the cycle, while providing superior returns to our shareholders."

Simon Thompson
Chairman
26 February 2020

2019 highlights

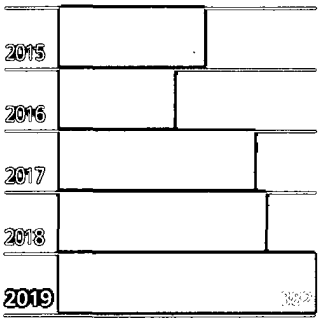
Our value over volume strategy, capital discipline, and strong markets for some of our key commodities enabled us to deliver a robust financial performance in 2019.

Total dividends declared



$7.2bn
(2018: $13.5bn)

Full-year ordinary dividend per share



382 US cents per share
(2018: 307 US cents per share)

$10.4bn
underlying earnings

$45.1bn
direct economic contribution

Shareholder returns policy

Our shareholder returns policy balances three factors:

- Maintaining a strong balance sheet
- Investing for future growth
- Directly rewarding shareholders

We expect total cash returns to shareholders to be in the range of 40-60% of underlying earnings through the cycle. For our shareholder returns policy, see page 36.

Chairman's statement

Rio Tinto produces materials essential to human progress. There is hardly any aspect of modern life that our products do not touch, and our 46,000 employees work hard – every shift, every day – to safely fulfil our purpose.

Mining is a highly competitive, capital- and energy-intensive, long-cycle industry that has major impacts, both positive and negative, on society and the environment. To deliver long-term, sustainable success, we need to meet or surpass our customers' expectations; invest in developing the skills and capabilities of our people and the productive capacity of our assets; build mutually beneficial relationships with our suppliers and technology partners; protect the environment; bring lasting social and economic benefits to our local communities and host governments; and reward our shareholders.

We aim to achieve and maintain industry-leading safety and sustainability performance, operational excellence, capital discipline and the financial strength to invest throughout the cycle, while providing superior returns to our shareholders. In 2019, I am pleased to report that your company has made good progress in all of these areas.

Performance

Safety is our top priority. In 2019, all of our safety performance indicators improved and we had zero fatalities. This is an outstanding achievement that reflects years of hard work and commitment by the leadership team and all of our employees and suppliers. But we are not complacent, and we know that we now need to sustain this success.

Overall, the operating performance of the Group was satisfactory, despite a number of challenges during the year, and our value over volume strategy, capital discipline, and strong markets for some of our key commodities enabled us to deliver a robust financial performance in 2019.

Underlying earnings increased to $10.4 billion (2018: $8.8 billion), underlying EBITDA rose to $21.2 billion (2018: $18.1 billion), representing an underlying EBITDA margin of 47% (2018: 42%), and free cash flow amounted to $9.2 billion (2018: $7.0 billion). As a result, we were able to maintain our strong balance sheet, while maintaining our track record of superior returns to shareholders. The Board has recommended a final ordinary dividend of 231 US cents per share, taking total dividends declared to shareholders announced this year to $7.2 billion.

We continue to invest in high-return projects to sustain and grow our production capacity, including in our iron ore operations in Australia and the Kennecott copper mine in the US. We also continue to make progress with the Oyu Tolgoi underground development in Mongolia, one of the most complex capital projects in the world today.

In order to develop future growth options, including the Resolution copper project in the US and the Winu copper-gold exploration project in Australia, in 2019, we boosted exploration and evaluation expenditure from $488 million to $624 million.

Sustainability

In parallel with this report, we have published our second report on climate change, which has been guided by the recommendations of the Taskforce on Climate-related Financial Disclosure (TCFD). The report includes our new 2030 targets to reduce our emissions intensity by 30% and our absolute emissions by 15% from 2018 levels. To deliver these targets, we will spend approximately $1 billion over five years in climate-related projects, and research and development. We also report on progress in developing a feasible pathway towards our longer term ambition of net zero emissions by 2050.

The mining and metals value chain includes numerous "hard to abate" sectors, such as aluminium smelting, steel making and shipping, where there are significant technological and economic hurdles to the development of viable decarbonisation pathways. In order to address these challenges, we have established a number of technology partnerships that collectively represent a fundamental pillar of our sustainability strategy. However, there are limits to what business can achieve alone. Enabling regulation, such as carbon pricing, is essential to incentivise the decarbonisation of these sectors, together with measures to maintain the competitiveness of trade-exposed industries. Urgent, coordinated government action is therefore needed to encourage such investment within the timeframe required by the Paris Agreement.

We have also made good progress in other areas of sustainability. For example, we have continued to promote industry-leading practices in tax transparency by publishing our mineral development contracts and the beneficial ownership of our managed and non-managed joint ventures. We believe that such transparency helps to build trust and will result in better social and economic outcomes over the long term.

Tax payments and economic contribution

In 2019, we paid $4.5 billion in corporate taxes to governments around the world, helping our host governments to provide vital services to their citizens and to pursue their development goals. Our direct economic contribution to the communities in which we operate – including community investment, development contributions and payments to landowners – was $45.1 billion. While the monetary amount is clearly significant, equally important are the opportunities we have created for many thousands of people and local businesses to grow and to prosper.

Engagement
As expectations continue to increase about the role of business in society, it is vital that the Board hears first hand from stakeholders about their perceptions of our performance and the opportunities and challenges that lie ahead. This year, we held civil society roundtables in Australia, Canada and the US. The discussions focused on climate change and the environment, industry lobbying and our impact on the communities in which we operate. We have already acted on much of the valuable feedback that we received at these events – for example, by engaging with industry associations in Australia and elsewhere on climate change policy; intensifying our focus on delivering our water monitoring and resettlement compensation commitments to herders in Mongolia; and seeking to improve how we communicate our environmental performance to the local community and civil society in Madagascar. We also engaged with customers and suppliers, commissioning a customer attitudes' survey and inviting a major supplier and technology partner to present their views of Rio Tinto to the Board.

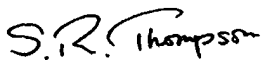
Board members continue to engage with Rio Tinto employees around the world. Almost 500 people attended our second "Employee AGM" in Montreal and individual Board members held smaller town halls in Australia, Madagascar, Singapore, South Africa and the US. The most frequent topics raised by employees in the Q&A sessions at these events related to sustainability, culture and behaviours, and technological change, emphasising the importance that our employees attach to our performance in these critical areas. Some examples of how engagement with our employees has shaped the Board's thinking and decision-making can be found on pages 92 and 93.

Visits to our sites and global hubs are one of the most rewarding parts of my job as Chairman and I am always impressed by the pride and commitment of our employees and the extraordinary scope of the innovations taking place across the Group. I would like to thank J-S, the leadership team and all of our employees for their hard work and dedication over the year, and to congratulate them on their achievements.

We look forward to meeting many of our shareholders at our annual general meetings in April and May 2020, in London and Brisbane, respectively. In addition to routine matters, we will be asking shareholders to approve the appointment of KPMG as our new auditors from 1 January 2020.

The Board
This year, the Board bid farewell to Ann Godbehere and Dame Moya Greene, who stepped down as non-executive directors in May and June, respectively. I am delighted to welcome Hinda Gharbi, Jennifer Nason and Ngaire Woods, who join the Board in 2020. We look forward to benefiting from their insights and expertise in natural resources, finance, technology, governance and public policy.

A look ahead
Looking ahead, we continue to face significant geopolitical uncertainties and we are currently evaluating the impact of the Covid-19 virus on our business as we enter a new decade, I am pleased to say Rio Tinto continues to be well positioned to create long-term, sustainable value for all of our stakeholders.



Simon Thompson
Chairman
26 February 2020

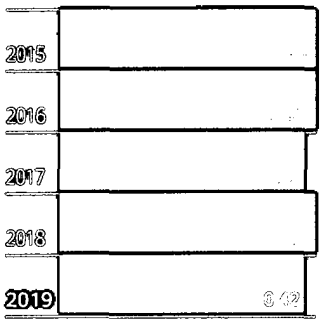
"2019 marked another year of strong financial performance. With a strong balance sheet and continuing investment in high-value growth, Rio Tinto is well-positioned to be resilient and to thrive."

J-S Jacques
Chief Executive
26 February 2020

2019 highlights

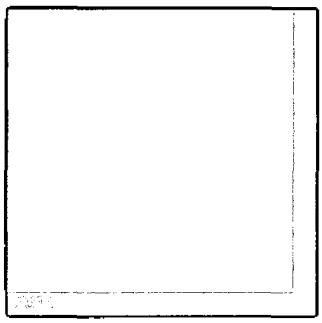
This year, we continued to invest in our business and to strengthen our portfolio, aiming to ensure our business remains strong and resilient well into the future.

All injury frequency rate (AIFR)



0.42
per 200,000 hours worked
(2018: 0.44)

Underlying EBITDA



$21.2bn
(2018: $18.1bn)

$10.4bn
underlying earnings

$9.2bn
free cash flow

$14.9bn
net cash generated from operating activities

24%
return on capital employed (ROCE)

Chief Executive's statement

Over the past years, our aim has been constant: to deliver superior shareholder value and contribute to society as we produce the materials essential to modern life. Our strong focus on generating cash from our world-class assets allows us to do exactly this.

0.42
all injury frequency rate (AIFR)

47%
Group underlying EBITDA margin

$3.7bn
net debt

With a strong balance sheet and our continuing investment in high-value growth, sustainability and workforce capabilities, we are well positioned to be resilient, and to thrive, in a new era of complexity.

I am grateful to our employees and partners around the world who made our success possible, particularly in safety. As I look back on our performance in 2019, I am most proud of our teams' efforts here. We improved our all injury frequency rate (AIFR), which was 0.42 this year (down from 0.44 in 2018), reflecting lower severity rates. We also ended the year with no fatalities and improved process safety performance. While this is a meaningful achievement, we know we cannot be complacent; we will continue to make safety our number one priority, with the aim of sending everyone home safely at the end of every shift, every day.

Performance

2019 marked another year of strong financial performance for our company, driven by favourable iron ore pricing and stronger operational performance in the second half of the year.

We delivered underlying EBITDA of $21.2 billion and an underlying EBITDA margin of 47%. Operating cash flow for the year was $14.9 billion, free cash flow was $9.2 billion and we ended the year with net debt of $3.7 billion – a strong balance sheet supports our resilience and provides optionality.

As a result, we were able to announce a record final ordinary dividend of $3.7 billion, or 231 US cents per share, bringing the full year ordinary dividend to 382 US cents per share. In total, we announced $7.2 billion in cash returns to shareholders this year, bringing the total returns declared since 2016 to $36 billion.

From an operational perspective, in the first half of this year we experienced some challenges in our iron ore business in the Pilbara, in Western Australia, which we proactively addressed, closing the year with solid production momentum. Overall, shipments for the year were 3% lower than in 2018, primarily due to these operational challenges and weather-related incidents. Despite this, our Pilbara iron ore operations delivered a 72% underlying free on board (FOB) EBITDA margin in 2019.

In aluminium, this year the market recorded significant price decreases in alumina and aluminium. Despite these challenges, our aluminium business maintained its position as the sector leader, delivering an EBITDA margin of 26% from integrated operations and a 21% increase in third-party bauxite sales.

In copper, our 2019 operational performance was affected by lower grades at all operations, which we partly offset by higher throughput and productivity improvements. Our average realised copper price for the year was down 7% compared to 2018; in 2019, the London Metal Exchange (LME) recorded a decline of 8%.

In our Energy and Minerals (E&M) product group, a favourable pricing environment, combined with improved operational performance, contributed to strong results. In 2019, E&M delivered underlying EBITDA of $1.8 billion, 41% higher than 2018 (excluding divested coal assets).

Portfolio

This year, we continued to strengthen our portfolio by increasing investment in high-value growth projects to ensure our business remains strong and resilient well into the future.

In December, for example, we announced a $1.5 billion investment at our Kennecott copper mine in Utah, in the US, which will serve to extend operations to 2032. In November, we announced a $749 million investment in our Greater Tom Price operations, in the Pilbara, to help sustain the production capacity of our iron ore business. In April, we announced we would sustain current capacity and extend the life of our Richards Bay Minerals operation through the investment of $463 million in the Zulti South project. After a number of security incidents, construction of this project is currently on hold; we will assess restarting construction after operations normalise.

In April, we committed $302 million of additional expenditure to advance the Resolution Copper project in Arizona, in the US, to fund additional drilling, orebody studies, infrastructure improvements and permitting activities as the project moves to the final stage of permitting.

At the Oyu Tolgoi underground copper and gold mine, in Mongolia, we completed the primary production shaft – a key milestone – in October 2019. Work continues on the mine design and, overall, we remain within the cost and schedule ranges announced in July 2019. We continue to expect to complete the mine design in the first half of 2020 and the definitive estimate of cost and schedule in the second half of 2020.

To create options for future growth, this year also saw us maintain our industry-leading investment in exploration. In 2019, we invested $624 million in 69 programmes in seven commodities across 17 countries, with copper remaining the focus. For example, we were pleased that our Winu copper-gold exploration project, in Western Australia, had some early success; we ended 2019 with phase 2 drilling well underway.

We also continued our work to make our portfolio as efficient as possible, in part through the use of technology and innovation, including automation. We begin 2020 with a fleet of 183 autonomous trucks, which, in the Pilbara, cost 15% less to operate than an equivalent manned truck. Rio Tinto is also home to the world's largest autonomous drill fleet – 26 drills – which this year, in our Pilbara iron ore business, unlocked a 25% increase in productivity and a 40% improvement in equipment utilisation. AutoHaul™, our automated rail network

in Western Australia, also continues to play an important role in increasing efficiency; to date, it has increased capacity by 10mt, a figure we expect to see increase with further optimisation.

Partners
Once again this year, our focus on partnership continued and intensified – we are very clear that no business can have sustainable, meaningful impact on its own. Partnership is a core enabler of our sustainability strategy, and I was very pleased with our progress in forming new, innovative connections across the value chain.

For example, recognising that students need the skills to keep pace with a rapidly changing world, we launched an innovative partnership in Australia with leading start-up accelerator BlueChilli and Amazon Web Services. Our collective aim is to fast-track the development of skills needed for the digital future, including critical thinking, problem-solving, automation, systems design and data analytics. Rio Tinto will invest $7 million (A$10 million) in this four-year national programme, which will crowd-source ideas from other start-ups as well as schools and universities.

And in Canada, we signed a historic agreement with the Innu community of Ekuanitshit. Named "Uauitshitun," or "mutual support" in the Innu language, the agreement is designed to generate economic development opportunities in a variety of ways. For example, we will support Innu businesses by providing health and safety training and improving their competitiveness in the procurement process. We will also partner in other areas such as environment, land stewardship, and traditional practices and education, through pre-employment vocational training and school programmes.

We also strengthened our commitment to climate change, which has been part of our strategic thinking for well over two decades. Since 2008, we have reduced absolute emissions from our managed operations by 46% (18% excluding divestments). Today, 76% of our electricity consumption at managed operations is supplied from renewable energy. Most of our operations now have significantly lower carbon intensities than sector averages. We announced new climate and environmental partnerships in 2019, including our initiative with China Baowu Steel Group, our customer in China, and Tsinghua University. We believe it is important to work with our customers and suppliers to help support mutual goals to reduce emissions and strengthen the resilience of our businesses.

In 2020, we set a new ambition: to reach net zero emissions across our operations by 2050. We also set new targets – to reduce our emissions intensity by 30% and our absolute emissions by 15%, both by 2030 and from 2018 levels. And overall, our growth between now and 2030 will be carbon neutral.

To continue to improve our performance, we plan to spend approximately $1 billion over the next five years in climate-related projects, research and development, partnerships and other activities to enhance the climate resilience of our business. For example, in early 2020, we announced a $98 million investment to build a 34 MW solar plant at our new Koodaideri iron ore mine in the Pilbara, alongside a lithium-ion battery energy storage system. The plant and battery will limit our annual carbon dioxide emissions by about 90,000 tonnes (compared to conventional gas-powered generation). This is the equivalent of taking about 28,000 cars off the road.

People
This year, I again spent a significant amount of time with our employees, visiting 17 assets and each of our global hubs and satellite offices. Over the course of the year, I held more than 30 town halls and small group discussions in 20 locations. I continue to be impressed by our employees' energy, creativity and ambition, and am proud of the efforts we have made to strengthen our culture and improve innovation, world-class technical talent and commercial capability. All three are critical to our success, today and into the future.

We continued building our innovation culture through initiatives like our Pioneering Pitch programme, in which our employees are encouraged to come up with new, creative ideas on how to strengthen and improve our business, and then pitch them to a panel of Rio Tinto judges, who award up to $250,000 and expert support to implement the best of them. In 2019, thanks to our employees' ingenuity, Pioneering Pitch identified $35 million in potential benefit to our business.

We also strengthened the technical capability of our employees, including by expanding our Centres of Excellence (CoEs) from three to eight. Our CoEs pool the company's technical expertise in areas such as tailings, geotechnical engineering and process and underground mining safety, allowing our experts to collaborate more effectively while also providing our operations with an easy to access, ready resource. RioExcel, our programme for recognising and promoting our technical experts, also continued to progress, with 50 employees taking part in 2019.

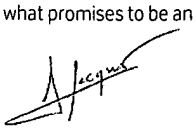
A look ahead
As we end one decade and begin another, our focus will remain on delivering our value over volume strategy, and striving to ensure our company remains strong, resilient and able to deliver superior returns to shareholders in the short, medium and long term.

This year, we did significant work on developing scenarios to help us understand what we need to do to thrive in this era of increasing complexity. Our focus on innovation, operational and commercial excellence, as well as high-value growth, will be key.

With $20 billion of capital expenditure planned over the next three years, we will continue disciplined investment in our business, renewing many of our operations through the replacement of mines and major equipment and by investing in growth, notably at Oyu Tolgoi.

Sustainability and partnership will remain important priorities and indeed, will play an increasingly important role across all aspects of our business. And our promise to our employees and contractors – to do everything we can to keep them safe, healthy, and equipped to meet this new era's challenges and opportunities – is as strong as ever.

And our purpose – to produce materials essential to human progress – will guide our company into what promises to be an exciting future.



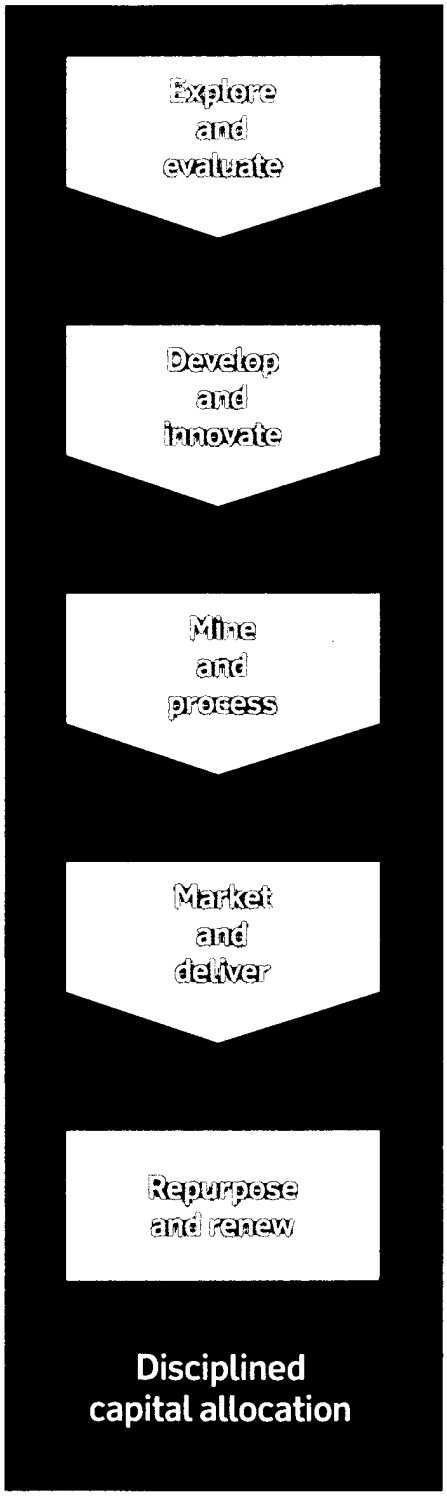
J-S Jacques
Chief Executive
26 February 2020

$1bn
to be spent in climate-related projects

Investing
A$10m
in building skills for the digital future in Australia

Our business model

Our ability to create value is underpinned by the quality of our assets, the capability of our people, our operational performance, innovative partnerships and disciplined capital allocation.



Explore and evaluate

We use some of the most advanced exploration technologies in the world to find potential new sources of minerals and metals. And we consider new products and operations with an understanding of customers' and communities' needs. We are also mindful of the future: our environmental impact as well as the diversity and balance of our portfolio.

Develop and innovate

We assess each potential operation with a focus on risk, potential returns, and long-term sustainability and value. Once we have approved an investment, we design and build each operation. We aim to develop every potential site to achieve optimal, long-term productivity while minimising risks.

We work in partnership with a growing network of stakeholders – governments, communities, customers and suppliers – who help expand our thinking, understanding, capabilities and, ultimately, our ability to deliver mutual benefit.

Mine and process

A safe site is a productive site, and advanced technologies are playing a more important role in how we achieve both. We share best practices across our assets to create safe, environmentally responsible working practices and a high-performing culture that targets production at lower costs.

At the same time, our operations aim to benefit local economies by contributing jobs, taxes and royalties, contracts with local businesses, and social and community investment. By understanding and respecting our business partners, employees, communities and the environment, we can create sustainable value for all our stakeholders.

Market and deliver

Our minerals and metals are used in a vast array of everyday products – from cars to coffee pods to smartphones. Our commercial team ensure that we manage our products in line with market and customer needs. And our network of rail, ports and ships means that we can control end-to-end logistics to deliver our products safely, efficiently and reliably.

Repurpose and renew

We aim to design and run our assets to create a positive legacy once our mining activity concludes. Applying this approach could entail rehabilitating the land for a nature reserve, for example, or repurposing it for light industrial use. Each of our sites has rehabilitation plans that we review every year. We see this long-term approach – planning and operating with the future in mind – as integral to running a safe, responsible and profitable business.

Disciplined capital allocation

Our business is underpinned by a disciplined approach to capital allocation; we strive to use every dollar prudently. Today, our balance sheet is a key strength, providing a resilient platform for strong and consistent shareholder returns, as well as enabling us to invest throughout the commodity cycle.

Our values

Our values reflect our commitment to the safety, rights and wellbeing of our employees, the integrity of our business and supply chain, and respect for the environment.

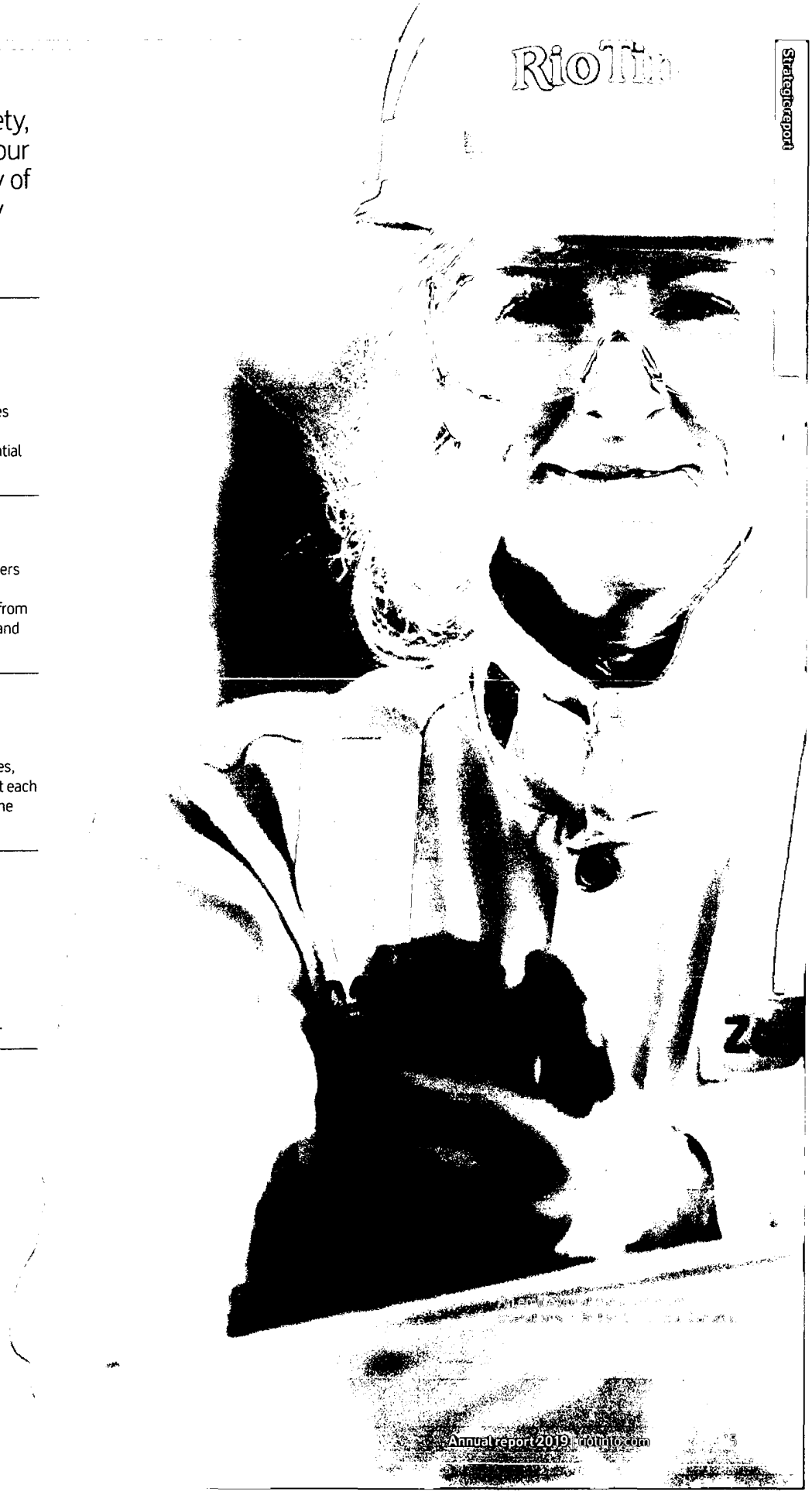
Caring for human life and wellbeing above everything else
We make the safety and wellbeing of our employees, contractors and communities our number one priority. Always. Safely looking after the environment is an essential part of our care for future generations.

Collaborating for success
We work together with colleagues, partners and communities globally to deliver the products our customers need. We learn from each other to improve our performance and achieve success.

Fostering inclusion and embracing diversity
We recognise and respect diverse cultures, communities and points of view. We treat each other with fairness and dignity to make the most of everyone's contributions.

Having the courage and commitment to do the right thing
We do the right thing, even when this is challenging. We take ownership of what we do and say. And we are honest and clear with each other, and with everyone we work with. This helps us to build trust.

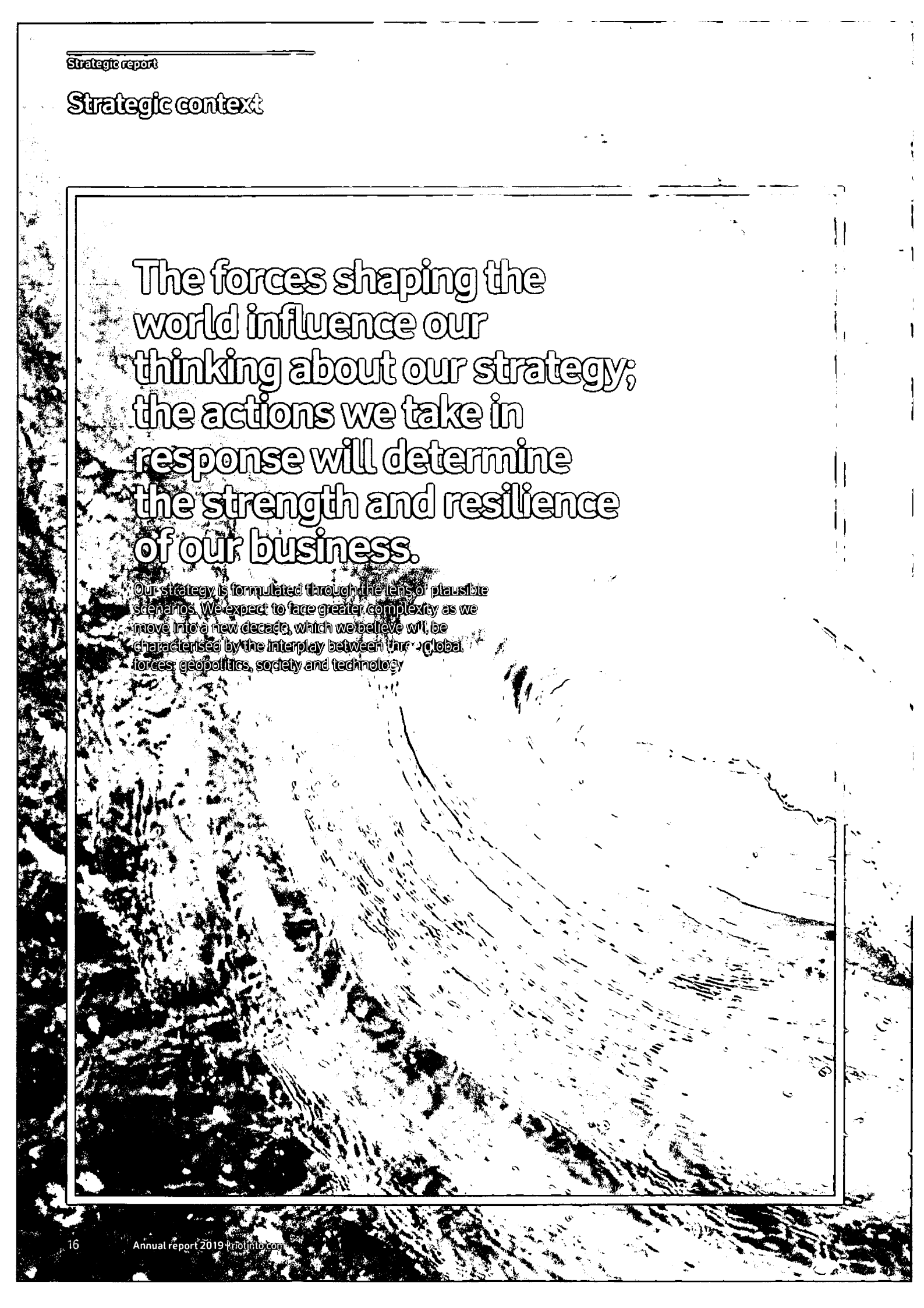
Being the best we can be for superior performance
We challenge ourselves and others to create lasting value and achieve high performance. We adopt a pioneering mindset and aim to do better every day.



Strategic context

The forces shaping the world influence our thinking about our strategy; the actions we take in response will determine the strength and resilience of our business.

Our strategy is formulated through the lens of plausible scenarios. We expect to face greater complexity as we move into a new decade, which we believe will be characterised by the interplay between three global forces: geopolitics, society and technology.



Technology

The transition to the fourth stage of industrialisation, in which technology becomes interwoven into increasing aspects of everyday life, continues. This era will be defined by a step change in digital connectivity and 'intelligent' systems that can gather and analyse data and communicate with other systems, supported by advanced analytics and artificial intelligence. There is no doubt the transition has already been deeply transformative in some sectors, resulting in a mix of disruption and new opportunity. Whether and how quickly this will translate to a broader boost in global economic productivity and growth remains uncertain.

Similarly, while the mining industry has arguably been at the forefront of automating mobile equipment over the past decade, the scope of digital transformation in the sector has been fairly limited. Nevertheless, technology and digital will need to play a key role in the industry's renewed productivity effort, which remains essential after a long period of productivity declines during the China boom. This effort will require companies like ours to further develop and strengthen partnerships – with original equipment manufacturers, research institutions and technology providers – to drive and further integrate technological innovation in mining.

Furthermore, the interplay between technology and society brings uncertainties related to the future of work, as well as the geopolitical and social tensions that emerge from a greater concentration of wealth and data in large technology companies. On the other hand, innovation and a continued drop in the cost of low-carbon technologies may lower barriers to a faster transition to a more sustainable, lower-carbon world.

Society

Sustainability, including climate change, is becoming an ever more pressing challenge facing society. Many would argue that the pursuit of sustainable goals can be constrained by a lack of accompanying social progress, including efforts to address social and economic inequality. Business has an important role to play in addressing each of these challenges – but the private sector cannot address the unprecedented challenge of climate change alone. It needs to work within strong and predictable policy frameworks and alongside robust local and global institutions promoting inclusive and sustainable growth.

This is certainly the case for our industry. While a safe, sustainable approach to mining is critical, it must also include a strong focus on local communities, including jobs and employment, and the effective management of shared resources, such as air and water, land and waste, through the mining life cycle. The mining industry must also be part of the solution in the global effort to address climate change. This will require the industry, including our business, to work together across the full value chain to develop materials with a reduced environmental footprint and support the transition to a lower-carbon economy.

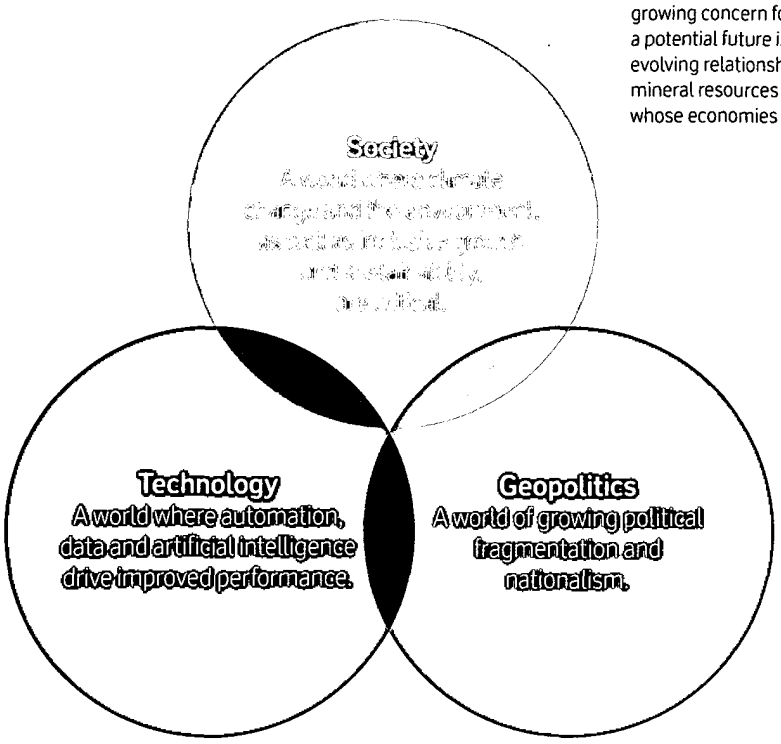
Ultimately, addressing societal challenges requires broad and deep collaboration, domestically and globally, and the mobilisation of a complex web of stakeholders around shared interests. Today, the international institutions that helped preserve global stability for much of the 20th century are themselves under pressure, reflecting tensions between segments of society and the established geopolitical order.

Geopolitics

Since the middle of the 20th century, geopolitics has been defined by globalisation – a dominant force that culminated with the development of China, which has been unprecedented in terms of scale and speed. However, while the development gap between countries has narrowed significantly over the past decade, it is also true that globalisation has not benefitted people equally within countries. This is, in turn, fragmenting the social and political landscape around the world and arguably leading to the rise of nationalism and the distrust of a political and business establishment that is perceived by some to be biased towards a global elite.

This change in the geopolitical cycle is further accentuated by a marked shift in the relationship between the US and China. Arguably, the world's most important relationship stands at a significant juncture as China's economy reaches maturity and continues to progress along the New Era roadmap articulated by President Xi Jinping. The interplay between geopolitics and technology will be particularly important as the US and China vie for leadership in the transition to the fourth industrial revolution. This could potentially lead to divergent technology standards and ecosystems with implications for the structure of global supply chains.

The mining industry, which is heavily dependent on free trade and growth, will need to be resilient in this new phase of geopolitics. We have already seen a shift in the industry's competitive landscape, with more acquisitions and minerals development being made by Chinese companies as part of the Chinese government's global development strategy known as the Belt and Road Initiative. Ensuring a secure supply of critical minerals is also becoming a growing concern for many countries. This points to a potential future in which the market is defined by evolving relationships between host countries of mineral resources and countries, such as China, whose economies generate large demand.

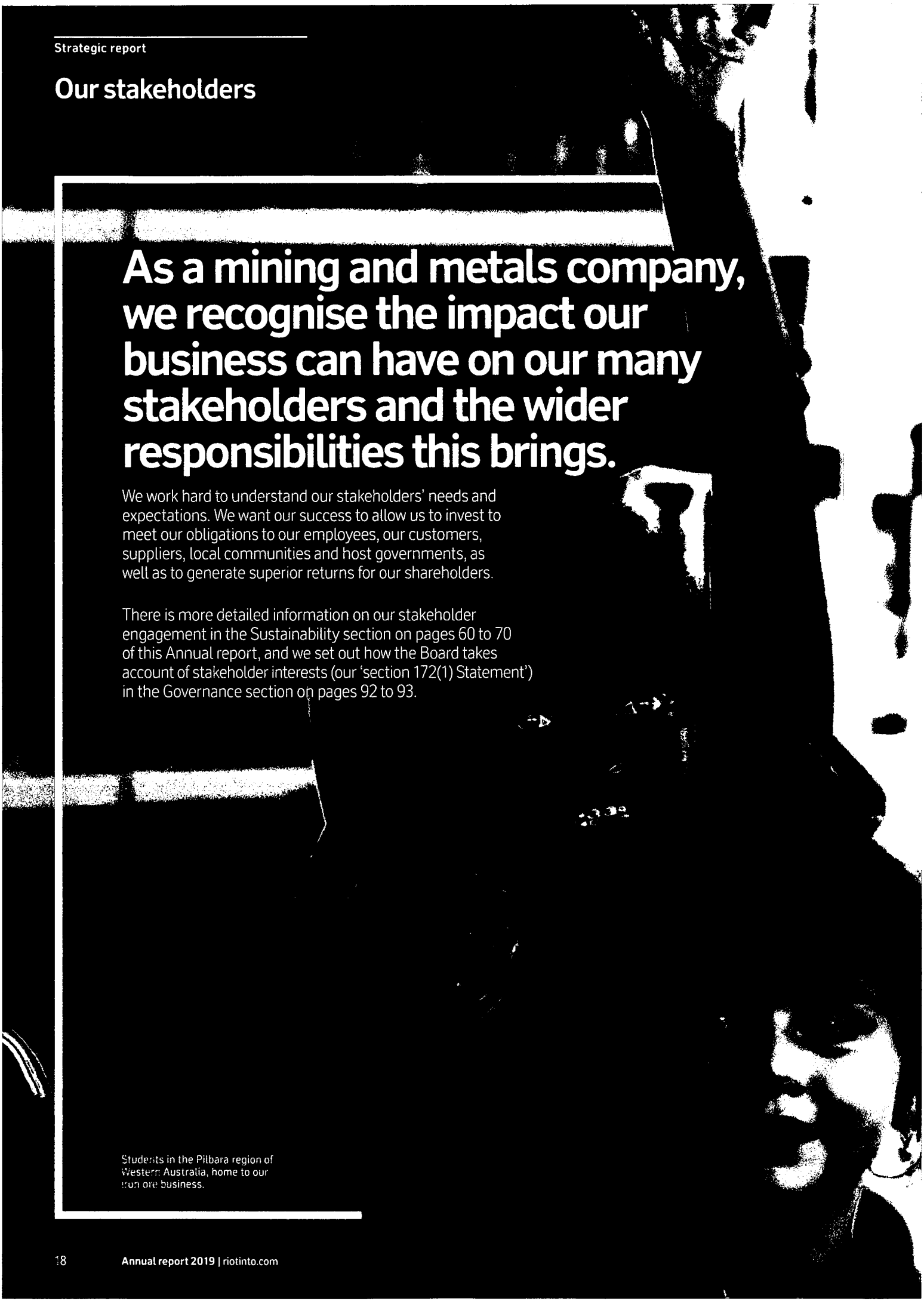


Our stakeholders

As a mining and metals company, we recognise the impact our business can have on our many stakeholders and the wider responsibilities this brings.

We work hard to understand our stakeholders' needs and expectations. We want our success to allow us to invest to meet our obligations to our employees, our customers, suppliers, local communities and host governments, as well as to generate superior returns for our shareholders.

There is more detailed information on our stakeholder engagement in the Sustainability section on pages 60 to 70 of this Annual report, and we set out how the Board takes account of stakeholder interests (our 'section 172(1) Statement') in the Governance section on pages 92 to 93.



Students in the Pilbara region of Western Australia, home to our iron ore business.

Employees

Our 46,000 employees in 36 countries are our most important asset. They want to work in an environment where they are safe and respected, and have the opportunity to learn, reach their potential and develop successful careers in a company they can be proud of.

We know that engaged employees make a productive and innovative business, and we have a wide range of activities aimed at understanding their views. In addition to the day-to-day engagement within teams, we hold numerous town halls with our Chief Executive and other senior leaders, and have regular conversations via our Yammer social platform.

By listening in this way, we continue to refine how and what we offer to meet the varying needs of our workforce. We do this by, for example, further investing in leadership development, as we know leaders are key to engaging and developing employees; by reviewing how we recognise individuals for their contribution and excellence; and by setting clear expectations for how we treat each other to bring our organisational values to life and give people a voice.

We conduct a six-monthly employee engagement survey to help measure our progress and to further understand how people feel about the company and its direction.

Communities and governments

Trust and partnership with the communities and governments that host our operations is vital.

Each of these groups has a strong interest not only in the employment opportunities our business creates, both directly and indirectly, but also the wider societal benefits that accrue – be it taxes and royalties or the millions we invest in our communities every year. Understandably, these groups are also concerned with the potential environmental and cultural impacts our operations may have.

We regularly engage with our communities and host governments on a wide range of topics, including employment opportunities, taxes and royalties, environmental protection and local procurement. In our Pilbara iron ore business, for example, we conduct an annual survey – called Local Voices – that provides real-time insights to inform decision-making.

We actively engage in dialogue around global social issues and the environment, including climate change. For example, this year we announced a partnership in China to explore ways to improve environmental performance across the entire steel value chain, in which our iron ore business plays an important part.

Customers and suppliers

Our business works with long-term horizons – our investments must often deliver returns for decades, not years – and both our customers and suppliers have an interest in developing partnerships that allow them to consistently share the benefits of our work together. This in turn requires trust and transparency: they want to know that we will do what we say we will do.

We work closely with customers and suppliers, and in doing so, bring their voice, and the needs of a dynamic market, into our operational, investment and production decisions. For example, by extending our supply chain into Chinese ports, we have enabled access to new customers, created value through product screening and blending, and increased the optionality in our supply chain. In addition, by working closely with our suppliers we have captured supply chain innovation to deliver improved operational performance. We have also continued to enhance how we engage with our markets, customers and suppliers, in part by using technology, data and analytics. We are continuing to pilot the latest technologies, including blockchain and paperless solutions, to evolve the way we conduct our business and make our transactions more efficient, safe and cost-effective.

Our suppliers are vital to our business success and we are continuing to work to improve our partnerships with them. We consider a supply chain of strong local suppliers to be good for our business, local communities and the economy. We are continuing to develop local procurement strategies designed to increase opportunities for businesses to be a part of the Rio Tinto supply chain.

Investors

Our investors include global investment funds, pension funds and corporate bondholders, as well as tens of thousands of individuals, all of whom have trusted us with their capital and wish to earn a financial return.

They are interested in understanding how we run our business: our strategy, our focus on operational excellence and sustainability, the views of our leadership, including on capital allocation – and the performance that results from the confluence of these. We are often also asked about the purpose, values and culture of the Group, as well as the threats and opportunities that affect delivery of our strategy.

We aim to deliver superior returns to our investors throughout the commodity cycle, and we have a comprehensive communication and engagement programme in addition to our annual general meetings (AGMs) in the UK and Australia. In 2018, for example, in addition to our usual programme of meetings and engagement, we held two investor seminars focused on sustainability; and in late 2019, we held a seminar to update investors on our progress against our strategy.

Our strategy

Our strategy is to create superior value for shareholders by meeting customers' needs, maximising cash from our world-class assets and allocating capital with discipline.

Our strategy comprises four key areas:

Portfolio
Low-cost, long-life assets that deliver attractive returns

People
Building capability to drive performance

Performance
Safety, operational and commercial excellence drive superior margins and returns

Partners
Working with others for future success

Employees at Oyu Tolgoi, where 93% of our employees are Mongolian.

Portfolio

Our portfolio of low-cost, long-life assets delivers attractive returns through the cycle. After a significant portfolio reshaping, we are invested in commodities with strong, long-term fundamentals and material growth opportunities.

Investing in our business

To sustain the strength and resilience of our business, in 2019 we continued to invest in high-return projects. For example, in December, we announced a $1.5 billion investment at our Kennecott copper mine in Utah, in the US, which will serve to extend operations to 2032. In November, we announced a $749 million investment in our Greater Tom Price operations, in the Pilbara region of Western Australia, to help sustain the production capacity of our iron ore business. In April, we announced we would sustain current capacity and extend the life of our Richards Bay Minerals (RBM) operation, in South Africa, through the investment of $463 million in the Zulti South project. Construction is currently on hold after a number of security incidents – we will assess a restart after normalisation of operations at RBM.

Also in April, we committed $302 million of additional expenditure to advance the Resolution Copper project in Arizona, in the US, to fund additional drilling, ore body studies, infrastructure improvements and permitting activities as the project moves to the final stage of permitting. And in March, we completed the commissioning of our $1.9 billion Amrun bauxite mine on the Cape York Peninsula in Queensland, Australia. The mine and associated processing and port facilities will replace production from our depleting East Weipa mine and increase annual bauxite export capacity by around 10 million tonnes.

$5.5bn

invested to grow and sustain the strength of our business

People

Attracting, developing and retaining the best people is crucial to our success. We continue to strengthen our technical and commercial capabilities through our Centres of Excellence, and are committed to building an inclusive and diverse workforce across our global business.

Recognising and promoting technical expertise

We launched an initiative – RioExcel – to recognise the important role our technical experts play in delivering our strategy, including safety, growth and operational excellence. The programme supports the career progression and development of technical experts – in fields ranging from geology to process engineering to asset management and data and optimisation – who wish to remain in technical roles, rather than become operational or line leaders. It provides those recognised as experts with a platform for further career and development opportunities and exposure across the Group.

In 2019, 50 people across our technical disciplines were recognised as experts – individuals whose unique contributions help our company challenge the status quo, introduce innovative solutions for safely managing our technical risks, and deliver productivity gains.

RioExcel delivers a deeper pool of technical expertise for our business – a source of competitive advantage, a more engaged and collaborative technical workforce and safer, more productive and future-ready operations.

50+

men and women recognised via RioExcel

Performance

Safety is our number one priority. We look to generate value from mine to market and also to prioritise value over volume in our investment decisions. We work to maximise value in other ways – for example, by developing new markets for our materials, including as part of the transition to a low-carbon economy. We focus on operational excellence to improve efficiency.

Progressing safety

We ended 2019 with strong performance in safety, improving our process safety and recording our first fatality-free year since we began operations, almost 147 years ago. While we recognise the efforts, Group-wide, that led to this performance, we know we cannot be complacent. And we again pledge to do everything we can to continually improve, and send everyone home safe and healthy.

In 2019, we introduced our safety maturity model (SMM) to expand on our successful critical risk management (CRM) programme. SMM incorporates a holistic approach to risk, work planning and execution, as well as learning, improvement and leadership engagement, including the continued focus on CRM and learning from potentially fatal incidents (PFIs). Our operations completed an initial self-assessment to familiarise themselves with the model. This was then followed by a baseline assessment and an end-of-year assessment led by Group HSE, and supported by an independent operational leader. We were pleased that they demonstrated a strong improvement over their baseline assessments, particularly in leadership and engagement. Across the Group, using a nine-point scale, we saw improvement to an average maturity of 4.5 (classified as evolving) from a baseline of 3.4 (classified as basic).

AIFR 0.42

down from 0.44 in 2018, marking a strong performance in safety

Partners

Partnerships and collaboration are essential to the long-term success of our business. We work closely with technology partners, local suppliers, governments, community groups, industry leaders and NGOs at all stages of the mining lifecycle, from exploration to rehabilitation and closure. We believe this gives us a competitive edge and also allows us to work more thoughtfully and responsibly, and to deliver real benefits to all our stakeholders.

Partnering to address climate change

We have long recognised the reality of climate change and its potential to affect our business, our communities and our world. However, we also recognise that no business can make a meaningful contribution on its own. To that end, this year we continued to form partnerships to help address the climate change challenge.

In September, we signed a memorandum of understanding (MOU) with China Baowu Steel Group and Tsinghua University to develop and implement new methods to reduce carbon emissions and improve environmental performance across the steel value chain. The MOU will enable the formation of a joint working group tasked with identifying a pathway to reducing carbon emissions across the entire steel value chain, which accounts for 7-9% of the world's carbon emissions.

In November, we partnered with the Natural Sciences and Engineering Research Council of Canada (NSERC) to fund a new Industrial Research Chair in Climate Change and Water Security at the University of Northern British Columbia. The C$1.5 million from NSERC and Rio Tinto support research by Dr. Stephen Déry to quantify the roles of climate variability, climate change and water management in the Nechako River basin's water supply. Our Kitimat aluminium smelter is located in British Columbia, with clean hydropower supplied by the Nechako reservoir.

C$1.5m

in research funding from NSERC and Rio Tinto

Key performance indicators

The Board uses a range of financial and non-financial metrics, reported periodically, to measure Group performance against the four key areas of our strategy (portfolio, people, performance and partners).

This year we reviewed our key performance indicators (KPIs) and made the following changes:

- We have added return on capital employed (ROCE). This measures how efficiently we generate profits from our assets, reflecting our strategy of investing in a portfolio of low-cost, long-life assets that deliver attractive returns throughout the cycle.
- We have added free cash flow, which measures net cash returned by the business after investment in sustaining and growth capital expenditure.
- We have removed capital expenditure as a standalone key performance indicator as this is a component of the new free cash flow metric.

Non-financial metrics for measuring the people strategic pillar have been developed, including the development in 2019 of a culture and values scorecard. In 2020, we will consider which of these internal metrics will be used as published KPIs in future annual reports.

Key performance indicator definition

All injury frequency rate (AIFR)

The number of injuries per 200,000 hours worked by employees and contractors at operations that we manage. AIFR includes medical treatment cases, restricted workday and lost-day injuries.

Strategic pillar

People **Performance** **Partners**

Relevance to strategy & executive remuneration

Safety is our number one priority, one of our core values and an essential component of everything we do. Our goals are to maintain zero fatalities, prevent catastrophic events and reduce injuries. We continually reinforce our safety culture, in part by improving leadership and simplifying tools and systems.

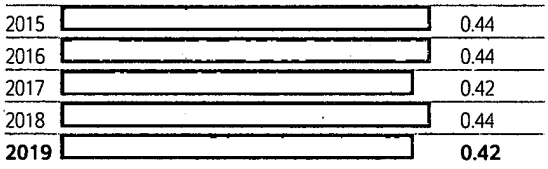
Link to executive remuneration
Included in the short-term incentive plan (see page 113).

Associated risks

- HSE
- Operational and people

Five-year trend

All injury frequency rate (AIFR)
per 200,000 hours worked



Performance in 2019

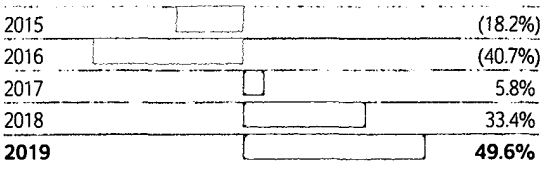
We experienced no fatalities in 2019 and overall delivered strong safety performance. We reduced our AIFR slightly to 0.42 (from 0.44 in 2018) and continued to improve our catastrophic event prevention through a step-change in managing process safety and more assurance over major hazard risks. Over the past five years, our AIFR performance has been strong.

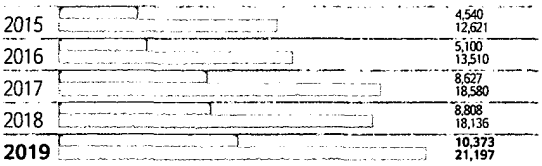
Forward plan

We will:

- Continue to implement our critical-risk management programme and safety maturity model
- Strengthen our safety leadership and coaching programmes
- Work more closely with contractors and joint-venture partners to improve our safety record
- Continue to implement our major hazard standards, including process safety, water and tailings, with strong assurance processes
- Simplify critical safety tools

	Total shareholder return (TSR)[1]	Underlying earnings and underlying EBITDA
Key performance indicator definition	Combination of share price appreciation (using annual average share price) and dividends paid and reinvested to show the total return to the shareholder over the preceding five years.	Underlying earnings represent net earnings attributable to the owners of Rio Tinto, adjusted to exclude items which do not reflect the underlying performance of the Group's operations. These items are explained in note 2 of the financial statements. Underlying EBITDA represents profit before tax, net finance items, depreciation and amortisation. It excludes the EBITDA impact of the items mentioned above.
Strategic pillar	**Portfolio Performance**	**Portfolio Performance**
Relevance to strategy & executive remuneration	Our strategy aims to maximise shareholder returns through the commodity cycle, and TSR is a direct measure of that. *Link to executive remuneration* Reflected in long-term incentive plans, measured equally against the EMIX Global Mining Index and the MSCI World Index (see page 113).	These financial KPIs measure how well we are managing costs, increasing productivity and generating the most revenue from each of our assets. *Link to executive remuneration* Underlying earnings is reflected in the short-term incentive plan; in the longer term, both measures influence TSR, which is the primary measure for long-term incentive plans (see page 113).
Associated risks	– Market – Strategic – Communities and other key stakeholders	– Market – Communities and other key stakeholders – Operational and people
Five-year trend	**Total shareholder return (TSR)** measured over the preceding five years (using annual average share price)	**Underlying earnings and underlying EBITDA** $ millions Underlying EBITDA Underlying earnings
Performance in 2019	The share prices of Rio Tinto plc and Rio Tinto Limited reached new highs in 2019. TSR performance over the five-year period was driven principally by movements in commodity prices and changes in the global macro environment. Rio Tinto significantly outperformed the EMIX Global Mining Index over the five-year period, and slightly outperformed the MSCI World Index.	Underlying earnings of $10.4 billion were $1.6 billion higher than in 2018. Underlying EBITDA of $21.2 billion was $3.1 billion higher than 2018. The 17% increase in underlying EBITDA resulted from higher iron ore prices, partly offset by lower prices for aluminium and copper, higher costs and the absence of contributions from assets divested in 2018.
Forward plan	We will continue to focus on generating the free cash flow from our operations that allows us to return cash to shareholders (short-term returns) while investing in the business (long-term returns).	We will continue to drive superior margins and returns through a focus on operational and commercial excellence and our value over volume approach.

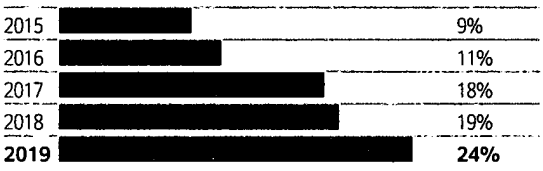


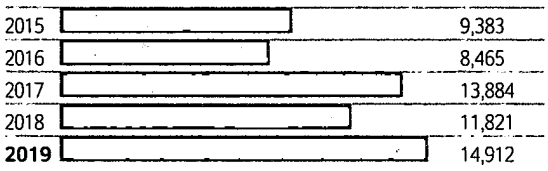


1 The TSR calculation for each period is based on the change in the calendar year average share prices for Rio Tinto plc and Rio Tinto Limited over the preceding five years. This is consistent with the methodology used for calculating the vesting outcomes for Performance Share Awards (PSA). The data presented in this chart accounts for the dual corporate structure of Rio Tinto.

Key performance indicators
continued

	Return on capital employed (ROCE)	Net cash generated from operating activities
Key performance indicator definition	Underlying earnings before interest divided by average capital employed (operating assets before net debt).	Cash generated by our operations after tax and interest, including dividends received from equity accounted units and dividends paid to non-controlling interests in subsidiaries.
Strategic pillar	**Portfolio** **Performance**	**Portfolio** **Performance**
Relevance to strategy & executive remuneration	Our portfolio of low-cost, long-life assets delivers attractive returns throughout the cycle and has been reshaped significantly in recent years. ROCE measures how efficiently we generate profits from investment in our portfolio of assets. *Link to executive remuneration* Underlying earnings, as a component of ROCE, is included in the short-term incentive plan. In the longer term, ROCE also influences TSR, which is included in long-term incentive plans.	This KPI measures our ability to convert underlying earnings into cash. *Link to executive remuneration* Included in the short-term incentive plan; in the longer term, the measure influences TSR which is included in long-term incentive plans (see page 113).
Associated risks	– Market – Strategic – Financial – Operational and people	– Market – Communities and other key stakeholders – Operational and people
Five-year trend	**Return on capital employed (ROCE)** %	**Net cash generated from operating activities** $ millions
Performance in 2019	ROCE increased five percentage points to 24% in 2019, reflecting the increase in underlying earnings driven by higher iron ore prices combined with the restructuring of our portfolio through divestments and investment in growth.	Net cash generated from operating activities of $14.9 billion was 26% higher than 2018. This was primarily due to higher iron ore prices and favourable working capital movements, partly offset by higher taxes paid in 2019 relating to the 2018 coking coal disposals.
Forward plan	We will continue to focus on maximising returns from our assets over the short, medium and long term. We will also maintain our disciplined and rigorous approach and invest capital only in projects that we believe will deliver returns that are well above our cost of capital.	We will focus on effectively converting earnings into cash, underpinned by operational and commercial excellence, including our careful management of working capital.





	Free cash flow	Net debt
Key performance indicator definition	Net cash generated from operating activities minus purchases of property, plant and equipment and payments of lease principal, plus sales of property, plant and equipment.	Net borrowings after adjusting for cash and cash equivalents, other liquid investments and derivatives related to net debt (see note 24 of the financial statements).
Strategic pillar	**Portfolio Performance**	**Portfolio Performance**
Relevance to strategy & executive remuneration	This KPI measures the net cash returned by the business after the expenditure of sustaining and growth capital. This cash can be used for shareholder returns, reducing debt and other investment. *Link to executive remuneration* Included in the short-term incentive plan; in the longer term, the measure influences TSR which is included in long-term incentive plans (see page 113).	This measures how we are managing our balance sheet and capital structure. A strong balance sheet is essential for giving us flexibility to take advantage of opportunities as they arise, and for returning cash to shareholders. *Link to executive remuneration* Net debt is, in part, an outcome of free cash flow, which itself is reflected in the short-term incentive plan. In the longer term, net debt influences TSR which is reflected in long-term incentive plans (see page 113).
Associated risks	– Market – Strategic – Financial – Communities and other key stakeholders – Operational and people	– Market – Strategic – Financial – Communities and other key stakeholders – Operational and people
Five-year trend	**Free cash flow** $ millions 2015 4,795 2016 5,807 2017 9,540 2018 6,977 **2019 9,158**	**Net cash/(net debt)** $ millions 2015 (13,783) 2016 (9,587) 2017 (3,845) 2018 255 **2019 (3,651)**
Performance in 2019	Free cash flow increased by $2.2 billion to $9.2 billion in 2019, primarily due to the increase in net cash generated from operating activities. This was partially offset by lower proceeds from sales of property, plant and equipment. Capital expenditure was in line with 2018.	Net debt increased by $3.9 billion from net cash of $255 million to net debt of $3.7 billion. This reflects $11.9 billion of cash returns to shareholders in 2019 through dividends and share buy-backs and a $1.2 billion non-cash increase from the implementation of IFRS 16 "Leases", partly offset by free cash flow of $9.2 billion.
Forward plan	We aim to continue our focus on free cash flow generation through the cycle. We expect capital expenditure to be approximately $7 billion in 2020 and $6.5 billion in both 2021 and 2022.	We believe that a strong balance sheet is a major competitive advantage and essential in a cyclical business. We will therefore continue to manage net debt carefully.

Key performance indicators
continued

Climate change is a global challenge and will require action across nations, across industries, and by society at large. We want to play our part.

Key performance indicator definition

Total greenhouse gas (GHG) emissions intensity

Total GHG emissions from managed operations, expressed in metric tonnes of carbon dioxide equivalent (tCO_2e), per unit of commodity production relative to the 2008 base year. Emissions include direct emissions, plus emissions from imports of electricity and steam, minus electricity and steam exports.

Strategic pillar

Performance **Partners**

Relevance to strategy & executive remuneration

Climate risks and opportunities have formed part of our strategic thinking and investment decisions for over two decades. We now have a portfolio that is well positioned for the transition to a low-carbon economy.

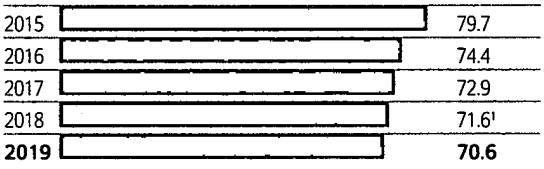
Link to executive remuneration
Our Chief Executive's performance objectives are reflected in his short-term incentive plan (STIP), which includes delivery of the Group's strategy on climate change consistent with the new 2030 targets. These are cascaded down into the annual objectives of relevant members of the Executive Committee and other members of senior management.

Associated risks

- Market
- Strategic
- Climate change
- Communities and other key stakeholder
- Operational and people

Five-year trend

Emissions intensity of our managed operations
(intensity, 2008 = 100)



Performance in 2019

In 2019, the emissions intensity of our managed operations fell to 70.6 (2008 = 100) and the percentage of our electricity consumption from renewable sources rose from 71% to 76%. We shut our coal power plant and purchased renewable energy certificates at our Kennecott copper operations. This reduces the operation's annual carbon footprint by as much as 65%, or the equivalent of more than a million tonnes of carbon dioxide.

Forward plan

Our ambition is to reach net zero emissions by 2050 across our operations. Our 2030 targets are to reduce our emissions intensity by 30% and our absolute emissions by 15%, compared with our 2018 equity baseline.

We plan to spend approximately $1 billion over five years on emissions reduction projects, research and development, and activities to enhance the climate resilience of our business.

1 Number adjusted from previous years to ensure comparability over time.

Chief Financial Officer's statement

Underlying EBITDA

$21,200m

Net cash generated from operating activities

$14,900m

Net debt

$3,700m

Our high-quality portfolio of long-life, competitive assets has consistently generated superior returns and cash flow.

Strong financial results, supported by price
We increased our revenues by 7% to $43.2 billion ($45.4 billion including equity accounted units), primarily due to higher iron ore prices. This more than compensated for lower copper and aluminium prices and the absence of revenues from our divestments in 2018, primarily the coking coal assets.

Our underlying EBITDA of $21.2 billion increased by 17% compared with 2018, and the underlying EBITDA margin was 47%. Higher prices and weaker local currencies, compared with the US dollar, were the principal drivers of the increase, adding around $4.9 billion in aggregate to EBITDA. Our iron ore shipments were 3% lower in 2019 following weather disruptions and operational challenges in the first half of the year. However, we were able to offset this impact following a strong second half for Iron Ore, higher bauxite volumes, improved aluminium product mix and an increase in by-products from our copper mines, mainly gold and molybdenum.

We saw a $0.5 billion increase in cash operating costs, which we present on a unit cost basis. This was primarily comprised of higher Iron Ore unit costs driven by first half challenges in the Pilbara, partly offset by reduced operating costs in aluminium from lower input prices and productivity improvements.

The movement from 2018 to 2019 underlying EBITDA also reflects the absence of approximately $1.2 billion of contributions from assets divested in 2018, primarily the coking coal business in Australia and the Grasberg copper mine in Indonesia.

Making disciplined investments for the future
Our capital allocation framework is well defined. We will continue to invest in safely managing our assets and improving their performance. This means that sustaining capital expenditure is always a priority, reflected in our decision at the half year to lift our sustaining investment to approximately $2.5 billion per year going forward.

Our investment decisions are carried out with considerable rigour and diligence. I believe this provides the best assurance for our shareholders that we will only invest in opportunities that create value.

In 2019, our capital expenditure was $5.5 billion, reflecting our commitment to invest through the cycle. This comprised $2.6 billion of development capital, of which $1.2 billion was replacement capital, and $2.9 billion of sustaining capital. Our most significant growth project remains the Oyu Tolgoi copper-gold underground project in Mongolia, where we invested $1.3 billion in 2019 on a 100% basis, as we fully consolidate Oyu Tolgoi. And we are ramping up our investments over the coming years with the replacement of iron ore production in the Pilbara, where we have commenced construction of the Koodaideri and Robe River sustaining mines.

Chief Financial Officer's statement continued

A strong balance sheet creates resilience and optionality
We ended 2019 with net debt of $3.7 billion, an increase of $3.9 billion since 2018. This is due to the $4.8 billion of shareholder returns we paid in 2019 from divestment proceeds received in 2018, as well as the adoption of IFRS16 "Leases" on 1 January 2019, which increased net debt by $1.2 billion.

Our world-class assets, combined with a strong balance sheet, support our ability to provide superior cash returns to our shareholders. They also enable us to manage the business through the cycle – allowing us to act counter-cyclically and providing us with optionality. Our strong balance sheet is particularly valuable in the current volatile environment, which has been compounded by the Covid-19 virus. We are evaluating the current situation, and all our operations are looking at opportunities to adjust to any changes in market conditions.

Our pay-out ratio continues to exceed the returns policy
We implemented our returns policy in 2016, committing to total cash returns to shareholders, through the cycle, of 40 - 60% of underlying earnings, on average. Since its implementation, we have consistently paid out well above this range each year.

2019 was no exception – we are returning 70% of underlying earnings to shareholders. This includes the final ordinary dividend of 231 US cents per share which brings total dividends for the year to 443 US cents, or $7.2 billion.

As we look to the future, I am confident our high-quality portfolio will continue to generate superior returns over the short, medium and long term.

Jakob Stausholm
Chief Financial Officer
26 February 2020

Our world-class assets, combined with a very strong balance sheet, support our ability to provide superior cash returns to our shareholders. It also enables us to manage the business through cycles – allowing us to act counter-cyclically and providing us with optionality.

Financial review

Non-GAAP measures
In addition to IFRS measures, management uses non-GAAP measures internally to assess performance. Full reconciliations are provided in the notes to the financial statements. These measures are highlighted with the symbol: •

At year end	2019	2018	Change
Net cash generated from operating activities (US$ millions)	**14,912**	11,821	26%
Capital expenditure[1] (US$ millions)	**5,488**	5,430	1%
Free cash flow[2] (US$ millions) •	**9,158**	6,977	31%
Underlying EBITDA[3] (US$ millions) •	**21,197**	18,136	17%
Underlying earnings[3] (US$ millions) •	**10,373**	8,808	18%
Net earnings (US$ millions)	**8,010**	13,638	(41)%
Underlying earnings[3] per share (US cents) •	**636.3**	512.3	24%
Ordinary dividend per share (US cents)	**382.0**	307.0	24%
Total dividend per share (US cents)	**443.0**	550.0	(19)%
Net (debt)/cash[4] (US$ millions) •	**(3,651)**	255	
Return on capital employed (ROCE)[6] •	**24%**	19%	

Our financial results are prepared in accordance with International Financial Reporting Standards (IFRS). Footnotes are set out on page 31.

- Strong safety performance in 2019, with no fatalities and a slightly improved all injury frequency rate, coming from a strong base. Continued improvement in prevention of catastrophic events through a step-change in process safety management.
- $14.9 billion operating cash flow was 26% higher than 2018 and $9.2 billion free cash flow[2] was 31% higher than 2018. Both are presented after $0.9 billion tax paid in 2019 relating to the 2018 coking coal disposals.
- $5.5 billion capital expenditure[1] was consistent with 2018. In late 2019, we announced the approval of two further investments, at Greater Tom Price (iron ore, $0.8 billion) and Kennecott (copper, $1.5 billion).
- $21.2 billion underlying EBITDA[3] was 17% above 2018, primarily driven by higher iron ore prices, with an underlying EBITDA margin[7] of 47%.
- $10.4 billion underlying earnings were 18% above 2018. Taking exclusions into account, net earnings of $8.0 billion were 41% lower than 2018, mainly reflecting $1.7 billion[8] of impairments in 2019, primarily the Oyu Tolgoi underground project, consistent with our 2019 interim results, and the Yarwun alumina refinery. This compared with $4.0 billion of gains on disposals in 2018.
- Strong balance sheet with net debt[4] of $3.7 billion, a rise of $3.9 billion, mainly reflected $11.9 billion of cash returns to shareholders in 2019 through dividends and share buy-backs, and a $1.2 billion non-cash increase from the implementation of IFRS 16 "Leases", partly offset by free cash flow of $9.2 billion.
- $7.2 billion full-year dividend, equivalent to 443 US cents per share and 70% of underlying earnings, includes $3.7 billion record final ordinary dividend (231 US cents per share).

Stronger revenues and underlying EBITDA
- $43.2 billion consolidated sales revenue ($45.4 billion including our share of equity accounted units) was 7% higher than 2018, primarily driven by higher iron ore prices. This was partially offset by lower copper and aluminium prices and the absence of revenues from assets divested in 2018.
- $21.2 billion underlying EBITDA[3] was 17% higher than 2018, reflecting the higher iron ore price and the recovery from the operational challenges earlier in the year. This more than compensated for higher unit costs and the absence of underlying EBITDA from assets divested in 2018.
- 30% effective tax rate on underlying earnings[3] – one percentage point higher than in 2018, primarily reflecting increased profits in Australia.
- $8.0 billion net earnings – 41% lower than 2018, mainly reflecting the impairments of Oyu Tolgoi and Yarwun alumina refinery in 2019, which compared with gains on disposals in 2018. See table on page 34.

$7.2 billion of dividends declared for 2019

	US$ billion	US cents per share
Ordinary dividend		
Interim ordinary dividend paid in September 2019	2.5	151
Final ordinary dividend to be paid in April 2020	3.7	231
Full-year ordinary dividend	**6.2**	**382**
Additional returns		
Special dividend paid in September 2019	1.0	61
Combined total is 70% of 2019 underlying earnings	**7.2**	**443**

Financial review continued

Strong cash flow from operations drives free cash flow

	2019 US$m	2018 US$m
Net cash generated from operating activities	**14,912**	11,821
Capital expenditure[1]	**(5,488)**	(5,430)
Sales of property, plant and equipment	**49**	586
Lease principal payments	**(315)**	–
Free cash flow[2]	**9,158**	6,977
Disposals*	**(80)**	7,733
Dividends paid to equity shareholders	**(10,334)**	(5,356)
Share buy-backs	**(1,552)**	(5,386)
Non-cash impact from implementation of IFRS 16 "Leases" from 1 January 2019	**(1,248)**	–
Other	**150**	132
(Increase)/decrease in net debt[4]	**(3,906)**	4,100

* Net disposal proceeds include a cash outflow representing Rössing's cash balance at the date of the sale. See page 34.
See page 31 for other footnotes.

- $14.9 billion in cash generated from operating activities, after $0.9 billion tax paid relating to the 2018 coking coal disposals. This was 26% higher than 2018 and was driven primarily by higher underlying EBITDA from higher iron ore prices and the ongoing management of working capital.
- $5.5 billion capital expenditure[1] comprised of $2.6 billion of development capital, of which $1.2 billion is replacement capital, and $2.9 billion of sustaining capital.
- $10.3 billion of dividends paid in 2019 comprised of the 2018 final and special dividends paid in April 2019 ($6.8 billion) and the 2019 interim and special dividends paid in September 2019 ($3.5 billion).
- $1.6 billion paid for 28.4 million share repurchases under the Rio Tinto plc on-market share buy-backs announced in 2018, with the remaining $0.2 billion purchases to be completed no later than 28 February 2020.
- The implementation of IFRS 16 "Leases" on 1 January 2019 increased net debt by $1.2 billion (non-cash movement).
- As a result of the above, and $0.2 billion of other movements, net debt[4] increased by $3.9 billion since the end of 2018 to $3.7 billion.

Continued investment in growth projects and development

- Greenfield success with further encouraging drill results released in August 2019 at the Winu project in Western Australia. Extensive drilling and geophysical testing programme completed: geotechnical, hydrology, mining, processing and basic engineering studies are well advanced. Targeting first production in 2023, subject to regulatory approvals and consents.
- $624 million spent on exploration and evaluation. This 28% rise was mostly driven by higher greenfield expenditure to underpin future growth projects, as well as increased activity at the Resolution copper project in Arizona, for which we committed $302 million ($166 million our 55% share) in future expenditure.
- $2.6 billion Koodaideri replacement iron ore mine progressed, with key construction activities on schedule. Koodaideri will have a 43 Mt annual capacity underpinning production of our Pilbara Blend™, with first tonnes in late 2021.
- $1.5 billion investment at Kennecott approved in late 2019. Phase 2 of the south wall pushback is expected to extend copper operations to 2032.
- At the Oyu Tolgoi underground copper/gold mine in Mongolia, we completed the primary production shaft in October 2019, a key milestone. Work continued on the mine design and, overall, we remain within the cost and schedule ranges announced in July 2019. We continue to expect to complete the mine design in the first half of 2020 and the definitive estimate[9] of cost and schedule in the second half of 2020.
- $463 million investment in the Zulti South project at Richards Bay Minerals (RBM) in South Africa approved in 2019 to sustain current capacity and extend mine life. Construction is on hold after a number of security incidents – we will assess a restart after normalisation of operations at RBM.

Total cash returns to shareholders declared

	2019 US$ billion	2018 US$ billion
Ordinary dividend		
Interim	**2.5**	2.2
Final	**3.7**	2.9
Full-year dividend	**6.2**	5.1
Additional returns		
Share buy-back announced in August 2018, completed by 27 February 2019	**n/a**	1.0
Special dividend announced in August 2019, paid in September 2019	**1.0**	n/a
Total cash returns from operations	**7.2**	6.1
Combined total as % of underlying earnings	**70%**	72%
Supplementary returns of post-tax divestment proceeds in 2018		
Off-market buy-back in Rio Tinto Limited, completed in November 2018	**n/a**	2.1
On-market buy-back in Rio Tinto plc from 28 February 2019 to 28 February 2020	**n/a**	1.1
Special dividend of 243 US cents per share paid in April 2019	**n/a**	3.9
Total supplementary returns	**n/a**	7.1
Total cash returns to shareholders declared for each year	**7.2**	13.2

Total dividends paid in 2019 in respect of 2018 differ from the 2018 declaration of $13.5 billion due to the impact of exchange rates and the share buy-back.

Total cash returns paid to shareholders

	2019 US$ billion	2018 US$ billion
Previous year's final ordinary dividend paid in April of each year	**2.9**	3.2
Special dividend announced in February 2019, paid in April 2019	**3.9**	n/a
Interim ordinary dividend paid in September of each year	**2.5**	2.1
Special dividend announced in August 2019, paid in September 2019	**1.0**	n/a
Share buy-backs	**1.6**	5.4
Total cash returns paid to shareholders	**11.9**	10.7

1 Capital expenditure is presented gross, before taking into account any cash received from disposals of property, plant and equipment (PP&E) and excludes capital expenditure for equity accounted units.

The following financial performance indicators – which are non-GAAP measures – are those management uses internally to assess performance. We therefore consider them relevant to readers of this document and present them here to give more clarity around the underlying business performance of our operations.

2 Free cash flow is defined as net cash generated from operating activities less purchase of PP&E, plus sales of PP&E less lease principal payments, following the adoption of IFRS 16 "Leases" in 2019.
3 Net and underlying earnings relate to profit attributable to the owners of Rio Tinto. Underlying EBITDA and earnings are defined on page 254. Underlying earnings is reconciled to net earnings on page 35.
4 Net debt / cash is defined and reconciled to the balance sheet on page 188.
5 Net gearing ratio is defined as net debt divided by the sum of net debt and total equity at the end of each period.
6 Return on capital employed (ROCE) is defined as underlying earnings excluding net interest divided by average capital employed (operating assets before net debt).
7 Underlying EBITDA margin is defined as the Group's underlying EBITDA divided by Product Group total revenues per the financial information by business unit on page 252. Product Group total revenues is defined as consolidated sales revenue plus share of equity accounted unit sales and intra-subsidiary/equity accounted unit sales.
8 See page 173 for a pre-tax analysis of impairment charge.
9 Refer to the 16 July 2019 market release "Update on Oyu Tolgoi underground project".

Financial review continued

Underlying EBITDA and underlying earnings by product group

	2019 US$m	2018 US$m	Change	Change %
Underlying EBITDA				
Iron Ore	**16,098**	11,378	4,720	41%
Aluminium	**2,285**	3,095	(810)	(26)%
Copper & Diamonds	**2,073**	2,776	(703)	(25)%
Energy & Minerals	**1,762**	2,140	(378)	(18)%
Other operations	**(77)**	(70)	(7)	10%
Reportable segment total	**22,141**	19,319	2,822	15%
Inter-segment transactions	**(9)**	–	(9)	–
Product group total	**22,132**	19,319	2,813	15%
Central pension costs, share-based payments and insurance	**59**	(128)	187	(146)%
Restructuring, project and one-off costs	**(183)**	(272)	89	(33)%
Other central costs	**(496)**	(552)	56	(10)%
Exploration and evaluation	**(315)**	(231)	(84)	36%
Total	**21,197**	18,136	3,061	17%
Underlying earnings				
Iron Ore	**9,638**	6,531	3,107	48%
Aluminium	**599**	1,347	(748)	(56)%
Copper & Diamonds	**554**	1,054	(500)	(47)%
Energy & Minerals	**611**	995	(384)	(39)%
Other operations	**(89)**	(102)	13	(13)%
Reportable segment total	**11,313**	9,825	1,488	15%
Inter-segment transactions	**(3)**	–	(3)	–
Product group total	**11,310**	9,825	1,485	15%
Central pension costs, share-based payments and insurance	**60**	(90)	150	(167)%
Restructuring, project and one-off costs	**(94)**	(190)	96	(51)%
Other central costs	**(550)**	(410)	(140)	34%
Exploration and evaluation	**(231)**	(193)	(38)	20%
Net interest	**(122)**	(134)	12	(9)%
Total	**10,373**	8,808	1,565	18%

Underlying EBITDA is a key financial indicator which management uses internally to assess performance. It excludes the same items that are excluded in arriving at underlying earnings. See page 252 for more detail and a reconciliation to profit on ordinary activities before finance items and tax.

Commentary on financial results

To give additional insight into the performance of our business, we report underlying EBITDA and underlying earnings. The principal factors explaining the movements in underlying EBITDA are set out in this table.

	US$m
2018 underlying EBITDA	**18,136**
Prices	4,382
Exchange rates	529
Volumes and mix	(20)
General inflation	(303)
Energy	75
Operating cash cost movements	(523)
Higher exploration and evaluation spend	(136)
One-off items	(16)
Absence of underlying EBITDA from assets divested in 2018, including coking coal	(1,246)
Non-cash costs/other	319
2019 underlying EBITDA	**21,197**

Significant momentum from higher iron ore prices
Commodity price movements in 2019 increased underlying EBITDA by $4,382 million compared with 2018. This was primarily driven by the strength in the iron ore price and was partly offset by lower prices for copper and aluminium. We have included a table of prices and exchange rates on page 298.

The Platts index for 62% iron fines was 39% higher on average compared with 2018 on a free on board (FOB) basis, driven by supply disruptions in the seaborne market and strong demand following record Chinese steel output.

Average London Metal Exchange (LME) prices for copper and aluminium were 8% and 15% lower, respectively, compared with 2018, as global manufacturing activity slowed. The gold price was 10% higher.

The 10% tariff on US imports of aluminium from Canada, in place from 1 June 2018, was removed on 19 May 2019, following agreement between the US and Canadian governments. The midwest premium for aluminium in the US averaged $320 per tonne - 24% lower than in 2018.

Underlying EBITDA benefits from weaker A$
Compared with 2018, on average the US dollar strengthened by 7% against the Australian dollar, by 3% against the Canadian dollar and by 9% against the South African rand. Currency movements increased underlying EBITDA by $529 million relative to 2018.

Volumes flat overall
Underlying EBITDA decreased by $20 million compared with 2018 from movements in sales volumes and changes in product mix. A 3% decline in iron ore shipments from the Pilbara, where we experienced weather disruptions and operational challenges at some of our mines in the first half of 2019, were mostly offset by increased bauxite shipments, improved aluminium product mix and higher by-product volumes (gold and molybdenum) from Kennecott and Oyu Tolgoi.

Energy prices marginally lower
Average movements in energy prices compared with 2018 improved underlying EBITDA by $75 million, *mainly due to lower diesel prices.*

Continued cost pressures
Our cash operating costs rose by $523 million compared with 2018 (on a unit cost basis), primarily reflecting an increase in iron ore unit costs, driven by the first half challenges. There was some respite on cost inflation for certain raw materials for Aluminium, in particular caustic soda and petroleum coke. However, this was partly offset by inflationary pressures on other costs.

Advancing our options through increased exploration spend
We spent $136 million, or 28%, more on exploration and evaluation compared with last year. This went to our highest value projects, particularly on evaluating the Resolution copper project in Arizona, advancing our Winu copper/gold deposit in Australia and progressing our Falcon diamond project in Canada.

One-off items
One-off items aggregated to be $16 million less than in 2018. 2019 underlying EBITDA includes the impact of a $199 million charge at Escondida to reflect the cancellation of existing coal power contracts, a $68 million impact from the curtailment of operations at Richards Bay Minerals (RBM) and $68 million for operational challenges faced at our ISAL and Kitimat aluminium smelters.

In 2018 we suspended operations for two months at Iron Ore Company of Canada before reaching a new labour agreement ($236 million impact). We also suspended production at Rio Tinto Iron & Titanium, following a fatality at our Sorel-Tracy plant and labour disruptions at RBM ($132 million impact).

$1.2 billion lower underlying EBITDA following divestments in 2018, primarily coal
The significant divestments in 2018 generated $1,246 million of underlying EBITDA in 2018, primarily the coking coal business and the Grasberg copper mine. Movements in our non-cash costs and other items lowered underlying EBITDA by $319 million compared with 2018. Following implementation of IFRS 16 "Leases" on 1 January 2019, a large proportion of our lease expense comprises charges for depreciation and interest and is not included in cash operating costs. In 2019, there was a consequent benefit to underlying EBITDA of approximately $320 million from this change in treatment.

Financial review continued

Net earnings, underlying earnings and underlying EBITDA
In order to provide additional insight into the performance of its business, Rio Tinto reports underlying EBITDA and underlying earnings. The differences between underlying earnings, underlying EBITDA, and net earnings are set out in this table.

Net earnings

$8.0bn

Net earnings
The principal factors explaining the movements in underlying earnings and net earnings are set out here.

	US$m
2018 net earnings	**13,638**
Total changes in underlying EBITDA	**3,061**
Increase in depreciation and amortisation (pre-tax) in underlying earnings	(366)
Decrease in interest and finance items (pre-tax) in underlying earnings	32
Increase in tax on underlying earnings	(1,011)
Increase in underlying earnings attributable to outside interests	(151)
Total changes in underlying earnings	**1,565**
Changes in exclusions from underlying earnings:	
Movement in net impairment charges	(1,554)
Movement in gains on consolidation and gains on disposals	(4,287)
Movement in exchange differences and gains/losses on derivatives	(904)
Other	(448)
2019 net earnings	**8,010**

Depreciation and amortisation, net interest and tax
Our depreciation and amortisation charge was $0.4 billion higher than 2018. This was primarily due to the inclusion of depreciation on leases brought on to the balance sheet on adoption of IFRS 16 and completion of the Amrun bauxite mine. The increase was partly offset by the impact of the weaker Australian and Canadian dollars against the US dollar, along with assets divested in 2018.

Interest and finance items (pre-tax) were broadly in line with 2018. This was mainly due to the bond tender we completed in 2018, which reduced our gross debt by $1.9 billion equivalent and incurred $0.1 billion in early redemption costs in 2018. In 2019, there was also a lower level of average net debt and an increase in capitalised interest. This was offset by the inclusion of interest expense on leases following adoption of IFRS 16 "Leases" in 2019.

The 2019 effective corporate income tax rate on underlying earnings, excluding equity accounted units, was 30%, compared with 29% in 2018. The effective tax rate on underlying earnings in Australia was 31% in 2019 compared with 30% in 2018. We anticipate an effective tax rate on underlying earnings of approximately 30% in 2020.

Items excluded from underlying earnings
Net impairment charges increased by $1.6 billion compared with 2018, primarily related to the Oyu Tolgoi underground project in Mongolia and the Yarwun alumina refinery in Queensland, Australia.

On 16 July 2019, we announced that completion of the definitive estimate for the Oyu Tolgoi underground project would be delayed until the second half of 2020. We also indicated that first sustainable production could be delayed by 16 to 30 months compared with the original feasibility study guidance in 2016 and that development capital spend may increase by $1.2 billion to $1.9 billion over the $5.3 billion previously disclosed. These matters were identified as an impairment trigger, so we carried out an assessment of the recoverable amount of the project as at 30 June 2019. This resulted in an impairment charge of $0.8 billion, after tax and non-controlling interests, which was included in our 2019 interim results. On page 173 there is a detailed explanation of the impairment process.

In 2019, we recognised a $0.8 billion impairment charge (after tax) related to the Yarwun alumina refinery. In prior years, for accounting purposes, the value of Yarwun was considered in aggregate with Queensland Alumina and the Weipa bauxite mine. The ramp-up of the Amrun expansion at Weipa resulted in increased bauxite exports to the extent that Weipa is now considered to generate cash inflows largely independent from the downstream alumina operations.

In 2018, we recognised $0.1 billion of after tax charges, mainly relating to the carrying value of the ISAL aluminium smelter in Iceland following its reclassification to assets held for sale. In 2019, we recognised a further $0.1 billion post-tax charge as these assets were reclassified back out of assets held for sale.

Gains on disposals were $4.3 billion lower than 2018. In 2019, we recognised a $0.3 billion loss (after tax) from the sale of Rössing Uranium, including a non-cash adjustment for historical foreign exchange losses. In 2018, we realised net gains of $4.0 billion (after tax), primarily from the sale of our Hail Creek and Kestrel coking coal businesses in Australia, the sale of our interest in the Grasberg copper mine in Indonesia and the formation of the ELYSIS joint venture in Canada. We created this joint venture in May 2018 with Alcoa, supported by Apple and the governments of Canada and Quebec, to develop a carbon-free aluminium smelting process and recognised a gain of $0.1 billion (post-tax) on forming the joint venture.

Exchange differences and gains/losses on derivatives were $0.9 billion lower than 2018. In 2019, these gave rise to a $0.2 billion after tax loss. This compared with gains of $0.7 billion in 2018 - mainly on US dollar debt in non-US dollar functional currency Group companies, intragroup balances and on the revaluation of certain derivatives which do not qualify for hedge accounting. These exchange gains are largely offset by currency translation losses recognised in equity. The quantum of US dollar debt is largely unaffected and we will repay it from US dollar sales receipts.

There were $0.4 billion in other changes in items excluded from underlying earnings. In 2019, we recognised a $0.2 billion loss (after tax) related to provisions for obligations in respect of legacy operations. In 2018, we recognised a $0.6 billion gain on sale of surplus land at Kitimat and a $0.3 billion increase in the closure provision at the Argyle diamond mine.

Profit

Net earnings and underlying earnings refer to amounts attributable to the owners of Rio Tinto. The net profit attributable to the owners of Rio Tinto in 2019 was $8.0 billion (2018: $13.6 billion). We recorded a profit after tax in 2019 of $7.0 billion (2018: $13.9 billion) of which a loss of $1.0 billion (2018 profit: $0.3 billion) was attributable to non-controlling interests.

Net earnings, underlying earnings and underlying EBITDA

The differences between underlying earnings and net earnings are set out in this table (all numbers are after tax and exclude non-controlling interests).

	2019 US$m	2018 US$m
Underlying earnings	**10,373**	**8,808**
Items excluded from underlying earnings		
Impairment charges	**(1,658)**	(104)
Net (losses)/gains on consolidation and disposal of interests in businesses	**(291)**	3,996
Foreign exchange and derivative (losses)/gains on net debt and intragroup balances and derivatives not qualifying for hedge accounting	**(200)**	704
Losses from increases to closure estimates (non-operating and fully impaired sites)	**–**	(335)
Gain relating to surplus land at Kitimat	**–**	569
Other exclusions	**(214)**	–
Net earnings	**8,010**	**13,638**

The explanation of excluded items is on page 170. On page 170 there is a detailed reconciliation from underlying earnings to net earnings, including pre-tax amounts and additional explanatory notes.
The differences between underlying EBITDA, EBITDA and net earnings are set out in this table.

	2019 US$m	2018 US$m
Underlying EBITDA	**21,197**	**18,136**
Net (losses)/gains on consolidation and disposal of interests in businesses	**(291)**	4,622
(Losses)/gains on embedded commodity derivatives not qualifying for hedge accounting (including exchange)	**(260)**	279
Gain on sale of wharf and land in Kitimat, Canada	**–**	602
Change in closure estimate	**–**	(376)
Change in other exclusions	**(171)**	–
EBITDA	**20,475**	**23,263**
Depreciation and amortisation in subsidiaries excluding capitalised depreciation	**(4,272)**	(3,909)
Impairment charges	**(3,487)**	(132)
Depreciation and amortisation in equity accounted units	**(653)**	(650)
Finance items in subsidiaries	**(648)**	(33)
Taxation in subsidiaries	**(4,147)**	(4,242)
Taxation and finance items in equity accounted units	**(296)**	(372)
Less loss/(profit) attributable to non-controlling interests	**1,038**	(287)
Net earnings	**8,010**	**13,638**

Financial review continued

Balance sheet
Our net debt of $3.7 billion increased by $3.9 billion in 2019, reflecting final, interim and special dividend payments of $10.3 billion and $1.6 billion of share buy-backs, partly offset by our strong free cash flow. It also reflects a non-cash increase of $1.2 billion following the implementation of IFRS 16 "Leases" from 1 January 2019. The introduction of IFRS 16 also resulted in a benefit to underlying EBITDA of approximately $320 million as a large proportion of lease payments are no longer charged to cash operating costs. There was no significant impact on net earnings, after the increase in depreciation and interest on leases.

Our net gearing ratio (net debt to total capital) increased to 7% at 31 December 2019 (31 December 2018: negative 1%).

Our total financing liabilities at 31 December 2019 (see page 188) were $14.3 billion (31 December 2018: $13.0 billion) and the weighted average maturity was around 10 years. At 31 December 2019, approximately 76% of these liabilities were at floating interest rates (84% excluding leases). The maximum amount within non-current borrowings maturing in any one calendar year was $1.8 billion, which matures in 2025.

We had $10.6 billion in cash and cash equivalents plus other short-term cash investments at 31 December 2019 (31 December 2018: $13.3 billion).

Our shareholder returns policy
The board is committed to maintaining an appropriate balance between cash returns to shareholders and investment in the business, with the intention of maximising long-term shareholder value.

At the end of each financial period, the board determines an appropriate total level of ordinary dividend per share. This takes into account the results for the financial year, the outlook for our major commodities, the board's view of the long-term growth prospects of the business and the company's objective of maintaining a strong balance sheet. The intention is that the balance between the interim and final dividend be weighted to the final dividend.

The board expects total cash returns to shareholders over the longer term to be in a range of 40-60% of underlying earnings in aggregate through the cycle. Acknowledging the cyclical nature of the industry, it is the Board's intention to supplement the ordinary dividends with additional returns to shareholders in periods of strong earnings and cash generation.

We determine dividends in US dollars. We declare and pay Rio Tinto plc dividends in pounds sterling and Rio Tinto Limited dividends in Australian dollars. The 2019 final dividend was converted at exchange rates applicable on 25 February 2020 (the latest practicable date before the dividend was declared). ADR holders receive dividends at the declared rate in US dollars.

Ordinary dividend per share declared

	2019 dividends	2018 dividends
Rio Tinto Group		
Interim (US cents)	**151.00**	127.00
Final (US cents)	**231.00**	180.00
Full-year (US cents)	**382.00**	307.00
Rio Tinto plc		
Interim (UK pence)	**123.32**	96.82
Final (UK pence)	**177.47**	135.96
Full-year (UK pence)	**300.79**	232.78
Rio Tinto Limited		
Interim (Australian cents)	**219.08**	170.84
Final (Australian cents)	**349.74**	250.89
Full-year (Australian cents)	**568.82**	421.73

Special dividend per share declared

	2019 dividends	2018 dividends
Rio Tinto Group		
Declared with 2019 interim results (US cents)	**61.00**	–
Declared with 2018 full year results – from divestment income (US cents)		243.00
Rio Tinto plc		
Declared with 2019 interim results (UK pence)	**49.82**	–
Declared with 2018 full year results – from divestment income (UK pence)		183.55
Rio Tinto Limited		
Declared with 2019 interim results (Australian cents)	**88.50**	–
Declared with 2018 full year results – from divestment income (Australian cents)		338.70

The 2019 final dividend to be paid to our Rio Tinto Limited shareholders will be fully franked. The board expects Rio Tinto Limited to be in a position to pay fully franked dividends for the foreseeable future.

On 16 April 2020, we will pay the 2019 final dividend to holders of ordinary shares and holders of ADRs on the register at the close of business on 6 March 2020 (record date). The ex-dividend date is 5 March 2020.

Rio Tinto plc shareholders may choose to receive their dividend in Australian dollars, and Rio Tinto Limited shareholders may choose to receive theirs in pounds sterling. Currency conversions will be based on the pound sterling and Australian dollar exchange rates five business days before the dividend payment date. Rio Tinto plc and Rio Tinto Limited shareholders must register their currency elections by 24 March 2020.

We will operate our Dividend Reinvestment Plans for the 2019 final dividend – see our website (riotinto.com) for details. Rio Tinto plc and Rio Tinto Limited shareholders' election notice for the Dividend Reinvestment Plans must be received by 24 March 2020. Purchases under the Dividend Reinvestment Plan are made on or as soon as practicable after the dividend payment date and at prevailing market prices. There is no discount available.

Portfolio management

We have a programme of high-quality projects across a broad range of commodities

In 2019, we funded our capital expenditure from operating activities. We expect to continue funding our capital programme from internal sources, except for the Oyu Tolgoi underground development, which is project-financed.

Capital projects

Projects (Rio Tinto 100% owned unless otherwise stated)	Total approved capital cost (100% unless otherwise stated)	Status/ Milestones
Completed in 2019		
Investment in the Compagnie des Bauxites de Guinée (CBG) bauxite mine in Guinea, West Africa, to expand capacity	$0.3bn (RT share)	Approved in 2016. We produced first ore in the fourth quarter of 2018. When the ramp-up is complete the project will increase annual capacity from 14.5 to 18.5 million tonnes.
Ongoing and approved		
Iron ore		
Investment in West Angelas and the Robe Valley in the Pilbara region of Western Australia to sustain production capacity	$0.8bn (RT share)	Approved in October 2018, the investments will enable us to sustain production of our Pilbara Blend™ and Robe Valley products. All major environmental approvals have been received with the exception of the Mesa H approval. All other procurement and construction activities are progressing to plan. First ore is expected in 2021.
Investment in Koodaideri, a new production hub in the Pilbara region of Western Australia, to sustain existing production in our iron ore system	$2.6bn	Approved in November 2018, the investment incorporates a processing plant and infrastructure including a 166-kilometre rail line connecting the mine to our existing network. Key construction activities are on schedule and we expect first production in late 2021. Once complete, the mine will have an annual capacity of 43 million tonnes.
Investment in the Greater Tom Price operations to help sustain production capacity	$0.8bn	Approved in November 2019, the investment in the Western Turner Syncline phase 2 mine will facilitate mining of existing and new deposits. It includes construction of a new crusher and a 13-kilometre conveyor. Pending final government approvals, construction will start in the first half of 2020 with first ore from the crusher expected in 2021.
Aluminium		
Investment in a second tunnel at the 1000MW Kemano hydropower facility at Kitimat, British Columbia, Canada	$0.5bn	Approved in 2017. Project completion is now set for 2021 (previously late 2020). Cost forecasts remain on budget. The project will ensure the long-term reliability of the power supply to the modernised Kitimat smelter and de-risks the hydropower facility.
Copper & Diamonds		
Investment to extend mine life at Rio Tinto Kennecott, US from 2019 to 2026	$0.9bn	Funding for the continuation of open pit mining via the push back of the south wall: the project largely consists of simple mine stripping activities and is expected to be complete in 2021.
Further investment to extend mine life at Rio Tinto Kennecott, US by a further six years to 2032	$1.5bn	Approved in December 2019, the investment will further extend strip waste rock mining and support additional infrastructure development in the second phase of the south wall pushback project. This will allow mining to continue into a new area of the orebody between 2026 and 2032.
Development of the Oyu Tolgoi underground mine in Mongolia (Rio Tinto 34%)	$5.3bn*	The project was approved in May 2016. A number of mine design options are under consideration which have different cost and schedule implications. These options have been defined to a level of accuracy associated with a Conceptual Study or Order of Magnitude Study. First sustainable production could be achieved between May 2022 and June 2023 (includes up to eight months contingency). Preliminary estimates for development capital are $6.5 billion to $7.2 billion. *Subject to the outcomes of the definitive estimate
Energy & Minerals		
Development of the Zulti South project at Richards Bay Minerals (RBM) in South Africa (Rio Tinto 74%), to sustain current capacity and extend mine life.	$0.5bn	Approved in April 2019, the investment will underpin RBM's supply of zircon and ilmenite over the life of the mine. Construction is on hold after a number of security incidents – we will assess a restart after normalisation of operations at RBM.

Material acquisitions and divestments

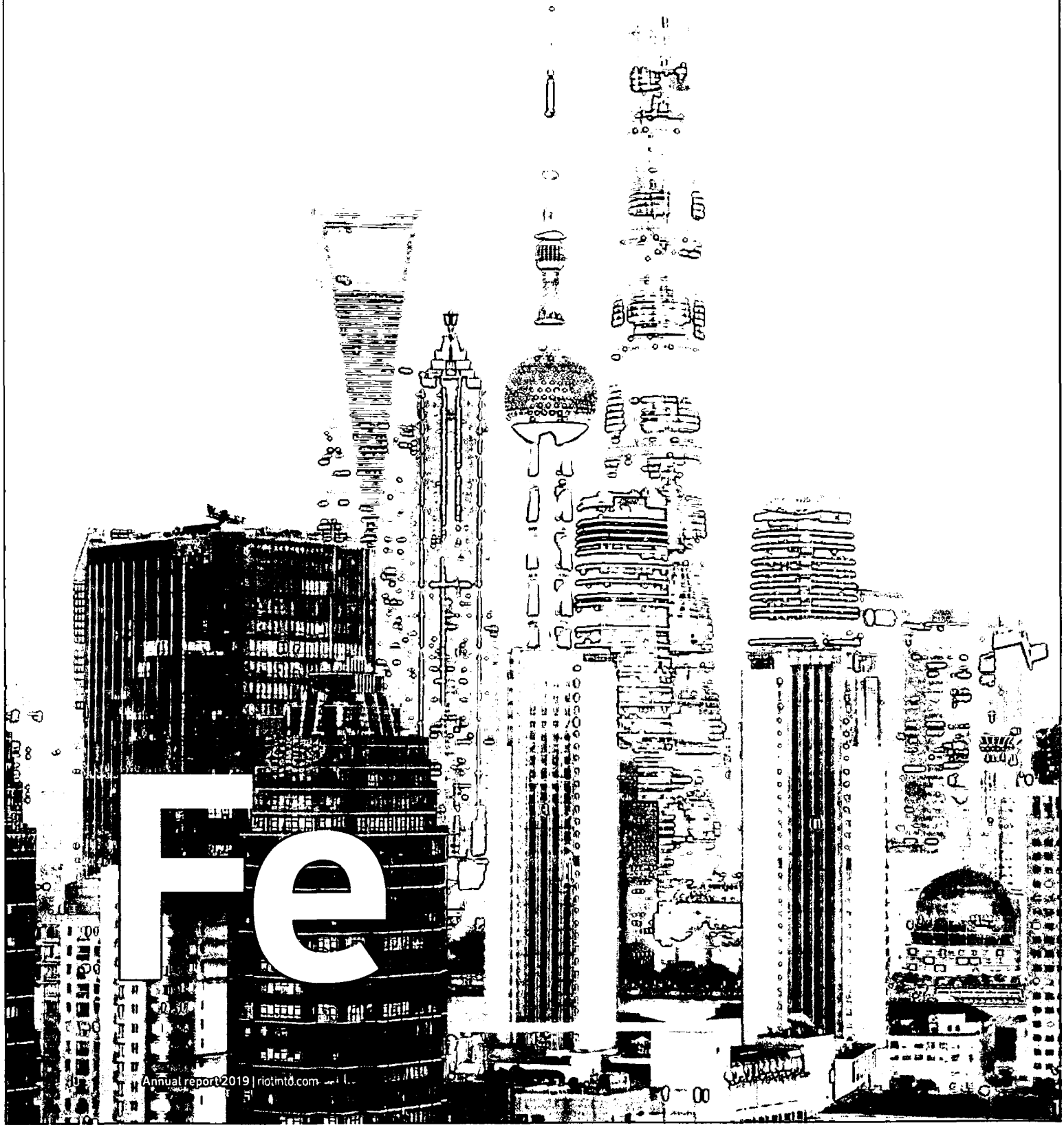
Asset	Consideration $m	Status
Divested in 2019		
Rössing Uranium	6.5[b]	Sold to China National Uranium Corporation Limited
Divested in 2018		
Hail Creek	1,550[a][c]	Sold to Glencore
Kestrel	2,250[a]	Sold to a consortium consisting of EMR Capital and PT Adaro Energy TbK
Aluminium Dunkerque	500[a]	Sold to Liberty House
Grasberg	3,500[a][d]	Sold to PT Indonesia Asahan Aluminium (Persero) (Inalum)
Divested in 2017		
Coal & Allied Industries Limited	2,690[a]	Sold to Yancoal Australia Limited

(a) Before working capital and completion adjustments.
(b) Gross cash sales proceeds, excluding cash held by Rössing included within the transaction and transaction costs. Excludes the contingent payment of up to US$100 million linked to uranium spot prices and Rössing's net income during the next seven calendar years.
(c) Excluding proceeds related to sale of Valeria coal development project of $150m (before working capital adjustments).
(d) Including a payment received of $107 million in respect of our share of Grasberg's copper and gold revenues, net of our capital contribution for the year.

Over the last three years, we have made no material acquisitions.

Further information on acquisitions and divestments is included in note 37 to the financial statements on page 212.

Iron Ore



Overview

In the Pilbara region of Western Australia, we operate a fully integrated network of 16 iron ore mines, four port terminals, a 1,700 kilometre rail network and related infrastructure.

Our Iron Ore product group includes Dampier Salt, also in Western Australia; with three solar salt operations, we are the world's largest exporter of seaborne salt. Our portfolio of quality assets, highly valued product suite, fully integrated system and committed people and partners are key pillars of our value over volume strategy. Together, these set our business apart from others in the industry and allow us to export our products, including our flagship Pilbara Blend™, to our customers safely, reliably and efficiently.

Snapshots from the year

0.66
AIFR
(2018: 0.63)

$24.1bn
gross sales revenue
(2018: $18.7bn)

72%
underlying free on board (FOB) EBITDA margin
(2018: 68%)

$11.4bn
Net cash generated from operating activities
(2018: $8.3bn)

Strengthening our iron ore business

We continued to invest in our Pilbara iron ore assets in 2019. Projects with a combined value of $4.6 billion are under construction with $450 million spent across projects at Koodaideri, West Angelas and the Robe Valley.

We also announced a $749 million investment in Western Turner Syncline Phase 2 (WTS2) this year. Part of our existing Greater Tom Price operations, WTS2 will produce high-quality Brockman ore, which will support our flagship Pilbara Blend™, the preferred baseload product for China's steel mills. With a capital intensity of about $25 per tonne of production capacity, the mine is expected to deliver an attractive internal rate of return. The haul truck fleet at WTS2 will also use Autonomous Haulage System (AHS) technology from 2021, which, across our Pilbara operations, has delivered significant safety benefits, enhanced productivity and lowered costs.

Construction of WTS2 will begin in the first quarter of 2020, with first ore from the crusher expected in 2021. At its peak, the construction workforce is expected to exceed 1,000.

Our partnership with Western Australia

In 2019, to help Western Australians develop the skills they need to succeed in a rapidly changing world, our Iron Ore product group invested $10 million in education programmes at a wide range of universities, schools, governments and non-profits. One of our flagship programmes is our partnership with the government of Western Australia and South Metropolitan TAFE (Technical and Further Education) to develop the first nationally recognised qualifications in automation. Alongside other states, Western Australia will also benefit from the Future Minds Accelerator, *our $7 million programme, developed and* launched in partnership with leading start-up accelerator BlueChilli and Amazon Web Services. The programme will work with school-age learners across Australia to fast-track the development of skills needed for the digital future.

In 2019, we continued to strengthen local procurement. We awarded our 400th scope of work to businesses based in the state; in total, we partnered with more than 1,900 businesses based in Western Australia. For example, we awarded Mondium, a company based in Perth, an approximate $280 million contract for the design and construction of our WTS2 mine. This contract is expected to create 450 jobs starting in the first quarter of 2020.

We also engaged with nearly 50 Pilbara Indigenous-owned businesses, and in 2019, awarded more than $42 million to such businesses to help develop Koodaideri – our most technologically advanced mine. We also awarded a landmark $14 million contract to Yurra Pty Ltd., which is majority owned by the Yindjibarndi Aboriginal Corporation, to provide civil maintenance services on and around our Pilbara rail network.

Pilbara Iron Ore in figures

16
integrated mines in Western Australia

5
mainstream iron ore products

4
port terminals

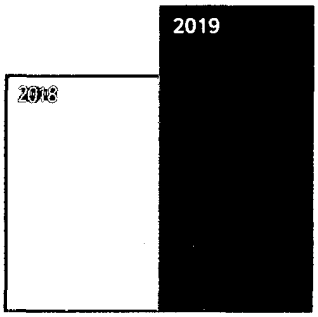
1,700km
automated rail network, including AutoHaul™

11.9%
of residential workforce who are Pilbara indigenous people*

12,300
employees (includes temporary employees and 100% of joint venture operations)

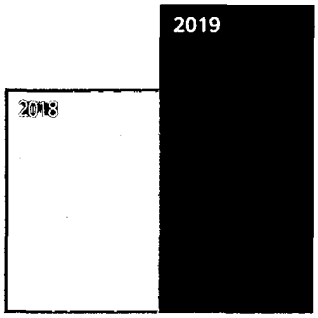
*Includes all indigenous people who live in the Pilbara and all members of our Traditional Owner groups who have signed *Rio Tinto's Regional Framework Deed*, regardless of where they live.

Gross sales revenue



$24.1bn
(2018: $18.7bn)

Net cash generated from operating activities



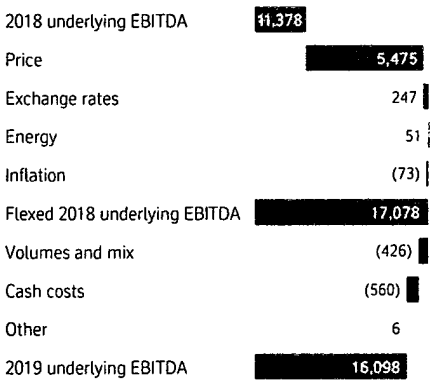
$11.4bn
(2018: $8.3bn)

Iron Ore continued

2019 year end results	2019	2018	Change
Pilbara production (million tonnes – 100%)	**326.7**	337.8	(3)%
Pilbara shipments (million tonnes – 100%)	**327.4**	338.2	(3)%
Salt production (million tonnes – Rio Tinto share)[1]	**5.4**	6.2	(12)%
Gross sales revenue (US$ millions)	**24,075**	18,731	29%
Underlying EBITDA (US$ millions)	**16,098**	11,378	41%
Pilbara underlying FOB EBITDA margin[2]	**72%**	68%	
Underlying earnings (US$ millions)	**9,638**	6,531	48%
Net cash generated from operating activities (US$ millions)	**11,420**	8,349	37%
Capital expenditure (US$ millions)[3]	**(1,741)**	(1,302)	34%
Free cash flow (US$ millions)	**9,601**	7,045	36%
Return on capital employed[4]	**67%**	42%	

1 To reflect a change in management responsibility, Dampier Salt is now reported within Iron Ore and we have restated prior year numbers accordingly. Iron Ore Company of Canada and the Simandou iron ore project in Guinea continue to be reported within Energy & Minerals.
2 The Pilbara underlying free on board (FOB) EBITDA margin is defined as Pilbara underlying EBITDA divided by Pilbara revenues, excluding freight revenue.
3 Capital expenditure is the net cash outflow on purchases less sales of property, plant and equipment, capitalised evaluation costs and purchases less sales of other intangible assets.
4 Return on capital employed (ROCE) is defined as underlying earnings excluding net interest divided by average capital employed (operating assets before net debt).

Underlying EBITDA 2018 vs 2019
($ million)



Safety

In 2019, our Iron Ore operations experienced no fatalities, and recorded an all injury frequency rate (AIFR) of 0.66. While slightly higher than the 2018 rate of 0.63, the number of significant near miss incidents was approximately 50% lower, year on year.

Our ongoing commitment to reducing material risk exposure – including implementing engineering and elimination controls to address vehicle and driving risks – resulted in a significant reduction in repeat serious incidences. We also continued our focus on major hazard risk reduction this year, including proactive management of our water storage and tailings facilities in line with the Group standard.

Our strong commitment to safety includes an emphasis on mental health and wellbeing, with a range of initiatives in place, including our industry-leading peer support programme.

Financial performance

In 2019, we benefited from robust demand for our high-quality products driven by strong demand from China and constrained seaborne supply. Iron ore shipments were down 3% on 2018, but recovered strongly in the second half of 2019 after disruptions earlier in the year, which included weather events, a screen house fire at one of our ports and operational challenges.

Underlying EBITDA of $16.1 billion was 41% higher than 2018, reflecting higher prices which were partially offset by higher unit costs. The Platts index for 62% iron fines on an FOB basis was 39% higher, on average, compared with 2018. This increased underlying EBITDA by $5.4 billion relative to 2018.

2019 Pilbara unit cash costs were $14.4 per tonne (2018: $13.3 per tonne). The fire and weather-related events in the first half of the year reduced shipments by 14 million tonnes (100% basis), increasing unit costs by around $0.5 per tonne. We incurred approximately $50 million in additional costs in 2019 ($0.2 per tonne) to address the mine operational challenges. Higher salaries, rising fuel prices and cyclical maintenance in 2019 compared with 2018 were mostly offset by a weaker Australian dollar.

We expect Pilbara unit cash costs to be $14-15 per tonne in 2020 (assumes a 0.67 Australian dollar exchange rate). Increased volume efficiency compared with 2019 is expected to be offset by longer haul distances and increased maintenance activity. Koodaideri is on track for first ore in late 2021. Once fully ramped up it will provide new volumes at a lower cost.

We have continued investing in productivity and automation, and 50% of our truck fleet in the Pilbara is now fully autonomous. We have a pathway that will see a large majority of the fleet being automated by the end of 2022. AutoHaul™, the world's first automated heavy-haul, long-distance rail network, was fully operational in 2019.

Our Pilbara operations delivered an underlying FOB EBITDA margin of 72%, compared with 68% in 2018.

We price the majority of our iron ore sales (76%) by reference to the average index price for the month of shipment. In 2019, we priced approximately 16% of sales by reference to the prior quarter's average index lagged by one month, with the remainder sold either on current quarter average, current month average or on the spot market. We made approximately 68% of sales including freight and 32% on an FOB basis.

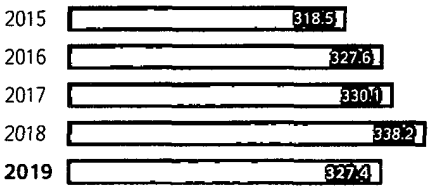
Underlying FOB EBITDA margin

72%

(2018: 68%)

Pilbara shipments

(million tonnes – 100% basis)



We achieved an average iron ore price of $79.0 per wet metric tonne on an FOB basis (2018: $57.8 per wet metric tonne). This equates to $85.9 per dry metric tonne (2018: $62.8 per dry metric tonne).

The gross sales revenue for our Pilbara operations included freight revenue of $1.7 billion (2018: $1.7 billion).

Net cash generated from operating activities of $11.4 billion was 37% higher than 2018, driven by the same trends as underlying EBITDA.

The $9.6 billion of free cash flow was 36% higher than 2018, reflecting the strong realised pricing partly offset by royalties, taxes and higher capital spend. This included sustaining capital as well as the construction of Koodaideri.

Review of operations

Our Pilbara mines in Western Australia produced 327 million tonnes (our share is 271 million tonnes) in 2019 – 3% lower than 2018. Overall material moved in 2019 was the highest on record. Our increased focus on waste material movement and pit development will continue in 2020 to improve mine performance and pit sequencing.

In the first half of 2019, shipments were affected by weather events, a screen house fire at one of our ports and mine operational challenges. Our second half performance was strong, with both production and shipments exceeding the same period in 2018, despite a planned, extended rail maintenance shutdown which limited rail capacity for 12 days. In October 2019 we commenced trials of portside trading. We maintain some inventory at Chinese ports and can also handle material from third parties and from Iron Ore Company of Canada.

New projects and growth options

We are progressing our $2.6 billion Koodaideri iron ore mine, with key construction activities on schedule. This new production hub will be our most technologically advanced, incorporating a processing plant and infrastructure including an airport, camp and a 166-kilometre rail line connecting the mine to our existing network. We continue to expect first ore in late 2021. Once fully commissioned, the initial mine development will have an annual capacity of 43 million tonnes. This will increase the lump to fines ratio of the entire portfolio from an average of 35% to 38% and will increase the annual capacity of our Pilbara system to 360 million tonnes.

We have multiple project scopes under study for Koodaideri Phase 2, following board approval for a $44 million pre-feasibility study. Ultimately, the capacity of the Koodaideri hub could be up to 70 million tonnes per year, depending on market conditions.

We are also investing $1.55 billion with our joint venture partners, Mitsui and Nippon Steel, (our 53% share is $820 million) at the Robe Valley and West Angelas operations. We have received all major environmental approvals, with the exception of Mesa H, and procurement and construction activities are progressing well. We anticipate first ore from these projects in 2021.

In late 2019, the board approved the $749 million investment in the Western Turner Syncline Phase 2 mine, part of the Greater Tom Price operations. This will facilitate mining of new deposits and includes construction of a new crusher and a 13-kilometre conveyor. Pending final government approvals, construction will start in the first half of 2020 with first ore expected in 2021.

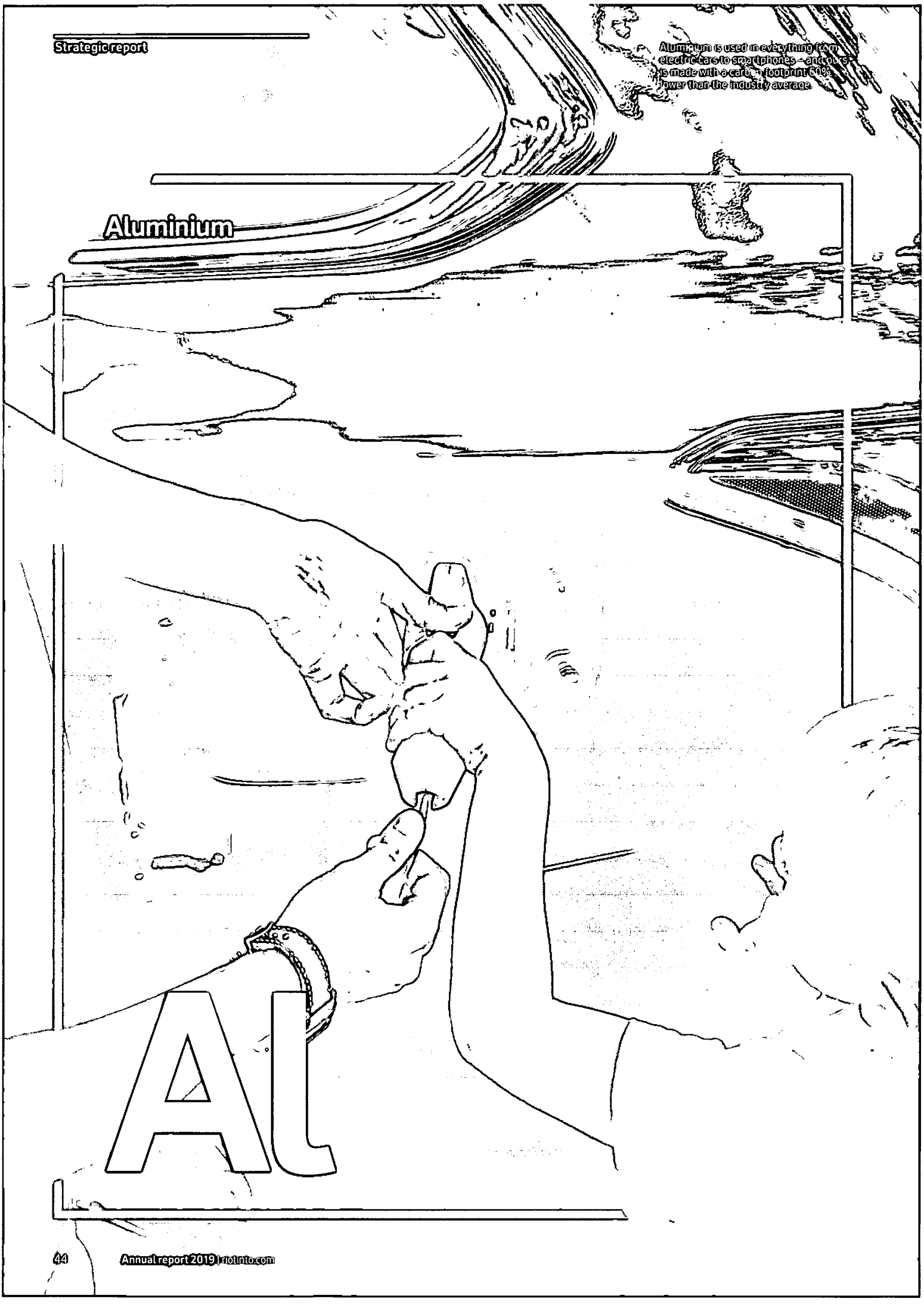
Greenhouse gas emissions

In 2019, Iron Ore greenhouse gas emissions intensity was ~1% higher than the baseline target set in 2008, a rise driven by increases in diesel emissions resulting from longer-than-anticipated haul distances and increased movement of materials.

We have established strategies for the management of greenhouse gas emissions in our Pilbara operations. Subject to government approvals, construction of the company's first solar plant at the new Koodaideri mine will start in 2020. This 34 megawatt plant will be complemented by a new 12MW/h battery energy storage system that will help power our entire Pilbara network.

Aluminium is used in everything from electric cars to smartphones – and our RA is made with a carbon footprint 64% lower than the industry average

Aluminium



Overview

We are a global leader in aluminium, with large-scale, high-quality bauxite mines and alumina refineries and, in Canada, Australia and New Zealand, smelters producing aluminium certified as responsible.

Through our integrated portfolio of mines, refineries and smelters, we produce bauxite, alumina and aluminium. Managing the process from start to finish allows us to deliver quality products to our customers efficiently. These are carefully calibrated to meet their specific and changing needs – from high-grade bauxite for the global seaborne trade to sustainably sourced aluminium to new, lighter alloys for the automotive industry.

Our Canadian operations are in the first decile of the industry cost-curve and produce aluminium using clean, renewable hydropower. In 2016, we launched RenewAl™, the world's first certified low carbon aluminium. We were the first producer to offer Aluminium Stewardship Initiative (ASI) certified, responsible aluminium through a "chain of custody" spanning the Gove bauxite mine in Australia to our alumina refinery, aluminium smelters and casthouses in Quebec, Canada. In 2019, we received further ASI certifications for our BC Works and Kemano sites in Canada, our Amrun and Weipa bauxite mines, Yarwun alumina refinery, and our Bell Bay and NZAS smelters in Australia and New Zealand.

We also established ELYSIS, a partnership with Alcoa supported by Apple and the governments of Canada and Quebec, to develop smelting technology free of direct carbon emissions. Across our aluminium operations, our greenhouse gas emissions intensity is 60% lower than the industry average.

Snapshots from the year

0.46
AIFR
(2018: 0.40)

$10.3bn
gross sales revenue
(2018: $12.2bn)

26%
underlying EBITDA margin from integrated operations
(2018: 32%)

$2.2bn
net cash generated from operating activities
(2018: $2.3bn)

A step-change in productivity for our Australian operations

In 2017, to strengthen productivity across RTA, we launched an initiative to operate our bauxite mines and our Pacific assets in a more integrated way. We first put this programme to the test at our Weipa mine and, in September 2019, achieved a key milestone with the commissioning of our Brisbane-based Bauxite Integrated Operations Centre (BIOC). Today, the BIOC runs 24 hours per day, seven days a week, and allows us to remotely monitor, control and operate our Weipa, Gove and Amrun mines.

Our vision is to have our people and our business operate to their full potential, to plan with the best information available and to exceed our customers' needs. To this end, the BIOC team collects large amounts of data from every mine, enabling us to gain a complete view across the mine's entire supply chain. Then, using new technologies and real-time reporting, we can make quicker, more accurate and agile decisions to optimise operations.

Key to this step change was leveraging experience from our aluminium and iron ore operations' centres in Canada and Western Australia, respectively. In 2019, the BIOC delivered over $50 million of additional value through grade optimisation, better resource allocation and quality improvements.

An alloy with customer needs in mind

Through discussions with our customers, we are seeing increasing demand for specialised alloys offering improved mechanical properties. We have a long and successful track record of developing such products, and our three research and development centres have always played a key role.

In 2019, we launched Revolution-Al™, a new aluminium alloy that unlocks design potential for car wheels. Created by our team at the Arvida Research & Development Centre in Canada, Revolution-Al™ is 15-20% stronger than a traditional alloy, enabling a 7% weight reduction versus standard wheels. This new product provides opportunities to reduce carbon emissions and tyre wear as well as improve vehicle performance, handling and visual appeal.

Our tests also show that Revolution-Al™ can increase our customers' productivity. It can be cast in existing facilities, reduces production time and can be easily recycled.

We received our first order in September 2019 and, as manufacturers compete to make lighter, more efficient cars, this alloy could soon be used to reduce the weight of other car parts, such as chassis parts or suspension components.

Aluminium in figures

4
bauxite mines in Australia, Brazil and Guinea

4
alumina refineries in Australia, Brazil and Canada

14
aluminium smelters in Canada, Australia, New Zealand, Iceland and Oman

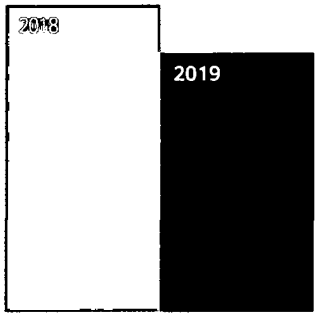
7
hydropower plants in Canada supplying 100% of the electricity we use there

3
research and development centres in Canada, France and Australia

22
sites certified responsible by the Aluminium Stewardship Initiative (ASI)

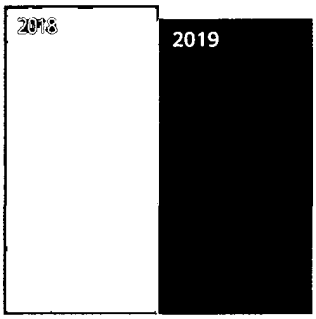
14,000
employees

Gross sales revenue



$10.3bn
(2018: $12.2bn)

Net cash generated from operating activities



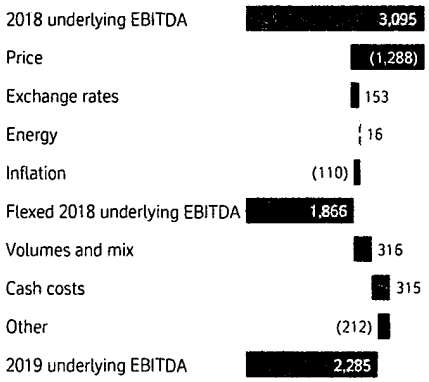
$2.2bn
(2018: $2.3bn)

Aluminium continued

2019 year end results	2019	2018	Change
Bauxite production (000 tonnes – Rio Tinto share)	**55,105**	50,421	9%
Alumina production (000 tonnes – Rio Tinto share)	**7,744**	7,980	(3)%
Aluminium production (000 tonnes – Rio Tinto share)[1]	**3,171**	3,231	(2)%
Gross sales revenue (US$ millions)	**10,340**	12,191	(15)%
Underlying EBITDA (US$ millions)	**2,285**	3,095	(26)%
Underlying EBITDA margin (integrated operations)	**26%**	32%	
Underlying earnings (US$ millions)	**599**	1,347	(56)%
Net cash generated from operating activities (US$ millions)	**2,183**	2,331	(6)%
Capital expenditure – excluding EAUs[2] (US$ millions)	**(1,316)**	(1,683)	(22)%
Free cash flow (US$ millions)	**821**	638	29%
Return on capital employed[3]	**4%**	8%	

1 To allow production numbers to be compared on a like-for-like basis, we have excluded production from asset divestments completed in 2018 from our share of prior year production data. The financial data above includes the results of divested assets up to the date of sale.
2 Capital expenditure is the net cash outflow on purchases less sales of property, plant and equipment, capitalised evaluation costs and purchases less sales of other intangible assets. It excludes equity accounted units (EAUs).
3 Return on capital employed (ROCE) is defined as underlying earnings excluding net interest divided by average capital employed (operating assets before net debt).

Underlying EBITDA 2018 vs 2019
($ million)



Safety
2019 marked a fifth consecutive fatality-free year for Rio Tinto Aluminium (RTA), and we finished the year with an AIFR of 0.46, a slight increase compared to 2018 (0.40).

We continued improving the safety maturity across our sites with a strong emphasis on leadership safety coaching and critical risk management, completing over 232,000 verifications on fatality-risk critical controls. We also initiated a project to increase vehicle-pedestrian segregation, including the introduction of a pedestrian detection system in our smelters.

We further enhanced our management of major hazards, reducing the number of process safety incidents and strengthening the way we manage critical risks in process safety and tailings. This resulted in a 50% reduction in the number of Tier 1 process safety incidents from 2018 to 2019.

Our strong commitment to safety extends to mental health and wellbeing. We continued to provide training and raise awareness on mental health to better support our employees and their families.

Financial performance
In 2019, our aluminium business benefited from a 21% increase in third-party bauxite sales, productivity improvements and lower raw material costs, but was affected by significant price declines, particularly for alumina and aluminium metal. Despite the challenging market environment, we maintained our position as the leading business in the sector, with an underlying EBITDA margin of 26% from integrated operations.

Underlying EBITDA of $2.3 billion declined by 26% compared with 2018, primarily driven by the weaker pricing environment. This reduced underlying EBITDA by $1.3 billion, including the impact of alumina legacy contracts, and was partly offset by $0.5 billion of improvements. Operating costs improved by $0.3 billion through productivity gains, including raw material efficiencies at the refineries and lower input prices, primarily for caustic soda and petroleum coke. We also benefited from $0.2 billion of gains from increased bauxite volumes and grade optimisation, supported by the successful ramp-up of our new Amrun mine in Queensland following its completion in late 2018.

We achieved an average realised aluminium price of $2,132 per tonne (2018: $2,470 per tonne). This comprised the LME price, a market premium and a value-added product (VAP) premium. The cash LME price averaged $1,791 per tonne, 15% lower than 2018. In our key US market, the midwest premium dropped 24% to $320 per tonne on average in 2019. VAP represented 51% of the primary metal we sold (2018: 54%, excluding the Dunkerque smelter which we sold in 2018) and generated attractive product premiums averaging $234 per tonne of VAP sold (2018: $227 per tonne). We paid a 10% tariff on our Canadian aluminium exports to the US under Section 232 until the tariff was removed on 19 May 2019.

Although we are broadly balanced in alumina, approximately 2.2 million tonnes of our legacy alumina sales contracts are exposed to a fixed linkage to the LME price. These contracts date back to 2005 or earlier, and the majority expire between 2023 and 2030. In 2019, the opportunity loss reduced to $0.2 billion, compared with $0.5 billion in 2018 when there was significant escalation in the alumina index caused by industry supply disruptions.

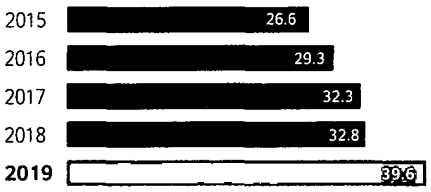
Despite the significantly weaker market environment, we generated $2.2 billion in net cash from operating activities with free cash flow increasing by 29% to $0.8 billion. This was underpinned by productivity improvements, lower costs, favourable movements in working capital and lower capital expenditure, following completion of the Amrun project.

Underlying EBITDA margin (integrated operations)

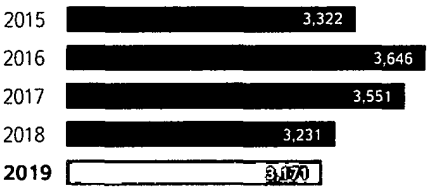
26%

(2018: 32%)

Third-party bauxite shipments
(million tonnes – Rio Tinto share)



Aluminium production
(thousand tonnes – Rio Tinto share)



Review of operations

Bauxite production was 9% higher than 2018 at 55 million tonnes. In Australia, production at the Pacific managed mines was up by 11% on 2018, underpinned by the successful ramp-up of Amrun. Production at the non-managed joint ventures (CBG in Guinea and MRN in Brazil) was 1% higher than 2018, but was constrained by the ramp-up of the expansion project at CBG being slower than planned.

Our production performance enabled us to increase shipments of bauxite to third parties by 21% to 40 million tonnes. Over the past five years, we have increased our third-party bauxite sales by 16 million tonnes (70%), maintaining our position as a leading global supplier in the seaborne bauxite trade.

In 2019, gross revenue for bauxite increased 6% to $2.5 billion – this includes freight revenue of $464 million (2018: $371 million).

At 7.7 million tonnes, our alumina production was 3% lower than 2018, primarily due to major maintenance activities at the Pacific refineries including a planned five-year maintenance shutdown to service the cogeneration plant at Yarwun.

At 3.2 million tonnes, our aluminium production was 2% lower than 2018, primarily due to lower volumes at ISAL from a safety related preventive pot-line outage in the third quarter and at Kitimat, due to earlier than planned pot-lining replacement. Excluding the non-managed Becancour operation where a lock-out constrained operations, the Quebec and Pacific smelters performed well, with aluminium production for 2019 up 1% on 2018, reflecting continued productivity improvements. The restart of Becancour is underway, with full ramp-up expected by mid-2020.

The aluminium industry continues to face challenging conditions in global markets and policy uncertainty, reflected in low industry profitability. We continue to actively work on enhancing the competitiveness of our smelters, including discussing energy pricing with stakeholders, to ensure the sustainability and global competitiveness of our smelters in Australasia and in Iceland. We announced strategic reviews of our interests in the Tiwai Point smelter in New Zealand in October 2019, and in the ISAL smelter in Iceland in February 2020. The strategic reviews will determine the ongoing viability and competitive position of these operations and will consider all options, including curtailment and closure.

New projects and growth options

The $1.9 billion Amrun bauxite mine on the Cape York Peninsula in north Queensland achieved its design capacity rate of 22.8 million tonnes a year in the fourth quarter of 2019, supporting higher third party sales and replacing the depleting Weipa mines.

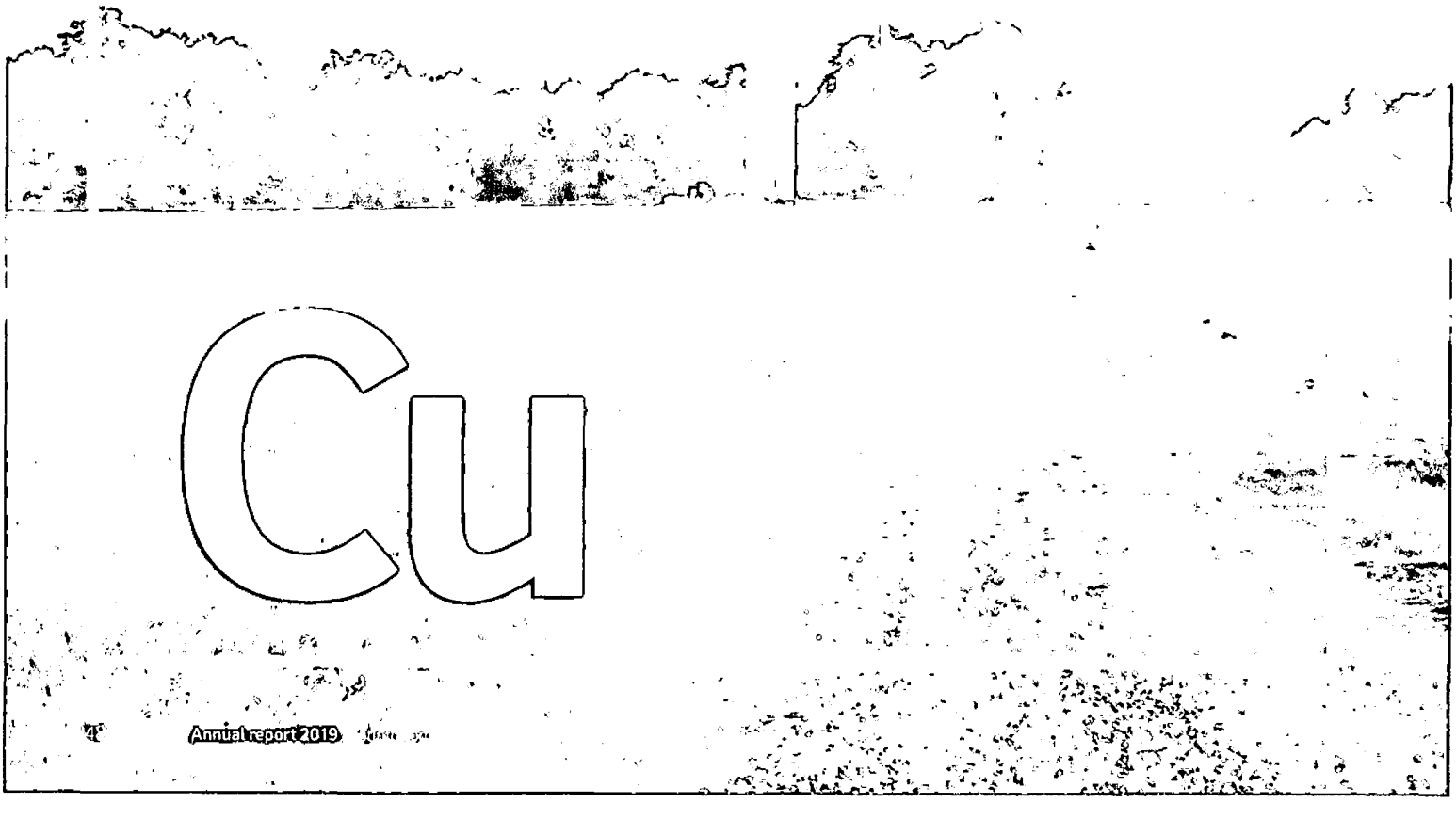
In 2019, production from the Sangaredi bauxite mine in Guinea was constrained by a slower than planned ramp-up of the $0.7 billion expansion project (our share is $0.3 billion). When this ramp-up is complete, the annual capacity of Compagnie des Bauxites de Guinée (CBG) will increase from 14.5 to 18.5 million tonnes (100% basis, our share of production is 45%).

At the $0.5 billion Kemano project in Kitimat, British Columbia, where we are constructing a second tunnel to de-risk our 100% owned hydropower facility, we had excavated 2.7 kilometres of the tunnel by the end of 2019. Progress has been slower than expected and completion is now expected in 2021 (previously late 2020).

ELYSIS, our joint venture with Alcoa, supported by Apple and the governments of Canada and Quebec, is developing a breakthrough technology that eliminates all direct greenhouse gases from the traditional aluminium smelting process. In 2019, ELYSIS started construction of its new Research and Development Centre, which will be located at Rio Tinto's Complexe Jonquière in the Saguenay, Quebec. We expect it to be fully operational in the second half of 2020. ELYSIS also announced that Apple had purchased the first commercial batch of aluminium produced using our carbon-free smelting process.

Greenhouse gas emissions

From 2008 to 2019, RTA's greenhouse gas emissions intensity has improved by 38%. Using our self-generated hydropower, the emissions from our Canadian smelters are 2.15 $tCO_2eq.$ per tonne of aluminium, well below the industry average, while our Vaudreuil alumina refinery has the lowest carbon footprint in the world today.


Cu

Overview

Our copper and diamond businesses have rich expertise in underground mining processes and technology. Combined with our strong people focus, this allows us to relentlessly prioritise safety and continue to be a profitable, future-ready, sustainability-driven business.

Copper

Global demand for copper is set to grow, driven by urbanisation, industrialisation, digital communications and increasing use of renewable energy: copper plays a key role in electrification and power production.

Our operations around the world are at various stages in the mining lifecycle, from exploration to programme rehabilitation. Alongside copper, we also produce gold, silver, molybdenum and other materials such as rhenium. We supply customers in China, Japan and the US.

Diamonds

In diamonds, we are a global exploration, mining and sales and marketing business. As one of the world's largest producers of rough diamonds from our two mines, Argyle in Australia and Diavik in Canada, we supply a full range of sizes, qualities and colours to established and emerging consumer markets.

Snapshots from the year

0.29
AIFR
(2018: 0.46)

$5.8bn
gross sales revenue
(2018: $6.5bn)

41%
underlying EBITDA margin (product group operations)
(2018: 47%)

$1.5bn
net cash generated from operating activities
(2018: $2.1bn)

Reducing our carbon footprint

As an essential component in electric vehicles and in solar, hydro and wind energy, copper is helping to build a more sustainable future. And at our Kennecott copper mine, in Utah, in the western US, we are taking sustainability one step further.

In 2019, we permanently shut the coal-fired power plant supplying the mine. Together with our purchase of renewable energy certificates, this will reduce Kennecott's annual carbon footprint by as much as 65%. The mine's electricity needs are now paired with 1.5 million megawatt hours of renewable energy certificates, supplied by Rocky Mountain Power, which will reduce carbon emissions associated with our operation by over one million tonnes.

Sustainability is not new to Kennecott, however; since 2005, the mine has been incorporating scrap metal, such as old copper wiring, into its smelting process. In 2019, we processed more than 210,000 pounds of copper from this recycled scrap metal – roughly equivalent to the electrical wiring of 6,500 new homes.

Diamonds to wildlife: life after the Argyle closure

Our Argyle diamond mine, located in the Kimberley region of Western Australia, is due to close at the end of 2020. To help our employees plan for their post-Argyle future, we launched a programme to help them find new opportunities at Rio Tinto or beyond. Some employees will remain with the mine for closure activities like decommissioning and rehabilitation. A number have already transferred to our iron ore mines in Western Australia, while others looking for a change are preparing for a whole new career with targeted training.

Blair, a safety support officer at Argyle, illustrates the success of the programme:

"I've been at Argyle for over a decade now, but we're heading towards closure and so we need to start thinking about what our life will be like after mining finishes. My passion outside of work is filming wildlife. I've been very lucky to work in the mining industry and be able to travel all over the world: I've been to Africa a dozen times, and I've been to some very remote islands diving and filming sharks of all sorts.

The beauty of the support I have been given is that it's allowed me to go out and get my full commercial drone operator certificate. That means that, after Argyle closes, I'm going to be able to have a real crack at filming wildlife as my career. It's pretty exciting!"

Copper and Diamonds in figures

3
copper operations in the US, Mongolia and Chile

2
copper growth projects in the US and Mongolia

1 million
tonnes of carbon emissions avoided by moving our Kennecott copper mine to renewable energy certificates

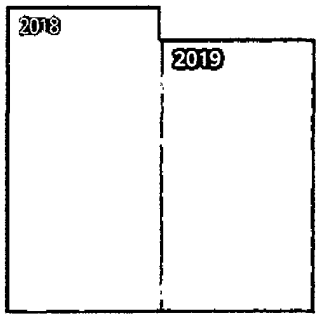
2
diamond operations in Canada and Australia

1st
mining company to be certified by the Responsible Jewellery Council

210,000
pounds of copper scrap recycled at our Kennecott copper mine in the US

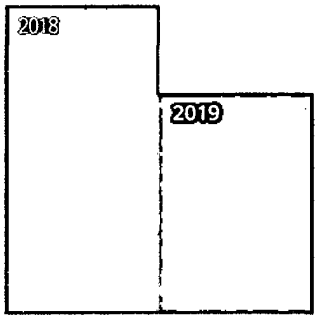
7,400
employees

Gross sales revenue



$5.8bn[1]
(2018: $6.5bn)

Net cash generated from operating activities



$1.5bn[1]
(2018: $2.1bn)

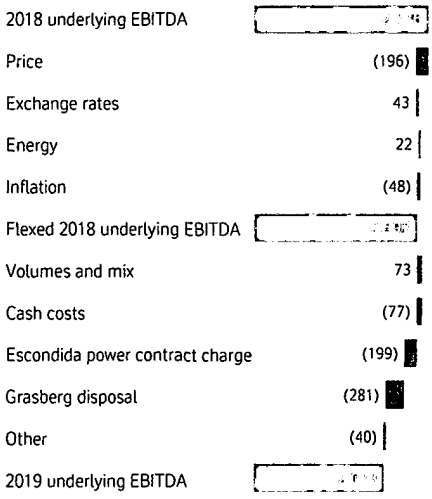
1 Includes the results of divested assets up to the date of sale.

Copper and Diamonds continued

2019 year end results	2019	2018	Change
Mined copper production (000 tonnes – Rio Tinto share)[1]	**577.4**	607.6	(5)%
Refined copper production (000 tonnes – Rio Tinto share)	**259.6**	274.8	(6)%
Diamonds production (000 carats – Rio Tinto share)	**17,030**	18,427	(8)%
Gross sales revenue (US$ millions)	**5,815**	6,468	(10)%
Underlying EBITDA (US$ millions)	**2,073**	2,776	(25)%
Underlying EBITDA margin (product group operations)	**41%**	47%	
Underlying earnings (US$ millions)	**554**	1,054	(47)%
Net cash generated from operating activities (US$ millions)[2]	**1,505**	2,114	(29)%
Capital expenditure – excluding EAUs[3] (US$ millions)	**(1,772)**	(1,848)	(4)%
Free cash flow (US$ millions)	**(284)**	266	(207)%
Return on capital employed[4]	**5%**	9%	

1 To allow production numbers to be compared on a like-for-like basis, we have excluded production from asset divestments completed in 2018 from our share of prior year production data. The financial data above, however, includes the results of divested assets up to the date of sale.
2 Net cash generated from operating activities excludes the operating cash flows of equity accounted units (Escondida) but includes dividends from the equity accounted units
3 Capital expenditure is the net cash outflow on purchases less sales of property, plant and equipment, capitalised evaluation costs and purchases less sales of other intangible assets. It excludes equity accounted units (EAUs).
4 Return on capital employed (ROCE) is defined as underlying earnings excluding net interest divided by average capital employed (operating assets before net debt).

Underlying EBITDA 2018 vs 2019
($ million)



Safety

This year, we recorded overall improvement in safety at our Copper and Diamond operations, driven by an unrelenting focus on safety fundamentals, including emphasis on caring and visible leadership and coaching, on embedding existing safety initiatives and on using problem solving techniques and engagement with front-line employees. 2019 was also a year free of fatalities, permanent disabling injuries and significant process safety incidents. The all injury frequency rate (AIFR) was 0.29, an improvement from 0.46 in 2018. Copper & Diamonds met our critical-risk management targets as well as our injury reduction targets: the number of injuries declined to 40 in 2019 (from 65 in 2018). We also saw a significant reduction in contractor-related incidents as a result of an increased focus on contractor management.

Financial performance

In 2019, our operational performance was affected by lower grades at all operations, partly offset by higher throughput and productivity improvements.

Our average realised copper price decreased by 7% to 275 US cents per pound, which compared with an 8% decline in the LME price to 273 US cents per pound.

At $2.1 billion, underlying EBITDA was $0.7 billion (25%) lower than 2018. This was the result of $0.2 billion in unfavourable pricing impacts, a $0.2 billion non-cash charge at Escondida in 2019 relating to the cancellation of existing coal power contracts to be replaced with lower cost renewable power, $0.1 billion from lower volumes at Escondida, and the divestment of Grasberg, which contributed $0.3 billion to underlying EBITDA in 2018. Our operating assets delivered on their productivity and improvement programmes, partially offsetting the above impacts, resulting in lower overall production costs compared with 2018. Our copper unit costs, at 93 cents per pound in 2019, were 15% lower than in 2018, with higher by-product credits and cost reduction programmes offsetting the impact of lower copper grades.

We generated $1.5 billion in cash from our operating activities in 2019, 29% lower than 2018, driven by the 25% reduction in underlying EBITDA described above, as well as $0.1 billion lower dividends from our 30% equity holding in Escondida. Free cash flow of $(0.3) billion reflected the lower operating cash flow and a sustained level of capital investment ($1.8 billion), mainly relating to activities at the Oyu Tolgoi underground project.

Review of operations

Mined copper production was 5% lower than 2018, primarily attributable to lower copper grades at all three operations, partly offset by higher throughput and productivity improvements. Refined copper production, at 6% lower, largely reflected the reduced copper concentrate availability at Escondida and our Kennecott smelter.

Kennecott

Mined copper production was 8% lower than 2018, mostly due to increased grade variability, with grades on average 11% lower. This grade impact was partially offset by a 4% improvement in ore processed since 2018. Grades will continue to be lower through 2020 before increasing from the first quarter of 2021, with the transition from east wall to south wall mining. Refined copper production was 5% lower than 2018. This reflected the reduced availability of copper concentrate, a planned smelter shutdown and additional unplanned maintenance impacting furnace online time.

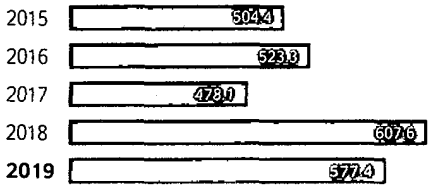
Underlying EBITDA margin

41%

(2018: 47%)

Mined copper production

(000 tonnes – Rio Tinto share)



Escondida

Copper production at Escondida was 3% lower than 2018. This was mainly due to grade declines, which were 8% lower than last year, partly offset by higher throughput.

Following the signing of renewable power agreements, Escondida has raised a provision related to the cancellation of existing coal contracts. We have recognised a charge of approximately $0.2 billion against 2019 underlying EBITDA, reflecting our 30% share.

In addition to the renewable power agreements, the Escondida water supply expansion project was successfully completed in December 2019 and the water requirements of the operation are now fulfilled entirely by desalinated water production.

Oyu Tolgoi

As anticipated, mined copper production from the open pit was 8% lower than 2018 as mining activity moved to lower grade areas. Grades were 11% lower for the year, and were partly offset by productivity improvements.

Diamonds

Diamond production was 8% lower than 2018. At Argyle, carat production was down by 8% due to a lower recovered grade – this was partially offset by record underground mining and processing rates. At Diavik, carats recovered were down by 8% due to lower ore availability and grade from the underground operations – this was partly offset by higher tonnes and grade from the A21 open pit.

Oyu Tolgoi underground project

During the fourth quarter of 2019, we took the decision to remove two of the three mid-access drives at Oyu Tolgoi. We will retain one mid-access drive on the apex level of the mine design of Panel 0. The removal of these mid-access drives has an unfavourable impact on schedule; overall, the underground project remains within the range announced in July 2019 of a 16 to 30 month delay in schedule and an increase of $1.2 to $1.9 billion[1] in development capital costs.

We continue the detailed work on mine design, which we still expect to complete in the first half of 2020, with a definitive estimate in the second half of 2020, as previously disclosed. This will include the estimate of development capital costs and schedule for the underground project based on the updated design of Panel 0.

Decisions on other key underground design elements such as the location of the ore handling system and options for panel sequencing will be taken in the first half of 2020. These will take into consideration the consequential impacts on cost, schedule and other key variables such as ore reserves, project ramp-up profile and peak production, together with improvements in productivity.

Productivity improvements resulted in increased underground lateral development during the fourth quarter, to an average monthly rate of 1,607 equivalent metres (eqm) compared with 1,214 eqm in the third quarter. Completion of shaft 2, a key milestone, occurred in October 2019. Construction is progressing on shafts 3 and 4 to enable commencement of main sinking operations for both shafts during the first half of 2020.

Under the Power Source Framework Agreement signed in 2018, Oyu Tolgoi continues to work with the government of Mongolia to secure a long term power solution for the project. Different power sourcing options are currently under evaluation and discussion with the government of Mongolia to identify the lowest cost and reliable option for Oyu Tolgoi. In February 2020, Oyu Tolgoi submitted a feasibility study to the government of Mongolia for the Tavan Tolgoi Power Plant. This envisages a 300 MW coal power plant with a project cost estimate of around $924 million. We are also progressing alternative options to source domestic power, including a renewable power component.

Other new projects and growth options

At Kennecott, we continue to progress stripping activities on the $0.9 billion phase 1 south wall pushback project. Grades are expected to increase in 2021 with the transition from east wall to south wall mining.

In late 2019, we announced the approval of a $1.5 billion investment in Kennecott, extending operations to 2032. The investment will further extend strip waste rock mining and support additional infrastructure development in the second phase of the south wall pushback project, allowing mining to continue into a new area of the ore body between 2026 and 2032 and generate attractive returns.

At our Resolution Copper project in Arizona, deepening of the existing shaft 9 continues, as well as work on the underground characterisation study to increase ore body knowledge. Permitting and studies are progressing well, following the release of the independently prepared draft Environmental Impact Statement (EIS) for the project in August 2019. A plan is in place with the US Forest Service to address comments received on the study to maintain schedule on the final EIS in 2020. The Land Exchange title transfer will be completed within 60 days of final EIS publication.

In April 2019, we approved $302 million ($166 million our share) of additional expenditure for Resolution, to fund additional drilling, orebody studies, infrastructure improvements and permitting activities, as we progress the project to the final stage of the permitting phase.

Greenhouse gas emissions

Copper and Diamonds decreased emissions intensity by 33.3% since 2008. We discontinued the use of a coal-fired power plant at Kennecott and are also working to reduce our environmental footprint at both of our diamonds operations. At Diavik, in Canada, our windfarm continues to reduce diesel usage through leading-edge cold-climate technology. At Argyle, in Western Australia, the hydropower scheme reduces our diesel usage for electricity. And as a product group, our sustainability strategy continues to focus on carbon and water.

1 As described above, and as disclosed in a Notice to the ASX/LSE on 16 July 2019, and our 2019 interim financial results, the level of accuracy of these estimates is preliminary in nature and subject to a range of variables. These estimates are at a confidence level associated with a Conceptual or Order of Magnitude Study; more work is needed between now and the second half of 2020 to refine the mine design options and study them to a level of confidence and accuracy associated with Feasibility Study quality estimates.

Energy and Minerals

Overview

The products from our diverse portfolio of high-quality mining, refining and marketing operations are part of people's everyday lives and play an important role in the technology and cutting edge materials of the future.

The Energy and Minerals (E&M) portfolio includes titanium dioxide; rutile and zircon; borates; iron ore concentrate and pellets; and uranium. Our products are used in everything from touch screens and hearing aids to high-strength steel and corrosion resistant coatings, and in industries such as aerospace, healthcare, and low-carbon energy.

As a key global supplier of borates, we meet approximately 25% of global demand – and have mining, processing, commercial and research facilities. Our Iron and Titanium business is a major global producer of high-grade titanium dioxide feedstock. The Iron Ore Company of Canada (IOC) is a leading producer of premium iron ore pellets and high-grade concentrate with low levels of impurities. We continue our study at the Jadar lithium-borate project in Serbia. We also own interests in a uranium business – Energy Resources of Australia – and a uranium project in Canada.

In 2019, we completed the sale of our entire interest in the Rössing Uranium mine in Namibia, formerly part of E&M.

The Rio Tinto Ventures team, also part of E&M, is exploring partnerships and other opportunities that will allow us to expand into metals critical to a low-carbon economy, with a strong focus on battery materials.

Snapshots from the year

0.43
AIFR
(2018: 0.55)

$5.2bn
gross sales revenue
(2018: $5.5bn)

37%
underlying EBITDA margin (product group operations)
(2018: 41%)

$1.4bn
net cash generated from operating activities
(2018: $1.2bn)

Pioneering a new source of lithium

As the world moves to electric vehicles, demand for lithium, for the vehicles' rechargeable batteries, is expected to increase to 1.3 million metric tonnes – over five times today's levels.

In 2019, we announced a $10 million investment to pilot the production of commercial grade lithium at our Boron operations in California. The lithium, discovered in nearly century-old borates tailings, creates additional value from existing waste rocks and as such, does not need to be mined.

The pilot could potentially produce 10 tonnes per year of lithium-carbonate, needed in rechargeable batteries for electric vehicles and consumer electronics. In the coming year, we will consider an additional $50-million investment to build an industrial-scale lithium plant with capacity for 5,000 tonnes per year, or enough to make batteries for approximately 15,000 electric vehicles.

The discovery of lithium in borates waste is significant, and could one day make our current boron operation the largest domestic producer of battery-grade lithium in the US.

"Unthinkable" performance improvements

In 2019, the Iron Ore Company of Canada (IOC) successfully trialled an electric autonomous drilling system and continued to develop its Integrated Operations Centre.

In the harsh climate of northern Canada, where electrical storms, blizzards and temperatures below -30°C are common, autonomous drills continue to work in all conditions, including those unsafe for manned crews. One operator is able to control multiple drill rigs remotely, replacing on-the-ground teams operating a single rig. The autonomous drill trial demonstrated a 30% improvement in productivity over standard rigs.

The autonomous drilling system is one element of the mining and production process that has been brought together in IOC's Integrated Operations Centre. The centre houses control and monitoring systems for the equipment in the five operating pits, ore delivery system, concentrator, pellet plant, 418km rail line, and port. Housing these systems together has improved communication and decision-making, as operators who previously worked in different locations spread over hundreds of kilometres now sit next to each other.

At IOC, new technology is enabling performance improvements in ways that would have been "unthinkable" only a few years ago.

Energy and Minerals in figures

6
mining sites

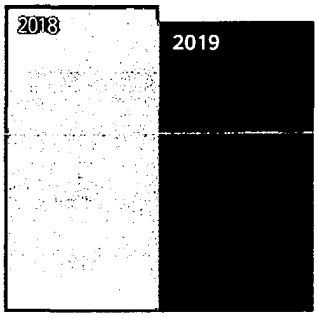
7
processing plants

Operations in
6
countries

8,600
employees

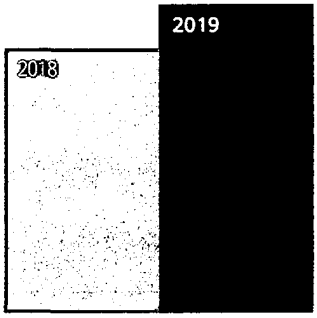
400,000
trees planted in Madagascar

Gross sales revenue



$5.2bn
(2018: $5.5bn)

Net cash generated from operating activities



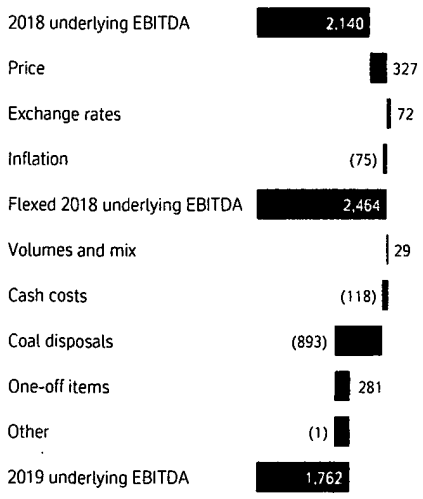
$1.4bn
(2018: $1.2bn)

Energy and Minerals continued

2019 year end results	2019	2018	Change
Iron ore pellets and concentrates production[1] (million tonnes – Rio Tinto share)	**10.5**	9.0	18%
Titanium dioxide slag production (000 tonnes – Rio Tinto share)	**1,206**	1,116	8%
Borates production (000 tonnes – Rio Tinto share)	**520**	512	2%
Uranium production (000 lbs – Rio Tinto share)	**4,754**	6,764	(30)%
Gross sales revenue (US$ millions)	**5,150**	5,451	(6)%
Underlying EBITDA (US$ millions)	**1,762**	2,140	(18)%
Underlying EBITDA margin (product group operations)	**37%**	41%	
Underlying earnings (US$ millions)	**611**	995	(39)%
Net cash generated from operating activities (US$ millions)	**1,387**	1,245	11%
Capital expenditure (US$ millions)[2]	**(551)**	(442)	25%
Free cash flow (US$ millions)	**817**	796	3%
Return on capital employed[3]	**15%**	20%	

1 *To reflect a change in management responsibility, Dampier Salt is now reported within Iron Ore and we have restated prior year numbers accordingly. Iron Ore Company of Canada and the Simandou iron ore project in Guinea continue to be reported within Energy & Minerals.*
2 Capital expenditure is the net cash outflow on purchases less sales of property, plant and equipment, capitalised evaluation costs and purchases less sales of other intangible assets.
3 Return on capital employed (ROCE) is defined as underlying earnings excluding net interest divided by average capital employed (operating assets before net debt).

Underlying EBITDA 2018 vs 2019
($ million)



Safety

Our E&M operations made significant improvements across all key safety metrics this year. The all-injury frequency rate, for example, was down to 0.43 (from 0.55 in 2018), the result of increased rigour and focused implementation of our safety programmes across our operations, made possible by the leadership and engagement of our employees. While 2019 was a fatality-free year, at our IOC operations, one of our employees experienced a permanent disabling injury. Our thoughts remain with him and his family; we continue to share the analysis and resulting lessons learned across the Group to ensure everyone takes all possible steps to prevent such incidents in the future.

Process safety incidents were also more than halved in 2019 following our implementation of a targeted improvement plan. We are particularly proud of the performance of QMM operations in Madagascar, which had one recordable injury and an all-injury frequency rate of 0.04. Four other E&M sites in Havre-Saint-Pierre, Suzhou, Simandou and Jadar ended the year with no recordable injuries.

In 2020, we will continue to implement the Rio Tinto safety maturity model, supported by lessons learned and best practices from 2019. The implementation of the process safety standard will also continue to be a key focus in 2020.

Financial performance

A recovery in volumes at both Rio Tinto Iron & Titanium and Iron Ore Company of Canada (IOC) following the disruptions in 2018, along with higher prices for iron ore pellets and concentrate and titanium dioxide feedstocks, contributed to our strong financial performance in 2019.

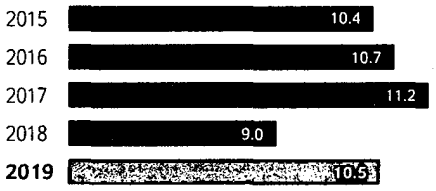
Underlying EBITDA of $1.8 billion was 18% lower than 2018, but was 41% higher excluding the coal assets we divested in 2018. Volumes were boosted by an improved operational performance at our titanium dioxide operations, and the return to normal operations at IOC following a two-month strike in 2018. The higher price environment, in particular for iron ore pellets and concentrate and titanium dioxide feedstocks, added $0.3 billion to underlying EBITDA compared with 2018.

We generated net cash of $1.4 billion from our operating activities and $0.8 billion of free cash flow, reflecting the higher volumes and stronger pricing environment. These were 11% and 3% higher than 2018, respectively, despite there being no contribution from the coking coal assets which we divested in 2018.

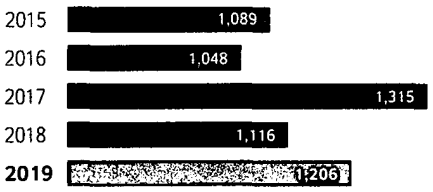
Underlying EBITDA margin

37%
(2018: 41%)

Iron ore pellets and concentrate production
(million tonnes – Rio Tinto share)



Titanium dioxide slag production
(thousand tonnes – Rio Tinto share)



Review of operations

Energy

Uranium production was 30% lower than 2018. While Energy Resources of Australia (ERA) continued to process existing stockpiles, production was 12% lower than 2018, reflecting lower grades. We have reported production from Rössing Uranium up to the date of completion of divestment to China National Uranium Corporation Limited on 16 July 2019.

In late 2019, we announced our support for ERA's plans for a renounceable entitlement offer to raise $324 million for the rehabilitation of the Ranger Project Area in Australia's Northern Territory.

Iron Ore Company of Canada (IOC)

Iron ore pellets and concentrate production at IOC was 18% higher than 2018, when operations were impacted by a two-month strike.

Minerals

Titanium dioxide feedstock production was 8% higher than 2018, reflecting improved operational performance and the restart of furnaces.

Production at the end of 2019 was affected by the curtailment of operations at Richards Bay Minerals (RBM) in South Africa. Operations were slowed in mid-November, following an escalation in violence in the communities surrounding the operations, and curtailed at the beginning of December. A phased restart began at the end of December.

All nine furnaces at Rio Tinto Fer et Titane (RTFT) are in operation, with three of four furnaces in operation at RBM. We will decide to idle furnaces or re-start the remaining idled furnace to match market demand.

Borates production was in line with 2018 and aligned with market conditions.

New projects and growth options

The $463 million Zulti South construction project at RBM is on hold after a number of security incidents – we will assess a restart after normalisation of operations.

We are continuing our pre-feasibility study at the Jadar lithium-borate project in Serbia – this will establish the economic business case for the project and include environmental and socioeconomic impact assessments.

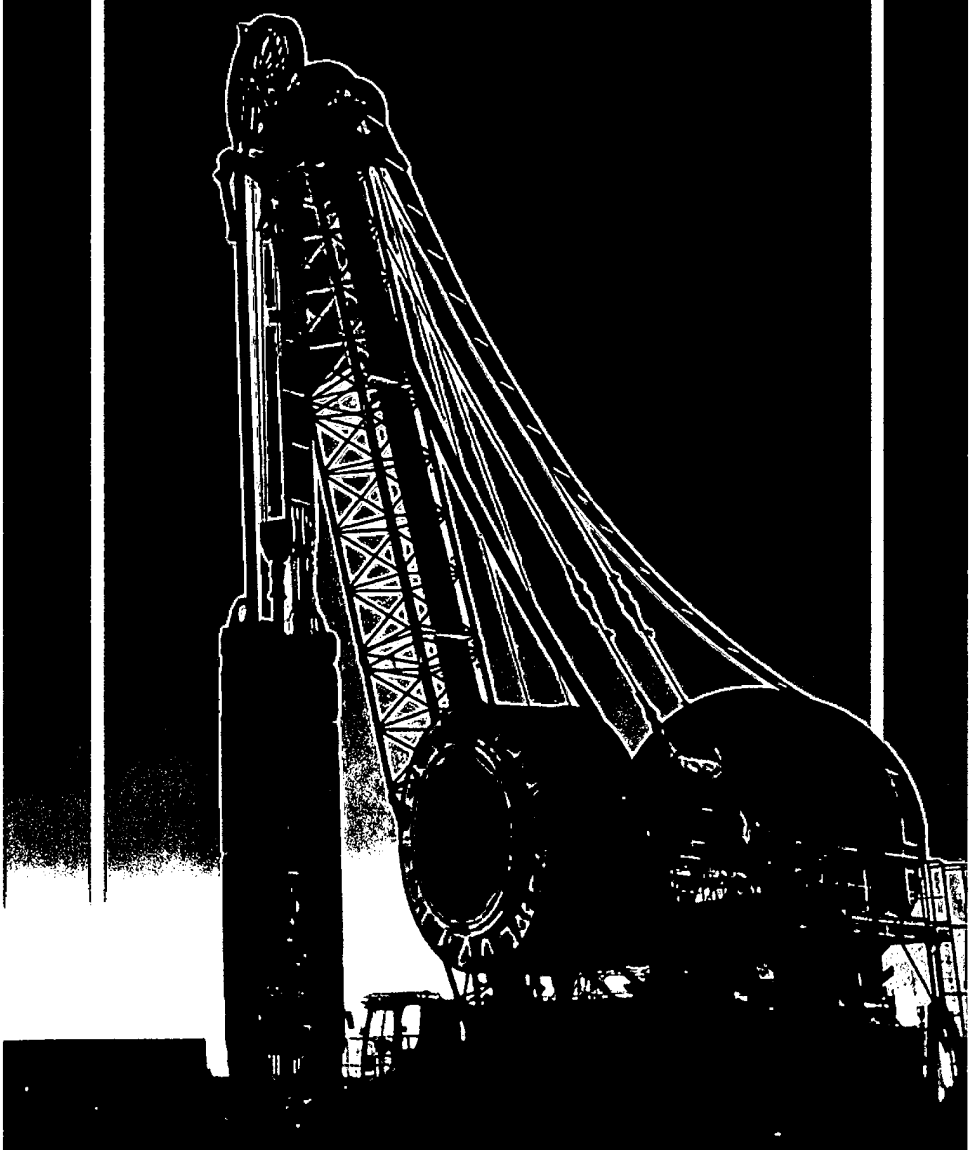
We continue to work with our joint-venture partners, Chinalco and the government of Guinea, to explore ways to optimise, develop and fund the world-class Simandou iron ore deposit and the trans-Guinean infrastructure needed to support the mine. We own 45.05%, Chinalco owns 39.95% and the government of Guinea owns a 15% stake in this project.

Greenhouse gas emissions

Compared with 2018, E&M's absolute GHG emissions were 11% lower, driven by the sale of our uranium asset in Namibia. There was a 5% improvement in E&M's overall GHG intensity compared to the 2008 baseline year.

The Bauer Cutter rig used for digging vertical trenches at FalCon, Canada.

Growth and Innovation



Whether exploring or building assets, we use advanced technology and some of the best minds in the business to maximise value across the lifecycle of our operations.

Our success, today and in the future, will be predicated upon using cutting-edge technology as well as data and artificial intelligence to establish new and more efficient ways of finding, building, running and closing our operations. This is the mandate of our G&I group.

Safety
Since G&I's inception in 2016 there have been no work related fatalities[1] and our all-injury frequency rate was 0.28. We have shown safety is our number one priority by continually learning from potentially fatal incidents, focusing on controls to prevent injury and illness, continuing to automate risky manual tasks and preventing catastrophic events, particularly in relation to tailings and process safety.

Industry-leading innovation
As an industry, we tackle some of the greatest engineering and technical challenges on the planet, and we have a long, proud history of meeting these challenges head on.

In exploration, for example, we are using advanced technology to mine data to improve our targeting, which lets us uncover resources that others may have missed – this was true of our Winu copper-gold exploration project, in Western Australia, which was announced in 2019.

In studies and construction, innovation and digital design is helping strengthen safety, reduce cost, and find new ways to improve waste and water management. We are also looking at more agile ways to build new mines: starting small, building quickly and safely, and embedding optionality for growth.

Technology also has an important role to play in helping us increase productivity and tackle critical industry challenges, such as tailings, energy and carbon reduction initiatives. In 2019, machine learning helped us unlock productivity improvements. For example, at our Kennecott copper mine in Utah, in the US, we used artificial intelligence to optimise the concentrator's recovery of minerals from the varying types of ore fed into the plant.

1 Health fatality reported in 2017 was reclassified as non-work related.

Exploration
This year, we explored for seven commodities in 17 countries and generated more opportunities than at any other time in our history. Expenditure on exploration and evaluation was $624 million. Of this, $315 million was for the exploration and evaluation of greenfield programmes and $309 million was for brownfield programmes in our product groups, mostly copper.

We had some early success in copper exploration at Winu, Western Australia, and assessment and interpretation of existing data is ongoing.

The majority of our projects this year are in the early stages of drilling. Projects at a more advanced stage are listed in the table below.

Projects
In 2019, the projects team in G&I, responsible for building our mines and other operations, delivered a significant volume of work safely, on time and on budget – or better. We were recognised for our work, winning multiple awards for our Amrun bauxite mine in Queensland, Australia, which officially opened in March, two months ahead of schedule and under budget. Amrun achieved its production rate of 22.8 million tonnes in the fourth quarter of 2019, much earlier than planned. Its Chith Export Facility received the 2019 Australian Construction Achievement Award, Institute of Civil Engineers Brunel Medal, and Management Innovation & Excellence Award for Operational Improvement. Our local and Indigenous participation strategy also received the Best Company Indigenous Procurement Initiative.

AutoHaul™, the world's first automated heavy-haul rail network, was handed over to our Iron Ore business in April and received a 2019 Freight Rail Excellence Award. Construction of Koodaideri, our intelligent mine in the Pilbara, Western Australia, began in 2019: the project remains on budget and first ore is expected in late 2021. We are leading the construction of a new crusher and 13 kilometre conveyor at the Western Turner Syncline Phase 2 project at our Greater Tom Price iron ore operations. We completed bulk earthworks for the Robe Valley sustaining project's wetplant area and poured the foundation for the West Angelas Deposit C&D primary crusher facility, both in the Pilbara.

The underground copper project at Oyu Tolgoi, in Mongolia, achieved a significant milestone with the completion of construction of Shaft 2, which enables the acceleration of work on the underground development. Shaft 2, a 10-metre diameter shaft sunk to approximately 1.3 kilometres, is a critical piece of infrastructure and will enable a step change in delivering the underground mine. Shaft 2 can carry 300 people per cage cycle versus a maximum of 60 people per cage cycle through Shaft 1. The 48-tonne capacity cage can now be used to support logistics, transporting supplies and components for development of the mine. This shaft also has a production component, which hoists 60 tonnes of rock at about 60 kilometres per hour. Completing Shaft 2 provides additional momentum as we continue to progress detailed work on the mine design, which we expect to complete in the first half of 2020, with a definitive estimate for the development of this world-class ore-body in the second half of 2020. Other facilities completed in 2019 include the mine dry facility, a new underground operations control room and the central heating plant expansion.

At our Resolution Copper project in Arizona, in US, we deepened Shaft 9 further, reaching 1,600 metres below ground in 2019. Working with our aluminium business at our Kitimat smelter in British Columbia, Canada, we progressed the construction of a second tunnel to safeguard our hydroelectric power supply. While our tunnel boring machine productivity was lower than expected, we reached 2,731 metres at the end of 2019.

Introducing Group Technical
This year, we introduced Group Technical as the organisation housing G&I's eight Centres of Excellence – Analytics, Automation, Asset Management, Energy and Climate Change, Ore Body Knowledge, Processing, Surface Mining and Underground Mining – representing our most critical technical capabilities. Group Technical also provides an added layer of assurance in managing our major hazard risks and supports the replication of best practices in productivity Group-wide.

Advanced stage exploration projects

Project	Commodity	Country	Type	Stage
Sudi	Mineral Sands	Tanzania	Greenfield	Project of Merit
FalCon	Diamonds	Canada	Greenfield	Order of Magnitude
Pilbara	Iron ore	Australia	Brownfield	Project of Merit
Oyu Tolgoi	Copper	Mongolia	Brownfield	Project of Merit
Bingham Canyon	Copper	US	Brownfield	Project of Merit
Winu	Copper	Australia	Greenfield	Order of Magnitude
Kalindi	Copper	Zambia	Greenfield	Project of Merit
Korgantas	Copper	Kazakhstan	Greenfield	Project of Merit
Janice Lake	Copper	Canada	Greenfield	Project of Merit
Pribrezhniy	Copper	Kazakhstan	Greenfield	Project of Merit

Project of Merit – Preliminary evaluation of orebody size, quality and potential.
Order of Magnitude – Judging whether an opportunity will be economical to develop.

G&I in figures

0.28
AIFR
(2018: 0.19)

2,600
people

+13,400
contractors

8
Centres of Excellence – Analytics, Asset Management, Automation, Energy and Climate Change, Ore Body Knowledge, Processing, Surface Mining, Underground Mining

Exploring for

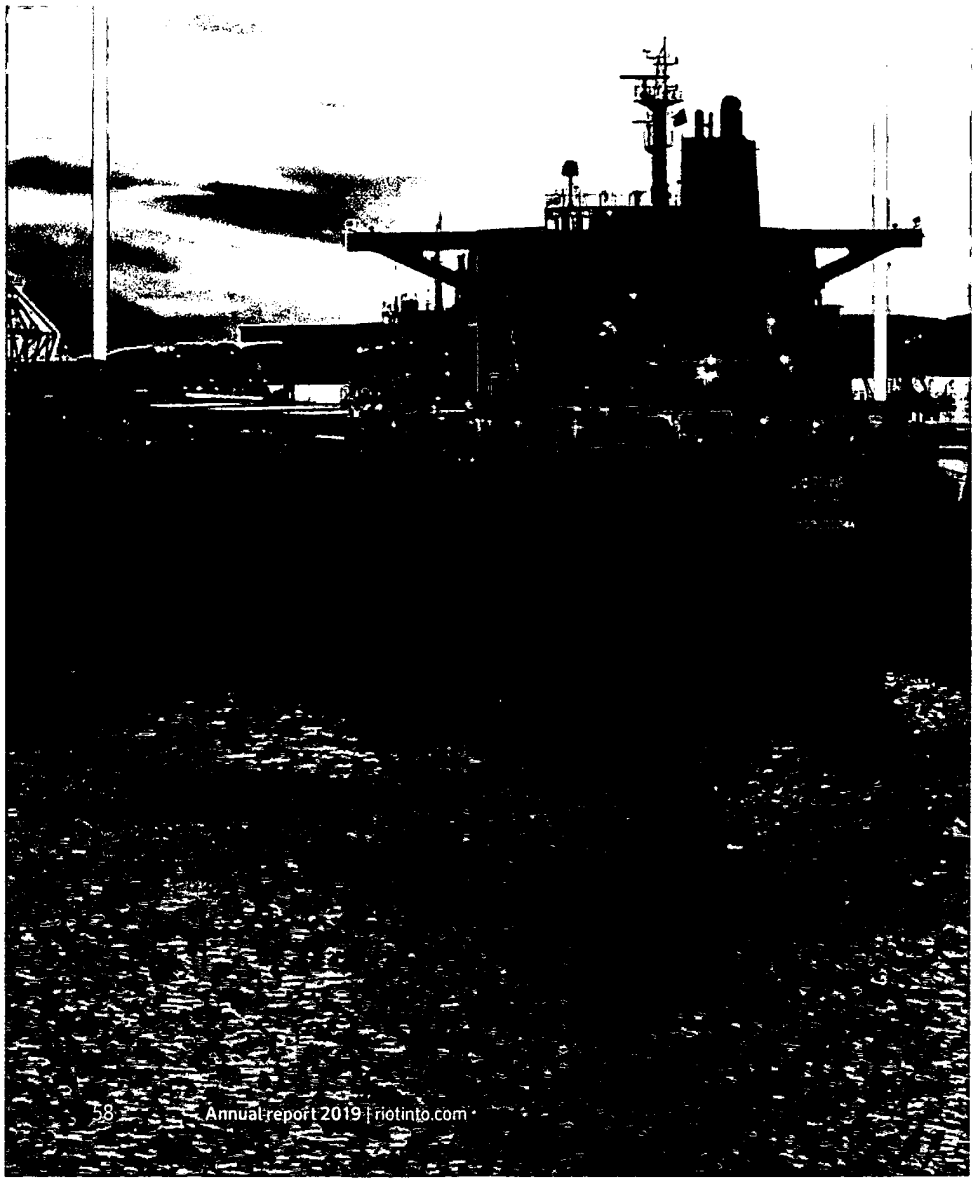
7
different commodities in 17 countries

$2.1bn
spent on capital projects in 2019

In 2019, we delivered a step-change in the way we value data. Our Integrated Data Platform, which pools operational and external sources of data into a 200 terabyte lake, reduced operating expenses associated with data sourcing by 70-80%.

G&I worked with our Iron Ore product group to award $1.3 billion in contracts to local or Indigenous businesses for capital projects in the Pilbara, Western Australia.

Commercial



The Commercial group puts the company's value over volume approach into practice.

Our Commercial group encompasses our global sales and marketing, procurement, and marine and logistics teams. We maximise the value of our physical flows to improve both our business and that of our customers. We link our customers and markets with our operations in a way that informs production and future investment decisions. We ensure that both the amount and the types of products that we produce meet our customers' needs and manage the trade-off between volumes, quality, cost and capital expenditure.

Safety

We are committed to the safety, health and wellbeing of our employees and contractors. We face a diverse range of risks across multiple geographies in our global sales and marketing, procurement and activities. Our primary focus has been implementing Group standards and critical-risk management fatality prevention programmes across our areas of greatest exposure, primarily marine and logistics, and procurement. We have also worked closely with our suppliers and contractors to embed safety into the equipment we procure and our approach to contractor management. In 2019, we had zero fatalities and a 0.04 all-injury frequency rate. In 2020, we intend to build on this and share our focus on safety, health and wellbeing through our daily interactions with our customers and suppliers.

Commercial strategy

Our Commercial strategy is built around four key pillars.

First, deepening our understanding of the value chain. We do this by improving the way we collect, organise and monetise information – solving our customer challenges and continuously generating value.

Second, building commercial excellence. We are taking what we do today and doing it better. We aim to sell every tonne we produce to the customer that values it the most, and rigorously measure and improve our performance.

Third, expanding our commercial activities into new areas. Moving from simple risk avoidance to an approach where we can better identify, quantify, and manage our risks.

Fourth, optimising our end-to-end value chain. We have an integrated approach to matching our production to the changing demand patterns of the market that seeks to ensure the real-time needs of the market can inform our decision-making.

Market insight and outlook
Global economic conditions remained uncertain throughout 2019 due to escalated trade tensions and heightened geopolitical instability. Global GDP growth is estimated to have slowed to 2.6% vs 3.2% in 2018. China's GDP growth was approximately 6.1% in 2019 vs 6.6% in 2018. And this gradual deceleration is expected to continue despite the near-term challenges and volatility created by the advent of Covid-19. In the longer term, the trend of income growth in emerging markets, including those in ASEAN countries and India, will continue to drive global commodity demand. In China, strong commodity demand will be increasingly driven by a large and evolving manufacturing sector, the need to modernise commercial and residential buildings, and the evolving trends of electrification in a low carbon world.

Iron Ore
Despite overall weakness in global macro conditions, demand for the quality iron ores we produce remained strong in 2019. This was mainly driven by a combination of seaborne supply disruptions and record Chinese steel output, which drove prices for the benchmark 62% iron ore on a free on board (FOB) basis up 39% in 2019 from the average 2018 price. Approximately 90% of our Pilbara products are priced with reference to the 62% index.

Global steel production increased by about 1.3% in 2019 compared to 2018. Record Chinese steel production of around 970 million tonnes (MT), more than offset lower steel output outside of China. Among other major steel-producing regions, India, the world's second largest steel producer, experienced a 2% growth in steel production. Meanwhile, Japan's output was down 3.7%, due to operational issues, natural disasters and other weather-related disruptions.

2019 seaborne iron ore supply decreased 30MT compared to 2018, with the cumulative impact of lower shipments following the Brumadinho dam failure and significant weather-related disruptions in the first quarter affecting Pilbara suppliers. China's domestic supply growth helped meet the supply shortfall in 2019, after overcoming improved environmental and safety standards, and financing availability. Scrap use in China increased in 2019, and we expect moderate growth to continue, albeit limited by availability, and the economics of collection and use.

Aluminium
The market for primary aluminium contracted by 1% in 2019 due to lower car production, durables output, and soft demand from construction. Chinese output growth continued to weaken in 2019, with capacity reductions of around 3.6MT due to lower prices and disruptions. In addition, there were 0.5MT of environmental winter curtailments. China permanently curtailed around 2MT of capacity in 2019. We expect aluminium demand to improve in 2020, as the transport sector recovers, but political and recessionary risks remain.

Alumina prices declined in 2019 on the back of increased output, weaker demand and lower caustic soda prices.

China continued to drive strong growth in seaborne bauxite demand in 2019, primarily as a result of the depletion of domestic, inland bauxite reserves and declining quality. To date, this demand has primarily been met by exports from Australia, Guinea and Indonesia.

Copper and Diamonds
A number of factors reduced the price of copper in the second half of 2019, primarily changing macroeconomic growth expectations and volatility in equity markets. Longer term demand is expected to remain robust as a result of urbanisation, industrialisation and electrification in China and emerging economies.

Mined supply contracted 1% in 2019 amid enhanced supply-side risks. Disruptions in Latin America and the African copper belt accounted for over 75% of global disruptions in 2019 as these regions faced environmental, social and governance challenges and regulatory disruptions respectively. These, and other challenges, are expected to persist in the coming years.

Weak diamond jewellery sales during late 2018 and early 2019 resulted in weak orders by retailers in 2019.

Energy and Minerals
Underlying titanium dioxide pigment demand weakened in 2019 resulting in lower sales volumes of paint. Against this, pricing of titanium dioxide feedstock strengthened due to structural shortages of rutile supply. In 2020, we anticipate a continuation of the demand trends of 2019 cushioned by feedstock supply shortages.

Medium to long-term demand for borates is tied to increases in wealth and living standards and associated requirements for the agricultural sector. In 2019, stronger demand in China was offset by weaker demand elsewhere, while trade restrictions and tariffs in India and China impacted the market, a situation we expect to moderately improve in 2020.

Seaborne iron ore pellet demand stayed robust in the beginning of 2019 due to tight fundamentals and supply disruptions. In the second half of 2019, reduced mill profitability, lower scrap prices outside China, and deterioration of developed market steel demand saw pellet prices fall. However, we expect a recovery through 2020.

Commercial in figures

0.04
AIFR
(2018: 0.18)

1,300
employees

Singapore Commercial Hub
with satellite offices in Chicago and Frankfurt and offices in China, Japan and South Korea

Approximately
2,000
customers across 96 countries

>230
contracted ships managed at any one time

37,000
suppliers managed in more than 120 locations

Sustainability

Our values, experience and history tell us we must work in a way that delivers real, lasting benefits.

We must care for our employees, respect and care for the environment when we explore, build and operate, and repurpose or rehabilitate the land when our operations come to an end. We must contribute our fair share to local and national economies, including through the payment of taxes and royalties.

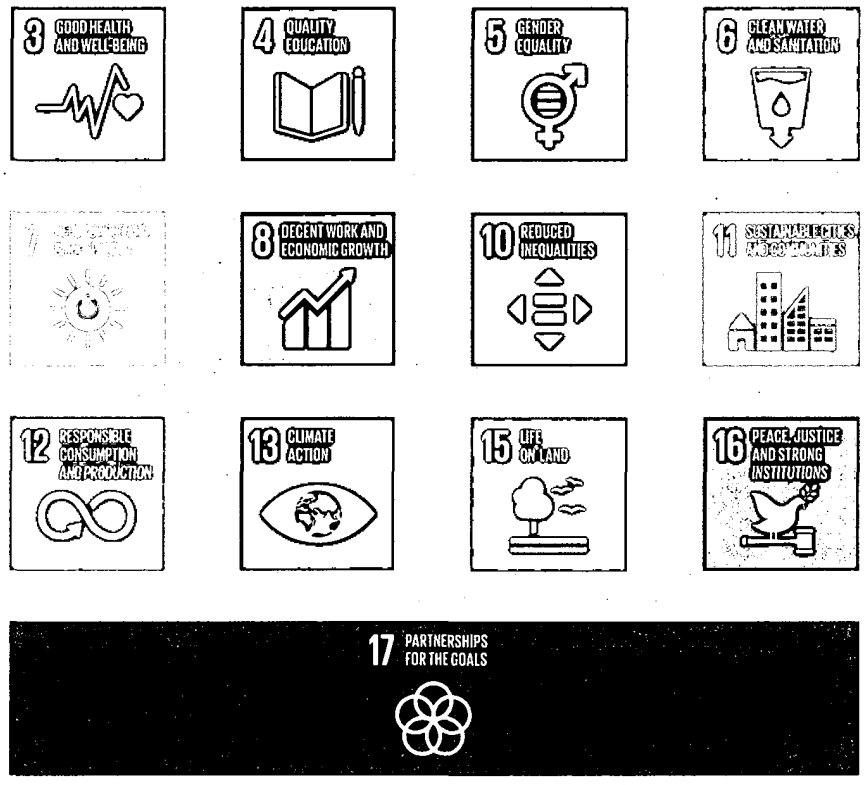
We therefore apply high standards to the sustainability issues that are material to our business, our employees, the communities that host us and the customers that buy and use our products. Our goal is to achieve consistent, high-quality social and environmental performance across all of our operations and to increase our stakeholders' knowledge of how we work through meaningful disclosures and transparency. We have also made an effort to better understand, engage and partner with our key stakeholders to create sustained, mutual value. We support the 2030 development agenda and contribute to the UN Sustainable Development Goals.

Our portfolio is also an important part of our sustainability strategy. In 2018, we became the only major player in our industry to have a portfolio free of fossil fuel production. Today, our portfolio comprises commodities with solid long-term fundamentals, including those critical for the transition to a low-carbon economy.

In 2018, we became the only major player in our industry to have a portfolio free of fossil fuel production.

Our approach to United Nations' Sustainable Development Goals (SDGs)

We continue to examine our approach to the UN SDGs in line with our integrated sustainability strategy.



Integrated sustainability strategy

Our strategy is expressed in three pillars.

Running a safe, responsible and profitable business

Running a safe, responsible and profitable business is the foundation of our approach, because safety and profitability allow us not only to manage risks, but also to invest in the future of our company and our communities – and in partnership with others, pioneer new ways to have a lasting positive impact. This pillar also includes the responsible, transparent and reliable management of our operational impacts.

Safety is our top priority. The health and safety of our workers and contractors is fundamental to the way we work. In 2019, we delivered positive safety performance across the business, and had no fatalities. Our performance on safety can still improve; we must continually work to improve safety across the Group. But we recognise the achievements made by thousands of our employees this year. Safety extends beyond personal safety, so we also have robust standards, processes and tools embedded across our business to protect the environment and ensure respect for the communities in which we operate.

Other activities that help us meet our obligations also sit in this first pillar: our commitment to our employees' rights and wellbeing, the ethics and integrity of our business and supply chain, and respect for the environment. Transparency underpins all of our efforts, including through our support of global initiatives like the Extractive Industries Transparency Initiative (EITI).

Collaborating to enable long-term benefits where we operate

Building on the first pillar, the second focuses on the success of our communities and our contribution to governments and partners, including Indigenous groups.

Agreement-making has always characterised our intent to partner for the long term, while respecting rights, and it still lies at the heart of our community engagement. For example, this year we signed a historic agreement in Quebec with the Innu community of Ekuanitshit to generate economic development opportunities associated with our operation in Havre-St-Pierre.

We also began revising our approach to communities and development this year, in alignment with the UN Sustainable Development Goals and with global technological, economic and social changes in mind. For example, we are looking at more holistic ways to contribute, including by improving our partnerships with the development arms of national, state and provincial governments, as well as international institutions such as the World Bank Group.

We are also investing in skills training for the future of work. For example, we have partnered with the government of Western Australia and South Metropolitan TAFE (Technical and Further Education) to develop three nationally recognised qualifications in automation.

We also recognise that our business is, in many of the 36 countries in which we work, a major source of jobs and opportunity – and we take this responsibility seriously. However, the employment opportunities we create go far beyond our own business. For example, in 2019, we spent $17.2 billion with suppliers around the world.

Pioneering materials for human progress

The third pillar encompasses activity that contributes to a sustainable, low-carbon future, including the materials we produce and the innovations we bring to market.

The materials we produce help support economic growth and facilitate social development because they are used to build bridges, hospitals, schools and are used in environmentally friendly solutions, such as wind turbines and electric vehicles.

For more information about how our materials will support the transition to a low-carbon economy and our approach to climate change, please see our climate change report, developed in line with the Task Force on Climate-Related Disclosures, on **riotinto.com.**

Innovation extends to other parts of our aluminium business. We also continued to look for ways to manage waste. In September, Queensland Alumina Limited (QAL) – an independently managed joint venture between Rio Tinto and Rusal – along with the University of Queensland's Sustainable Minerals Institute, received an award for research into technologies that could turn red mud – a waste product created during alumina refining – into soil able to grow plants.

The closure of our operations is also critical to the sustainable future of our communities. Today, we plan the design and construction of our operations with closure in mind. We progressively rehabilitate the land as we mine in places like Richards Bay Minerals, our operations in KwaZulu-Natal, South Africa, and our bauxite mines in Queensland, Australia. The Diavik diamond mine, in the Northwest Territories, Canada, was designed with closure in mind: the buildings on site can be removed and, when mining ends, the embankments will be reclaimed and the open pits will be filled with lake water.

Sustainability continued

2019 performance against targets

Goals	Performance
To reach zero fatalities, and to eliminate workplace injuries and catastrophic events	**Zero fatalities at managed operations** – All injury frequency rate (AIFR) at 0.42 (target: 0.38), reduced 5% from 2018 (0.44) – 1.42 million CRM verifications
All businesses will identify at least one critical health hazard material to their business and will demonstrate a year on year reduction of exposure to that hazard	**Reduction: 64.6% (38.5% airborne and 26.1% noise)** – Participation: 11 sites (167 exposed employees and contractors)
24% reduction in total greenhouse gas emissions intensity between 2008 and 2020	**29.4% decrease in greenhouse gas emissions intensity since 2008**
To reduce the rate of new occupational illnesses each year	– 34% decrease in the rate of new occupational illnesses since 2018
To disclose for all managed operations by 2023, their permitted surface water allocation volumes, their annual allocation usage and the estimated surface water allocation catchment runoff from average annual rainfall To achieve local water stewardship targets for selected sites by 2023	– Target statements defined and approved by our Sustainability Committee, a sub-committee of our Board. Assurance milestone schedules have been developed for the water target period (2019 – 23) and performance against these milestones will be tracked and assured annually.
To demonstrate local economic benefits from employment and procurement of goods and services by reporting yearly against a locally defined target To be effectively capturing and managing community complaints and reducing repeat and significant complaints each year	**90% of assets are on track to achieve their 2020 significant complaints target** – 70% of assets are on track to achieve their 2020 local employment target – 84% of assets are on track to achieve their 2020 local procurement target – 80% of assets are on track to achieve their 2020 repeat complaints target Note: 'On track' means 75% or greater progress towards 2020 targets
To improve diversity in our business by: – Increasing women in senior management[1] by 2% each year – Aiming for 50% women in our graduate intake, with 30% from places where we are developing new businesses	**25% of our Executive Committee were women, consistent with 2018** – 22.6% of senior management[1] were women, consistent with 2018 – 18.4% of our workforce were women, up 0.7% from 2018 – 54% of our graduate intake were women, 4% above target and up 18% from 2018 – 11.1% of Board roles were held by women. With the new non-executive director appointments announced in February 2020, this percentage has increased to 33% – 19% of our graduate intake were from places where we are developing new businesses[2]
Improving our employee engagement and satisfaction	**12-point increase in our employee net promoter score (eNPS[3])** – 3-point increase in employee satisfaction score (eSAT[4]) – 4-point increase in our recommend score – 37% of Yammer members engage on a monthly basis, on average

1 We define senior management as general managers, Group advisers and chief advisers as well as employees in leadership roles who report directly to Executive Committee members.
2 Identifying with a nationality is not mandatory. Over 48% of our graduates have not formally reported a nationality.
3 eNPS is a measure of "how likely an employee is to recommend Rio Tinto to a friend or colleague". It is calculated by subtracting the proportion rating 0-6 from the proportion rating 9 and 10 (on a 0-10 scale).
4 eSat is a measure of "how happy an employee is to work at Rio Tinto". It is calculated by averaging the responses on the 1-7 scale and expressing this out of 100.

Our reporting

Nothing is more important than the safety and wellbeing of our employees, contractors and communities. Safety is also one of our core values, and part of who we are and the way we work, every shift, every day.

Today, we believe all incidents and work-related health risks are preventable, so we concentrate on identifying, understanding, managing and, where possible, eliminating these. In 2019, we had no fatalities. Still, we know we must do better.

Over the past ten years, both the severity of injuries and our all injury frequency rate have fallen significantly (from 0.81 in 2009 to 0.42 in 2019).

We closely monitor leading indicators of injuries, incidents, occupational illnesses and fatalities. In 2019, we continued to focus on eliminating fatalities from our potential fatal incidents (PFIs) and our critical risk management (CRM) programme.

Eliminating fatalities

In an effort to move further towards leading indicators, we expanded critical risk management to include the safety maturity model (SMM), also adding it to the Group's 2019 short-term incentive plan. SMM is a tool that captures the key elements of our safety management system, including CRM, and builds a roadmap that describes a fully mature safety culture. Our model was introduced in 2019 and each site was assessed using the tool and given a baseline score, which averaged 3.4 across the Group, using a 9-point scale. Group performance measures were then set at 3.4 for threshold, 4.4 for target, and 5.7 for outstanding. At the end of the year the sites were reassessed by our internal auditors and an operations line leader. All sites involved showed strong improvement, and across the Group, the average score advanced from the baseline of 3.4 to the end of year 4.5, demonstrating SMM helped each site strengthen its focus on proactive actions to improve safety.

The SMM was well received across our business both as a roadmap to improve safety performance and as a way to increase employee engagement. The assessments gave us valuable insight into the effectiveness of key safety management controls. We are committed to zero fatalities and a zero harm work environment, and have maintained our focus on CRM to verify that critical controls are in place. We also continue to report, investigate and learn from our potential fatal incidents (PFIs). These processes also form part of our SMM model. As part of SMM implementation and focus on leadership, in 2019 we also introduced the cascaded coaching framework to build safety leadership capability across leadership. This replicates the programme from Boyne Smelters, Australia, which has been a leader in safety for many years due to strong safety capability among its leadership.

Managing major hazards

Running a safe, responsible and profitable business requires us to manage major hazard risks and do everything we can to prevent catastrophic events, including those involving tailings and water storage facilities, chemicals, underground mining and process safety. We identify major hazard risks (low probability, high consequence events) and manage them by verifying controls, conducting external reviews and requiring compliance with standards and procedures – such as our tailings and water storage facilities' management standard. Standards and procedures provide a consistent approach that is then implemented across our managed operations around the world. We audit every operation against our standards, and require our businesses to meet their health and safety performance requirements and targets. We remain committed to the reduction of our process safety risks and continue to run our Occupied Buildings Programme, which will eliminate, or mitigate, the total process safety exposure to our people occupying buildings.

Using data to improve health and safety

By looking for trends in data, we can help keep our employees and contractors safe. We track health and safety performance to identify patterns – for example, using additional controls to prevent incidents at times of the day when they are more likely. We have started to look beyond traditional health and safety metrics – bringing factors like weather and workers' accommodation into the picture – to identify the leading indicators of injuries, incidents, occupational illnesses and fatalities. We are factoring our learnings into revised health and safety practices in key parts of our business.

fatalities

reduction in all injury frequency rate over ten years

Safety and health performance[1] 2015-19

	2019	2018	2017	2016	2015
Fatalities at managed operations	**0**	3	1	1	4
All injury frequency rate (per 200,000 hours worked)	**0.42**	0.44	0.42	0.44	0.44
Number of lost-time injuries	**230**	228[2]	199	206	220
Lost time injury frequency rate (per 200,000 hours worked)	**0.27**	0.27	0.25	0.26	0.25
New cases of occupational illness (per 10,000 employees)	**20**	30[2]	25	47	32
Number of employees[3]	**46,000**	47,500	47,000	51,000	55,000

1 Data relating to fatalities, all-injury frequency rate and lost-time injury frequency rate includes all employee and contractor exposure hours and incidents. New cases of occupational illness are reported for employees only.
2 Numbers adjusted from previous years to ensure comparability over time.
3 Includes our share of joint ventures and associates (rounded to the nearest thousand).

Sustainability continued

95

active tailings storage facilities (TSF)

Member of the International Council of Mining & Metals (ICMM) tailings working group since 2016.

Tailings

We manage tailings storage facilities (TSFs) at 25 sites around the world, with a further five non-managed operational sites and 12 closed and legacy sites. Most of these sites have multiple storage facilities, so we have a total of 95 active TSFs, with 40 more facilities that are closed or under rehabilitation. We aim to protect the health and safety of people who live and work near our TSFs as well as safeguard the surrounding environment, including water.

Of these 95 active TSFs, 22 had the last raise as upstream construction. And of these 22 facilities, 15 are managed by our joint-venture partners and seven by Rio Tinto. We also operate a number of large water storage facilities. Our website lists tailings and water storage facilities reflecting any operational and ownership changes. Our facilities have been regulated, permitted and managed for many years; and they comply with local laws, regulations, permits, licences and other requirements. In 2015, we introduced a Group safety standard for all tailings and water storage facilities. Our assurance processes verify that our managed facilities around the world operate in accordance with this standard.

For our non-managed operational sites with tailings facilities, we actively participate in technical committees in an advisory capacity with our joint-venture partners. Each of the technical committees has a Tailings Steering Committee, or equivalent, to support the effective management of tailings.

There have been no external wall failures at our TSFs operations for more than 20 years. We are dedicated to continuous improvement in tailings management and seek to enhance our governance systems and processes while lifting our operational capability and practices.

In 2016, we joined the International Council on Mining & Metals (ICMM) tailings working group, which develops tailings management guidance for member companies. Our work helped inform its 2016 position statement, identifying the six elements of TSF governance. Our own Group-wide safety standard is consistent with these six key elements:

1. Accountability, responsibility and competency
2. Planning and resourcing
3. Risk management
4. Change management
5. Emergency preparedness and response
6. Review and assurance

Tailings management has been listed on our Group-level risk register since 2010. Since establishing our Group safety standard for tailings in 2015 and working with the ICMM committee in 2016, we have:

- Established the Surface Mining Centre of Excellence Tailings team to pool and provide technical expertise, own the technical content of the Group tailings safety standard and act as a second line of assurance, conducting technical risk reviews of our facilities.
- Introduced seven training modules that include leading practices for safe tailings management as regular training for our tailings facility operators.
- Implemented internal and independent third-party reviews of all designs and major studies for operational tailings facilities. Our Surface Mining Centre of Excellence completed technical risk reviews at each of our managed and non-managed tailings facilities (with the exception of Mineração Rio do Norte, which will be completed in the first quarter of 2020). The reviews found that while our tailings facilities are well managed, we still have an opportunity to improve. We are currently working on implementing improvement plans.
- Developed a Group procedure to more consistently implement the safety standard, and updated the procedure and the safety standard to reflect learnings from our tailings review.
- Supported the ICMM as a co-convener of the independent Global Tailings Review, alongside the UN Environment Programme and the Principles for Responsible Investment, and provided feedback on drafts of the proposed standard.
- Joined the Minerals Council of Australia Tailings Working Group.
- Participated in the preparation of the International Commission on Large Dams Tailings Dam Design – Technology Update (ICOLD bulletin), and in the Australian National Committee on Large Dams – Guidelines on Tailings Dams: Planning, Design, Operation and Closure Revision 1.

Our ambition

zero

net emissions by 2050

Our targets

15%

reduction in absolute emissions by 2030

30%

reduction in emissions intensity by 2030

underpinned by

$1bn

spend on climate-related projects over the next five years

Climate change

Climate risks and opportunities have formed part of our strategic thinking and investment decisions for over two decades. We now have a portfolio well positioned for the transition to a low-carbon economy, and we are the only major diversified company in the industry not involved in fossil fuel extraction. While we are uniquely positioned, like many other businesses, we still face significant challenges in meeting our climate change ambition and delivering tangible outcomes.

In addition, each of the commodities we produce has a role to play in the transition to a low-carbon economy – aluminium for electric vehicles, copper for wind turbines, iron ore for critical infrastructure, and minerals for rechargeable batteries, including lithium.

This year, we have set a new ambition to reach net zero emissions by 2050. While there is no doubt we will face many challenges in achieving this ambition, and we do not yet have a clear pathway to get there, we will focus on reducing emissions across our operations, partner with others to develop new technology solutions and look for ways to improve the quality of our products.

In 2019, we looked at our operations in detail to identify emission reduction opportunities and develop marginal abatement cost curves. This comprehensive work informed our 2030 targets for our managed and non-managed operations: to reduce our emissions intensity by 30% and absolute emissions by 15% compared to our 2018 baseline (equity basis). And our overall growth between now and 2030 will be carbon neutral.

This will be underpinned by approximately $1 billion spend over five years on climate-related projects, research and development, and activities to enhance the climate resilience of our business. For example, in early 2020, we announced a $98 million (A$144 million) investment to build a 34MW solar plant at our new Koodaideri iron ore mine in the Pilbara, alongside a lithium-ion battery energy storage system. The plant and battery will limit our annual carbon dioxide emissions by approximately 90,000 tonnes (compared to conventional gas-powered generation).

We support the use of market mechanisms and the establishment of stable regulatory frameworks that support investment in low-carbon technology. Effective climate policies must prevent "carbon leakage" by avoiding the negative unintended consequence of transferring industrial production to countries with weaker regulations.

We also test our portfolio against a range of scenarios mapping the policy and technology pathways necessary to limit global temperature rises. Our analysis indicates that the diversity of our portfolio enhances our resilience, including in a scenario in which the global average temperature increase is below 2°C; consistent with the goals of the Paris Agreement.

Climate change will only be successfully addressed through collective action by governments, business and consumers around the world. We are working on innovative partnerships to stimulate action with customers and other partners across our value chain. In September, we signed a Memorandum of Understanding with China's largest steel producer, China Baowu Steel Group, and Tsinghua University, one of China's most prestigious and influential universities, to develop and implement new methods to reduce carbon emissions and improve environmental performance across the steel value chain.

Task Force on Climate-related Financial Disclosures
We have provided disclosures in line with this framework in our climate change report, which can be found on **riotinto.com**.

Greenhouse gas and energy performance 2015-2019

	2019	2018	2017	2016	2015
Greenhouse gas emissions intensity (indexed relative to 2008)	**70.6**	71.6[1]	72.9	74.4	79.7
Total energy use (petajoules)	**407**	425[1]	440	458	433

1 Numbers adjusted from previous years to ensure comparability over time.

Commentary

Sources of greenhouse gas emissions	Net purchases electricity and steam 35.2%; fuel 36.4%; anodes and reductants 24.8%; process gases 3.0%; net land management 0.6%
Primary sources of energy used[1]	Coal 32.2%; hydro 31.1%; natural gas 19.6%; diesel 12.6%; nuclear 0.5%; fuel oil 2.4%; other renewable 1.6%; other 0.0%
Sources of electricity used[1]	Hydro 72%; coal 14.8%; natural gas 8.1%; diesel 0.9%; other 4.2%

1 Due to rounding, the sum may not total 100%.

Sustainability continued

$36m*
in community investment

$5.5 billion
spent with Western Australian businesses – including Pilbara Indigenous-owned businesses

Communities

We plan our business for the long term and aim to play a positive role in society, as well as in the communities in which we operate, where many of our employees and their families live. We engage communities in ways that are inclusive, respecting dignity, rights, culture and way of life. We aim to maximise social and economic development and minimise potential issues, such as noise and dust. Our vision is to strengthen communities so they can sustain and drive their own progress.

As we continue to automate our operations, we have scaled up our investment in education partnerships that help develop skills for the future. This year, for example, we announced a A$10 million, four-year partnership focusing on skills for the digital future with leaders in Australia's education and innovation sectors, including leading start-up accelerator BlueChilli and Amazon Web Services.

We also recognise that we have a role to play promoting and supporting regional economic development. This requires dialogue and coordination with other stakeholders, including governments, international organisations, civil society, communities and other businesses. In Madagascar, for example, our QMM team funds business skills training to support local agricultural cooperatives. In Quebec, Canada, we support local projects and businesses, including the creation of the "Centre en entrepreneuriat multi-ressources". Established in 2019, the centre supports entrepreneurs in the natural resources sector, helping them to run more efficient, sustainable and profitable businesses. We are also looking at ways to deploy financial tools, including social impact investments, and to amplify the impact of our own community investments. In 2019, we were pleased to make more than $36 million of community investments in health, education, local business development, vocational skills training, environment, culture, community infrastructure and services. We consider Indigenous people to be important stakeholders. In 2019, we supported the Uluru Statement from the Heart, which seeks to enshrine an Indigenous voice in the Australian Constitution. We won the 'Best Company Indigenous Procurement Initiative Award' at the Queensland Resources Council Indigenous Awards in recognition of our work at our Amrun bauxite mine. When we work with land-connected groups, we want to understand their physical, spiritual and cultural connection with the local environment. As such, we seek their active engagement in monitoring and managing cultural heritage impacts. For example, at our Cape Lambert operation in the Pilbara region of Western Australia, our turtle monitoring programme, a partnership with the Department of Biodiversity, Conservation and Attractions, has been expanded to become a collaboration between operational teams, local communities, regulators and the Ngarluma Aboriginal Corporation. This proactive management was acknowledged with an Excellence in Environmental Management award at the 2019 Australian Mining Prospect Awards.

Our impact on communities extends beyond our operational sites. For example, we work with suppliers in more than 120 locations, supporting the employment of many thousands of people. In 2019, we spent $17.2 billion with these suppliers; in Mongolia we spent more than $366 million with local suppliers. In Western Australia, we awarded our 400th scope of work through our local procurement portal in 2019, and spent A$5.5bn with over 1,900 Western Australian businesses – including Pilbara Indigenous-owned businesses. Our direct economic contribution is the total value of operating costs, employee wages and benefits, payments to providers of capital, payments to government by country, development contributions, payments to landowners and community investments during the year. In 2019, it was $45.1 billion.

Direct economic contribution 2015-19 (US$ million)

	2019	2018	2017	2016	2015
Value add[1]	27,841	30,504	27,734	20,065	18,888
Payments to suppliers[2]	17,245	17,231[3]	16,471[3]	15,812[3]	17,968[3]
Community contributions*	*	192	176	168	187

***Note:** In 2019, we adopted new definitions and data collection processes for reporting discretionary community investments, non-discretionary development contributions, management costs and payments to landowners to align with GRI Reporting Standards. As a result of these changes, 2019 data is not comparable with previous years.

1. Sum of payment to employees, governments and returns on capital invested in operations.
2. Includes our share of joint ventures and associates.
3. Numbers restated from those originally published to ensure comparability over time.

	2019
Community investment[1]	**36.4**
Development contributions[2]	**13.0**
Payment to landowners[3]	**147.3**

1. Community investments are voluntary financial commitments, including in-kind donations of assets and employee time, made by Rio Tinto to third parties to address identified community needs or social risks.
2. Development contributions are defined as non-discretionary financial commitments, including in-kind donations of assets and employee time, made by Rio Tinto to a third party to deliver social, economic and/or environmental benefits for a community, which Rio Tinto is mandated to make under a legally binding agreement, by a regulatory authority or otherwise by law.
3. *Payment to landowners are non-discretionary compensation payments made by Rio Tinto to third parties under land access, mine development, native title, impact benefit and other legally binding compensation agreements.*

By 2023, we will disclose:

- permitted surface water allocation volumes
- annual allocation usage
- estimated catchment runoff from average rainfall

Water

In some regions we work in environments where water is scarce, like the Gobi Desert in Mongolia, and others where rainfall can vary greatly from year to year, such as Weipa in Queensland, Australia. Many of our sites are also experiencing changes in rainfall and water availability due to climate change.

Whatever the context, we see ourselves as water stewards. We take this commitment seriously, as water is essential not just for human life, health, and the environment, but for economic prosperity. Our processing plants, refineries, smelters and mines use water to process ore, manage dust and promote rehabilitation. In some instances, water is used to produce hydroelectricity to power our operations. In places like Tom Price, one of our Pilbara iron ore mines, we also supply drinking water to the surrounding communities.

We aim to balance our operational water needs with those of local communities, Traditional Owners and ecosystems. We avoid degrading water resources like lakes, streams and groundwater aquifers, and to control the quality and quantity of the water we use and return to the environment. We also try to use water as efficiently as possible in the design and operation of our sites.

To this end, we now consider water risk against the following four themes: water resource, quantity and quality, dewatering and long-term obligations. This framework allows us to identify, assess, manage and communicate water risk both internally and to the communities where we operate.

We support the new ICMM position statement on water stewardship and, from 2020, will report our practices against the commitments outlined in the statement:

- To apply strong and transparent water governance
- To manage water at operations effectively
- To collaborate to achieve responsible and sustainable water use

Our new water targets

Water targets remain at the heart of our integrated water management approach. To be more transparent about our water usage and our water risk profile, management and challenges, our new water targets consist of one Group target and six site-based targets. These will help us improve the datasets we need to drive good water stewardship; they will also improve our performance over the next five years through a programme of risk awareness and response.

Our Group target

By 2023, we will disclose for all managed operations:

- Permitted surface water allocation volumes
- Annual allocation usage
- Estimated catchment runoff from average annual rainfall

Our site-based targets, which were developed in line with our ICMM commitments, will help us to focus on the right issues using appropriate resources at operational sites where water is a recognised risk.

At Oyu Tolgoi, in Mongolia, we will maintain our average water use efficiency at 550L/tonne of ore at the concentrator. We are focused on optimising the use of the scarce water resources and taking a stewardship approach to ensure the long-term future of the mine, the environment and the livelihoods of local herders.

QIT Madagascar Minerals (QMM) operations present a significant risk from a water and broader environmental perspective due to their location, the nature of the surrounding environment and the mining process. So we have committed to reviewing our current practices and infrastructure to develop and implement an improved site water management approach by 2023.

Fresh water used 2015-19

	2019	2018	2017	2016	2015
Fresh water used (billion litres)	448	401	465	467	460

Sustainability continued

2019 also saw us progress in other important areas, many of which are integral to our business as well as the way we work.

Biodiversity and ecosystems

In 2017, we announced a new approach to ensure we are able to mitigate specific material risks and impacts at each of our managed sites. To do this, our sites aim to first avoid, then minimise and restore impacts, implementing offsets if impacts remain significant. This is a positive and practical evolution of our approach, based on 15 years of operational experience and engagement with external stakeholders, including UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC), BirdLife International, the International Union for Conservation of Nature, Fauna & Flora International, The Biodiversity Consultancy, Hardner & Gullison and others.

This year, we began auditing the new standard covering biodiversity protection and natural resource management across our operations. Our first step was to work with experts from the (UNEP-WCMC) to assess and rank the biodiversity sensitivity of the footprint of each operation using the best available global information and data. This baseline analysis, along with our internal assurance framework, will help us implement robust biodiversity management programmes. It also encourages our sites to find more ways to work with host communities and conservation organisations to ensure long-term stewardship of the lands and waters where we operate. In Queensland, Australia, for example, we work with the Australian Wildlife Conservancy, the University of Queensland and the Queensland Department of Environment & Science to help protect Australia's rarest bird of prey – the red goshawk. Working with these partners, we have refined our tracking and trapping techniques to gain invaluable information which will contribute to conserving this threatened species nationally.

We progressively rehabilitate our operations. In 2019, our total land holding was 153,287 square kilometres (sq km), of which 3,622 sq km has been disturbed (2.4%). In 2019, we rehabilitated 490 sq km.

Closure

We operate with closure in mind, incorporating it into the design of every asset and new project. All of our existing operations have a closure plan and align with our asset closure framework, ensuring closure is considered throughout the lifecycle of the asset.

We will be transitioning a number of assets into closure over the next five years, including our Argyle diamond mine in Western Australia, which is set to close in late 2020, as well as the Ranger uranium mine, in the Northern Territory, Australia, set to close in 2021.

With this in mind, in 2019, we intensified both our closure planning and the resources dedicated to it. For example, today, we have a dedicated team conducting closure studies as well as a team supporting closure planning at our assets. We also developed a closure readiness framework this year, which helps sites nearing closure transition effectively, ensuring that all risks are well managed and opportunities realised where possible. We continue to engage stakeholders of our sites nearing closure – governments, Traditional Owners, employees and local communities, for example – to keep them apprised of progress and planning, which helps them plan their futures. Such engagement also helps us transfer the land in a way that optimises its use after mining comes to an end.

As we consider the growing importance of closure to our business, we remain focused on understanding, planning and optimising for any long-term management obligations, such as water treatment, and repurposing and/or remediating the land. Over the last year, as we continued our planning and studies, the associated costs, risks and opportunities related to closure became clearer; at the end of 2019, closure provisions on our balance sheet totalled $11.1 billion (compared with $10 billion in 2018).

Ethics and integrity

Integrity is one of our five core values. We have clear standards around competition, data privacy, bribery and corruption, conflicts of interest, benefits, sponsorships and donations and fraud. Our code of conduct, *The way we work*, provides clear guidance on how we should conduct our business, no matter where we work or where we are from. We reinforce these standards with ongoing training, reviews and – where necessary – disciplinary action.

Activities during the year in this area included:

- Focusing resources in areas such as enhanced business integrity risk assessments and increased on-site compliance reviews to better support our core assets and business activities
- Reaching more than 4,400 people in 15 countries with face-to-face training on how to spot and manage business integrity dilemmas
- Reviewing 805 incidents reported either through Talk to Peggy, our confidential, independently operated whistleblowing programme, compliance managers or team leaders, up roughly 19% on last year. 34% of reported incidents were substantiated.

Political integrity
As a company, we do not favour any political party, group or individual, or involve ourselves in party political matters. Nor do we make any payments to political parties or candidates.

We do not offer, pay or accept bribes, no matter where we operate, what the situation is, and who is involved. Nor do we allow our agents or intermediaries to do so. We also have strict guidelines on giving and receiving benefits.

We engage on public policy on issues that affect or could affect our business, including by contributing relevant information and sharing experiences that help create robust public policy. Our Business Integrity Standard includes strict guidelines for dealing with government officials and politicians, including whether they can be appointed to company positions or engaged as consultants.

We join industry associations where membership provides value to our business, investors and other stakeholders. We publish the principles that guide our participation in industry associations, and the way we engage them, as well as a list of the top five industry association memberships by fees paid. We also track and disclose how we engage on climate policy issues, disclosing when industry association positions are significantly different to our own.

Transparency
We are founding members of the Extractive Industries Transparency Initiative (EITI) and signatory to the B Team Responsible Tax Principles. We believe greater transparency leads to greater accountability; both are key to building trust and achieving better social and economic outcomes over the long term.

To that end, where they are not subject to confidentiality restrictions, this year we disclosed our minerals development contracts with governments – and we continue to encourage governments to allow such disclosures. We also disclosed information about the beneficial owners of our joint ventures in line with EITI standards and expectations. Both sets of disclosures are available on **riotinto.com**.

We are also transparent about our taxes paid and payments to governments. In 2020, we will publish additional country by country disclosures relating to our taxes paid in 2018. We are also working closely with governments and the Organisation for Economic Co-operation and Development (OECD) on new tax reporting codes and policies to ensure consistency in our reporting procedures. And we endorse the B Team Responsible Tax Principles, which support fairer, more sustainable tax systems and global standards of responsible tax practices.

Human rights

We respect all internationally recognised human rights, prioritising action around salient issues where our operations or business relationships could have the most severe impact on people. These issues include security, land access and resettlement, indigenous people's rights, environmental issues (such as access to water), labour rights and in-migration (such as access to health services). We have human rights due diligence processes in place to identify, prevent and mitigate the adverse effects of our own operations and business relationships. This is a core consideration in our social risk analysis and impact assessment processes and is embedded in our human rights policy.

Engaging our stakeholders and getting feedback, including complaints, is a vital part of our approach to respecting human rights. It helps us to provide effective remedies where we identify that we have caused or contributed to harm. It also helps us to improve the way we run our operations, and is a crucial part of our understanding of systemic issues. All of our sites are required to have in place a complaints, disputes and grievance mechanism, in line with the Criteria of Effectiveness for Non-Judicial Grievance Mechanisms outlined in the UN Guiding Principles on Business and Human Rights (UNGPs).

We have committed to following core business and human rights-related standards, are members of relevant multi-stakeholder initiatives and also support other key international human rights instruments, including:
- Voluntary commitments to the OECD Guidelines for Multinational Enterprises, the UN Global Compact and the Voluntary Principles on Security and Human Rights (VPSHR)
- Supporting and implementing the UN Guiding Principles on Business and Human Rights
Supporting the UN Declaration on the Rights of Indigenous Peoples
- Striving to obtain the free, prior and informed consent of Indigenous peoples and other affected communities to access land and natural resources, in line with the International Finance Corporation Performance Standard 7 and the International Council on Mining and Metals position statement on Indigenous peoples and mining.

Our actions and achievements on human rights in 2019 include:
- Ranking second overall, and as the top company within our sector, in the 2019 results for the Corporate Human Rights Benchmark
- Supporting Indigenous Australians and the Uluru Statement
- Having open conversations with investors, global civil society organisations and community members on a variety of human rights issues including security, land access, an open civic space and labour rights including modern slavery. This included roundtables with global civil society organisations
- Publishing our second annual report on implementation of the VPSHR, also available on **voluntaryprinciples.org**, and our third modern slavery statement
- Implementing a modern slavery clause in our global standard contract for suppliers
- Continuing to screen suppliers for human rights-related risks including modern slavery, and taking action where necessary
- Actively participating in certification schemes (such as the Aluminium Stewardship Initiative) and other voluntary initiatives to validate company performance on human rights

People

Employee engagement
We aim to create a workplace that is supportive, inclusive, empowering and engaging. This year, our Chief Executive visited 17 sites, engaged in small group discussions at more than 20 locations and held more than 30 town halls. He also regularly has conversations with employees around the world on our internal Yammer platform, which more than 30,000 of us use.

We saw a 12-point increase in our employee Net Promotor Score (eNPS) over the past 12 months. This measures how employees feel about the company, its leadership and its future.

Inclusion and diversity
We aim to recognise and respect diverse cultures, communities and points of view, and to treat each other with fairness and dignity.

We employ people on the basis of job requirements and do not discriminate on any grounds. We do not employ forced, bonded or child labour. We employ people with disabilities and make considerable efforts to offer suitable alternative employment and retraining to employees who become disabled and can no longer perform their regular duties.

Our graduate programme continues to help us bring new perspectives into the organisation, challenging our current practices with new ways of working. This year's graduate cohort comes from 29 countries, represents 20 nationalities and most speak at least two languages. We also increased our intake of female graduates by 18%, to 54% of the total intake.

Land footprint 2015-19

	2019	2018	2017	2016	2015
Land footprint – disturbed (square kilometres)	**3,622**	3,595	3,616	3,696	3,629
Land footprint – rehabilitated (square kilometres)	**490**	485	497	541	533

Sustainability continued

At the end of 2019, our equal pay gap was less than 2% and our gender pay gap was less than 1%. Equal pay is at the core of our approach to pay equity. This means making sure that men and women employed by the same company in the same location and performing work of equal value receive the same pay. Unlike equal pay, the gender pay gap is also influenced by the relative seniority of men and women. It is a measure of the difference between average earnings across the Group, regardless of roles – and is expressed as a percentage of men's earnings.
In 2019:

- We partnered with universities to build a diverse pipeline and, through targeted primary and high school programmes, attracted students into the fields of science, technology, engineering and mathematics
- Women in operational roles decreased by 3%, to 12% overall
- The overall percentage of female employees increased by 0.7% to 18.4% (7,337 women; 32,628 men)
- 22.6% of senior management roles were held by women (112 women; 385 men)
- 11.1% of the Board roles were held by women. With the new non-executive director appointments announced in February 2020, this has increased to 33%.

We define senior management as general managers, Group advisers and chief advisers as well as employees in leadership roles who report directly to Executive Committee members. The numbers of employees quoted above excludes contractors.

Our approach to sustainability

Governance, materiality and assurance

The Sustainability Committee of our Board of directors reviews our approach to ensure consistency with our purpose and values, the effective management of material sustainability risks and our contribution to sustainable development.

We conduct a sustainability materiality assessment to ensure that we report on topics that matter most to our stakeholders as well as to our business. Materiality in sustainability, as opposed to financial materiality, is the threshold at which an issue or topic becomes important enough to be reported externally, taking into account the impact and level of perceived importance from stakeholders.

In 2019, we updated our materiality assessment based on a wider engagement with stakeholders, providing us with a richer dialogue and pool of information.

We engaged an independent external assurance organisation, PricewaterhouseCoopers LLP, to provide the directors of Rio Tinto with assurance on selected sustainability subject matters. From 2020, we will be engaging KPMG to complete the independent external assurance for future reports.

PricewaterhouseCoopers LLP's assurance statement satisfies the requirements of subject matters 1 to 4 of the ICMM assurance procedure. See page 102 of the Governance report for more information on our external auditors and internal assurance.

Notes on data

The data summarised in this sustainability section relates to calendar years. Unless stated otherwise, parameters are reported for all managed operations without adjustment for equity interests. Where possible, we include data for operations acquired before 1 October of the reporting period. Divested operations are included in data collection processes up until the transfer of management control.

We report against GRI standards and the requirements of other select reporting frameworks, and reflect the ten principles of the ICMM and the mandatory requirements in the ICMM position statements within our policies, standards and procedures. For more about our data definitions, our reporting of GRI disclosure requirements and our alignment with the ICMM, see the sustainability section of **riotinto.com**.

Non-financial information statement

This section (pages 60 to 70) provides information as required by regulation in relation to:

- Environmental matters
- Our employees
- Social matters
- Human rights
- Corruption and bribery

Other related information can be found as follows:

- Our business model – page 14
- Principal risks and how they are managed – pages 74 to 80
- Non-financial key performance indicators – pages 22 and 26

Risk management

At Rio Tinto, creating shareholder value is the reward for taking and accepting risk responsibly.

Effective management of risk provides confidence to all our stakeholders in the Group's ability to meet strategic objectives in alignment with our values – Safety, Teamwork, Respect, Integrity and Excellence.

Risk can manifest as opportunities (upside) or threats (downside) that can affect our business performance.

At Rio Tinto, creating shareholder value is the reward for taking and accepting risk responsibly through effective risk management.

Emerging risks

As we enter a new era of complexity, we expect to experience increasing uncertainty from the interplay of three global forces: geopolitics, technology and society.

There remain significant implications for the Group that arise from ever-growing geopolitical tensions impacting market sentiment. Rising trade tensions between global centres of demand and supply, geopolitical frictions such as the Hong Kong crisis, and deteriorating corporate balance sheets have the potential to slow global growth and impact demand for our products. This in turn could affect Group earnings. Additionally, as not all societies have benefited equally from globalisation, there is an increasing focus on resource nationalism. Global economic conditions remained uncertain throughout 2019 due to escalated trade tensions and heightened geopolitical instability. This combination created market volatility.

Advances in technology bring both opportunities and threats in the medium term. Digital connectivity, and intelligent systems supported by advance analytics and artificial intelligence, are expected to drive the fourth stage of industrialisation. We are focused on being at the frontier of mining technology, implementing industry-leading innovation to sustain our leading cost positions, tackle critical industry challenges, deploy emerging technologies and deliver economic growth options through exploration and orebody optimisation. As we continue to integrate automation in our operations, we are working to position and prepare our workforce for the future through regular training programmes. We are also investing in closing the skills' gap in Australia's future workforce through a four-year national programme that fast-tracks development of skills needed for the digital future. We are acutely aware that with increasing reliance on technology comes a necessity to continue to enhance our cyber security. In 2019, we implemented monitoring technology to enable us to identify malicious activity at our most critical operating assets, and we continue to build on these capabilities.

In the longer term, we see societal expectations around the impact of our business on the local economy, communities and environment continuing to rise. There has also been an increase in focus by investment firms on environmental, social and governance (ESG) issues when considering their investment criteria. Climate change constitutes an important part of the ESG framework. Climate risks and opportunities have formed part of our strategic thinking and investment decisions for over two decades. Our climate change report explains our approach to governance and risk management in this area and sets out our 2030 targets and our ambition to reach net zero emissions by 2050 across our operations. We continue to enhance our monitoring and management of greenhouse gas emissions, water and land use, and rehabilitation. Additionally, we have established partnerships across our value chain to explore solutions to climate change. These include the International Council on Mining and Metals (ICMM), Climate Smart Mining, Elysis, Baowu Steel and Tsinghua University.

In 2019, we further improved our controls for managing operational risks. In particular, we have strengthened how we manage the risks of major hazards through the introduction of Centre of Excellence (CoE) teams, in geotechnical, underground, process safety, tailings, energy and climate change and asset management. Our partner-to-operate strategy also supports the value creation and maintenance of mutually beneficial partnerships with key stakeholders, including host governments, communities, customers and suppliers.

Assessing our risks

With the help of management, the Board has carried out a robust bottom-up assessment of the emerging and principal risks of the business. They have also tested the Group's financial plans for severe but plausible scenarios related to certain principal risks materialising. Our principal risks are discussed on the following pages.

There remain certain threats, such as natural disasters and pandemics where there is limited capacity in the international insurance markets to transfer such risks. We monitor closely such threats, and develop business resilience plans. We are currently closely monitoring the potential short and medium-term impacts of the Covid-19 virus, including for example supply-chain, mobility, workforce, market demand and trade flow impacts, as well as the resilience of global financial markets to support recovery. Any longer-term impacts will also be considered and monitored, as appropriate.

We also seek to bring a commensurate level of rigour and discipline to our managed and non-managed joint-ventures as we do to our wholly-owned assets, through engagement and influence, subject to applicable laws.

Risk management
continued

How we manage risk
Our risk policy and standards commit us to manage risks in a proactive and effective manner. At Rio Tinto, effective risk management requires:

- Identifying and evaluating risks that matter most in achieving strategic objectives, so resources can be prioritised in the most efficient and effective way
- Effective communication of risk management information to decision makers across the Group, so we can respond at the right level of the organisation
- Embedding risk awareness into all decision-making processes to support leaders in managing risks proactively and effectively to improve business performance by either creating or protecting value
- Clearly defined roles and responsibilities for risk management.

Our process for identifying, evaluating, planning, communicating, and managing material business risks is designed to manage uncertainty and, where appropriate, to accept a degree of risk to generate returns. We have an enterprise-wide risk management information system where all material risks, controls and actions are documented and kept current for managing and reporting purposes.

All of our employees and business leaders are responsible for identifying, evaluating and managing risks. Risk management is a key accountability and performance area for our leaders. Our Risk team supports the understanding and management of risks at all levels of the business. They provide a framework for managing and reporting material risks and support the Risk Management Committee in escalating key issues to the Executive Committee or to the Board, if appropriate.

Longer-term viability statement

Our long-term planning reflects our business model of running our business in ways that are safer, smarter and more sustainable. Our business planning processes include preparing a one-year detailed financial plan and a longer-term life of asset outlook. We develop our strategy and make capital investment decisions based on an assessment of cash flows and risk over this multi-decade horizon. We assess our financial investment capacity regularly to ensure capital commitments can be funded in line with our disciplined approach to capital allocation.

Our planning process includes modelling a series of macroeconomic scenarios and using a range of assumptions considering both internal and external factors. As part of our robust Risk Management Framework, we closely track, monitor and mitigate principal risks to our business plan and our business model, both in the near and longer term. The key assumptions underpinning our long-term plan include:

- Long-term economic growth and commodity demand in major markets such as China
- Continued access and economic viability of resources and reserves to support organic and inorganic growth programmes
- Pathways to reduce carbon footprint
- No significant industry-wide disruptive technology or productivity enhancement to unlock very low-cost supply
- No operational risks materially impacting the long-term plan

Our business plan and macroeconomic forecast have the greatest level of certainty in the underlying assumptions in the first three years. This enables a detailed analysis of potential impacts of severe but plausible risks materialising in quick succession, and enables directors to assess Rio Tinto's capacity to exercise financial levers available to maintain the Group's viability.

Therefore, our longer-term viability assessment examines in detail the first three years (2020-22) of the business plan, analysing a number of 'severe but plausible' scenarios contemplated within our Group's principal risks and uncertainties.

The principal risks and uncertainties included in our longer-term viability assessment are as follows.

Market risk: A global economic crisis triggered by a disrupting factor, such as geopolitical tensions or a pandemic event, that could generate global recessionary conditions and lead to an economic downturn. Our stress testing includes modelling a large negative pricing shock assumed in 2021 followed by a recovery in most commodities by 2024.

Operational risk: A "one-off" catastrophic event resulting from a major operational failure, such as a tailings and water storage event, underground event or a geotechnical event, resulting in multiple fatalities, operation cessation and significant financial impact.

Stakeholder risk: An adverse action by stakeholders resulting in a cancellation or non-performance in offtake obligations impacting sales revenue for a prolonged period.

The expected financial impact for each risk is quantified based on our internal macroeconomic and business analysis, and internal and external benchmarking on similar risks. A probabilistic approach to quantify risks and impacts is applied where relevant. Although the likelihood of more than one principal risk materialising in close succession is unlikely, the stress test assumes these risks materialise individually and in combination to create 'severe but plausible' scenarios which could threaten the Group's viability.

Applying these scenarios, the first three years of the Group's business plan is stress tested for the impact on the Group's longer-term viability, including whether additional financing facilities will be required. In addition to liquidity and solvency, the assessment also considers a set of metrics over the period related to financial performance, cash flows, debt capacity and credit rating, as well as dividend payments. These metrics are subject to robust stress tests and reverse stress tests.

Taken in isolation, the materialisation of each risk does not threaten the viability of the Group's business model. The main impact from each risk on the Group is a significant decrease in free cash flow, with consequent reduction in the level of the dividend. The Group has levers to maintain adequate levels of liquidity, including reducing discretionary capital expenditure and accessing lines of credit.

The most 'severe' scenario, albeit unlikely, considers the combination of the financial impact of all three risks materialising in a single year. The occurrence of this scenario creates an immediate severe impact on the Group's financial performance with an estimated negative free cash flow of $7 billion. The Group has a suite of management actions available to preserve resilience, including accessing lines of credit, reducing capital expenditure, the sale of assets, and raising debt while maintaining the shareholder return policy. Our financial flexibility could potentially be limited during the trough of the crisis. However, the Group's economic and operational recovery is estimated to be within 18 months with business model integrity maintained. The viability of the Group under all the severe but plausible scenarios tested remained sound.

Therefore, taking into account the Group's current position and the robust assessment of principal risks, the directors have assessed the prospects of the Group over the next three years (until 31 December 2022) and have a reasonable expectation that we will be able to continue to operate and meet our liabilities as they fall due over that period.

Roles and responsibilities for risk management in Rio Tinto

Oversight	**Board**	– Determines the nature and extent of risks that the organisation is willing to take in order to meet our strategic objectives. – Oversees the risk management process and confirms that management's strategies are within the Board's risk appetite and tolerances.
	Board committees	– Monitor and review the maturity and effectiveness of our risk management framework. – Review management reports on the strategies and controls applied to any material business risks identified within the committees' scope.
Third line	**Group Internal Audit**	– Provides independent and objective assurance of the effectiveness of the risk management framework.
Second line (Group level)	**Executive Committee**	– Sets and reviews risk management strategies for risks to the Group's business strategy, planning and investment decisions. – Defines the Group's risk tolerances around key business objectives and seeks Board endorsement of those tolerances. – Reviews the Group-level risks at least three times per year and approves material provided to the Board and its committees. – Approves new or revised Group-level controls (policies, standards and procedures) that support the management of material risks.
	Risk Management Committee	– Monitors and reviews the effectiveness of the risk management framework across the Group's operations and functions on behalf of the Executive Committee and Board. – Provides oversight for the management of material Group-level risks and associated management responses.
	Risk function	– Coordinates and supports Group-level risk management activity and reporting. – Embeds risk management into core business processes, such as planning and capital allocation. – Builds risk management capability and a risk-aware culture throughout the Group.
	Group's standard-setters	– Develop, maintain and communicate Group-level controls, including policies, standards and procedures. – Assure management's (product groups and Group functions) compliance to Group-level controls and the control effectiveness in managing risk.
First line (Operational level)	**Senior leadership in product groups and functions**	– Manage material risks and critical controls within their business activities, escalating when appropriate. – Embed risk analysis and management into their business strategy, planning and investment decisions. – Provide oversight of performance in their area of accountability through Risk, Assurance and Compliance forums.
	Operational management	– Identifies, assesses and manages risks in areas in which management is accountable. – Executes line and functional management responsibilities for implementing and monitoring performance of actions and controls.
	Risk community of practice	– Supports alignment, consistency and continuous improvement of risk management.

Our risk management framework sets out the organisational foundations for designing, implementing, monitoring, reviewing and continually improving risk management throughout the organisation.

A key element of this framework is our Risk Management Standard. Together with the Group's Risk Policy, the standard outlines the expected outcomes from risk management, the roles and responsibilities associated with implementing risk analysis and management effectively, and the minimum requirements that must be met.

The framework also defines the oversight responsibilities of the Board and the Executive Committee, supported by Group Internal Audit, the Risk Management Committee and central support functions across our business.

The risk management framework lays out a "three lines of defence" approach to managing risks and controls:

- First line assurance is the role of risk owners and business leaders. Oversight by senior leadership teams through the Risk, Assurance and Compliance forums chaired by product group chief executives and heads of functions.
- Second line assurance is provided by our central support functions and technical Centre of Excellence teams eg Underground Mining. As our Group standard-setters, their assurance activities are planned and managed by the Integrated Assurance Office (IAO). Management oversight of this assurance over material Group-level risks is supported by a quarterly Risk Management Committee meeting chaired by the Rio Tinto Group Chief Executive.
- Third line assurance is conducted by Group Internal Audit (GIA) to provide independent assurance that the risk management and internal controls are effective to the Board and its sub-committees.

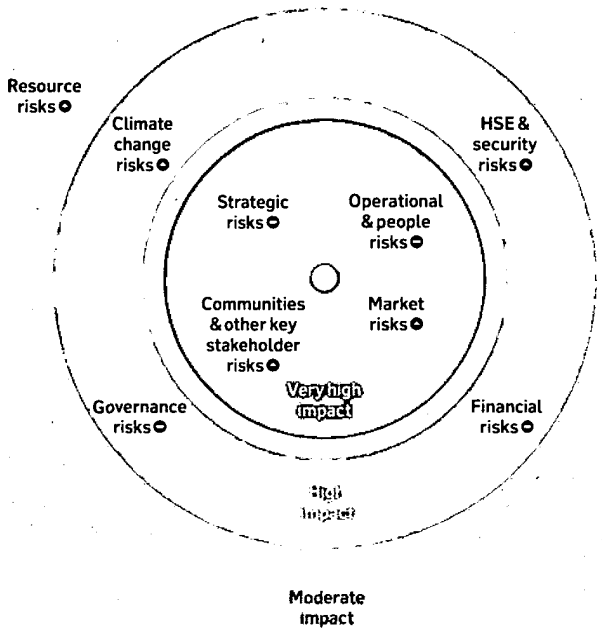
Principal risks and uncertainties

The principal risks and uncertainties outlined in this section reflect the risks that could materially affect Rio Tinto, or its ability to meet its strategic objectives, either directly or by triggering a succession of events that in aggregate become material to the Group.

Our business units and functions assess the potential economic and non-economic consequences of their respective risks using the framework defined by the Group's Risk Management Standard. Once identified, each principal risk is reviewed and monitored by the relevant internal experts and by the Risk Management Committee and, as appropriate, by the relevant Board committees and the Board.

We deliver our strategy through *The way we work*, which focuses on the "4Ps": portfolio, people, performance and partners. The principal risks, uncertainties and trends outlined in this report should be considered as forward-looking statements, and are made subject to the cautionary statement on page 300.

Risk impact and trend assessment



Risk trend assessment: Increasing · Decreasing · Unchanged

Market risks

We operate in global markets and accept the value impact of exchange rate movements and market-driven prices for our commodities, and pursue a value over volume approach.

Commodity prices: risk and uncertainty

Commodity prices, driven by demand for and supply of the Group's products, vary and may not be as expected over time. Exchange rate variations and geopolitical issues may offset or exacerbate this risk.

Potential impact

- Business model value
- Future financial performance
- Solvency
- Liquidity
- Group reputation

Strategy delivery:

Portfolio **People**

Opportunities

A rise in commodity prices, or favourable exchange rate movements, generates more cash flow from operations, enabling the Group to pursue growth options or capital expansions, pay down debt and/or increase returns to shareholders.

Capturing above-planned returns from commercial insights relating to market movements would deliver additional cash flow to the Group.

Threats

Falling commodity prices, or adverse exchange rate movements, reduce cash flow, limiting profitability and shareholder returns. These may trigger impairments and/or impact rating agency metrics. Extended subdued prices may reflect a longer-term fall in demand for the Group's products, and the reduced earnings and cash flow streams resulting from this may limit investment and/or growth opportunities.

Failure to deliver planned returns from commercial insights would negatively impact cash flows for the Group.

Market risks continued

China development pathway: risk and uncertainty
China's growth pathway could impact demand for the Group's products outside of expectations. China is the largest market for our products.

Potential impact
- Business model value
- Future financial performance
- Solvency
- Liquidity
- Partnerships

Strategic delivery:

Portfolio People

Opportunities
Strong growth, positive policy decisions and reforms drive demand for commodities, resulting in rising commodity prices that may justify capital expansion and increased shareholder returns in the short to medium term.

Threats
An economic slowdown in China, and/or a material change in policy, could result in a slowdown in demand for our products and reduced earnings and cash flow for the Group.

Mitigating actions include:
- Pursue low-cost production, allowing profitable supply throughout the commodity price cycle.
- Maintain a diverse portfolio of commodities across a number of geographies.
- Maintain a global portfolio of customers and contracts.
- Monitor multiple leading indicators and undertake detailed industry analysis to inform our forecasting assumptions.
- Leverage market-facing sales, marketing and trading resources in the Group.
- Apply strong governance reflecting relevant regulatory frameworks and jurisdictions.
- Comply with the Group's financial risk management practices outlined in the Group's Treasury policy and standard.

Strategic risks

Rio Tinto enforces disciplined capital and risk allocation to the best opportunities (organic and inorganic) for shareholders returns.

Execution of acquisitions and divestments: risk and uncertainty
Our ability to secure planned value by successfully executing divestments and acquisitions may vary.

Potential impact
- Business model value
- Future financial performance
- Solvency
- Liquidity
- Group reputation

Strategy delivery:

Portfolio People Partners

Opportunities
Proceeds realised from divested assets are greater than planned, allowing more capital to be returned to shareholders or redeployed into higher-returning or more productive uses. The Group is successful in acquiring and integrating businesses on acceptable terms that provide sustainable future cash flow and/or future growth optionality.

Threats
Divestment and acquisition activity incurs transaction costs that cannot be recouped. Such activity may result in value destruction by realising less than fair value for divestments, or paying more than fair value or failing to integrate successfully for acquisitions. The Group may also be liable for the past acts or omissions of assets it has acquired that were unforeseen or greater than anticipated at the time of acquisition. The Group may also face liabilities for divested entities if the buyer fails to honour commitments or the Group agrees to retain certain liabilities.

Principal risks and uncertainties
continued

Strategic risks continued

Capital project development: risk and uncertainty
Large capital investments require multi-year execution plans and are complex. The Group's ability to deliver projects to baseline plan, principally in terms of safety, cost and schedule, may vary due to changes in technical requirements, law and regulation, government or community expectations, or through commercial or economic assumptions proving inaccurate through the execution phase.

Potential impact
- Future financial and operational performance
- Health, safety, environment and security (HSE&S)
- Solvency
- Liquidity
- Group reputation

Strategic delivery:

Portfolio **Performance**

Opportunities
An ability to develop projects safely, on time and within budget enhances the Group's cash flows, its licence to operate and investor confidence. Effective implementation of optimisation programmes reduces cost and accelerates development schedules resulting in higher returns earlier.

Threats
A delay or overrun in a project schedule and/or a significant safety or process safety incident could negatively impact the Group's profitability, cash flows, ability to repay project-specific debt, asset carrying values, growth aspirations and relationships with key stakeholders.

Strategic partnerships: risk and uncertainty
Strategic partnerships play a material role in delivering the Group's growth, production, cash and market positioning, and these may not always develop as planned.

Potential impact
- Business model value
- Future financial and operational performance
- HSE&S
- Group reputation

Strategic delivery:

Portfolio **Performance** **Partners**

Opportunities
Joint ventures and partnerships offer opportunities to access resources, increase shareholder returns, and reduce political, portfolio and operational risks. We seek to bring a commensurate level of rigour and discipline to our managed and non-managed joint-ventures as we do to our wholly-owned assets, through engagement and influence subject to applicable laws.

Threats
The capacity or financial circumstance or business disposition of our joint venture partners may present barriers to investment decisions and/or to the realisation of full value for the joint venture(s). For non-managed operations, the decisions of the controlling partners may cause adverse impacts to the value of the Group's interest in the operation, or to its reputation, and may expose it to unexpected financial liability.

Mitigating actions include:
- Complete detailed, objective due diligence on all material divestments and acquisitions.
- Undertake rigorous third-party due diligence and assurance.
- Involve business unit leaders early in process to recognise integration planning and synergies, or separation of threats and opportunities.
- Undertake post-investment reviews on divestments and acquisitions to identify key learnings to embed into future initiatives.
- Consistently approach development of large-scale capital projects through a specialised projects division.
- Follow rigorous project approval and stage-gating process, including monitoring and status evaluation, as articulated in the Project Evaluation Standard and Guidance.
- Ensure effective stakeholder management in project development.
- Approach investments and partnerships with a view to long-term development of relationships rather than short-term transactional advantage.
- Maintain strong focus on contractor management.
- Actively participate within the governance structures of joint ventures to promote, where possible, alignment with the Group's policies and strategic priorities.

Financial risk

We maintain a strong balance sheet and liquidity position to preserve financial flexibility through the cycle.

Liquidity: risk and uncertainty
External events and internal capital discipline may impact Group liquidity.

Potential impact
- *Future financial performance*
- Solvency
- Liquidity
- Group reputation

Strategic delivery:

Performance

Opportunities
Favourable market conditions and strong internal capital discipline could increase Group liquidity and/or balance sheet strength and allow the Group to pursue investment or growth opportunities, pay down debt and/or enhance returns to shareholders.

Threats
The Group's ability to raise sufficient funds for planned expenditure, such as capital growth and/or mergers and acquisitions, as well as the ability to weather a major economic downturn, could be compromised by a weak balance sheet and/or inadequate access to liquidity.

Mitigating actions include:
- Comply with the Group's Treasury policy and standard, which outlines the fundamental principles that govern the Group's financial risk management practices.
- Maintain a prudent gearing ratio and other financial metrics commensurate with a strong investment-grade credit rating.
- Manage the liquidity and financing structure of the Group using forecasts and sensitivity analysis tools to actively monitor, determine and enable access to the appropriate level, sources and types of financing required.
- Subject funds invested by the Group to credit limits and maturity profiles based on Board-approved frameworks to promote diversification and maintain appropriate liquidity.
- Maintain accurate financial reporting and tracking of our business performance.
- Report financial performance monthly to senior management and the Board.
- Seek Board approval of the financial strategy, long-term planning and cash flow forecasting.
- Apply a shareholder returns policy which allows shareholder returns to adjust with the cycle.

Resources risks

We invest to accurately identify new deposits and develop orebody knowledge accurately, which underpin our operations and projects, as well as our projections for the financial performance of the business.

Exploration and resources: risk and uncertainty
The success of the Group's exploration activity and estimates of Ore reserves and resources may vary.

Potential impact
- Business model value
- Future financial and operational performance
- Group reputation

Strategy delivery:

Portfolio **Performance**

Opportunities
The discovery of a new viable orebody can significantly improve future growth options.

The volume of ore in reported reserves/resources numbers is based on the geological, commercial and technical information available at the date of the report and is, by its nature, incomplete. As new information comes to light, the economic viability of some Ore reserves and mine plans can be restated upwards. As a result, projects may be more successful and of longer duration than initially anticipated.

Threats
A failure to discover new viable orebodies could undermine future growth prospects.

If new information comes to light, or operating conditions change, the economic viability of some Ore reserves and mine plans can be restated downwards. As a result, projects may be less successful and of shorter duration than initially anticipated, and/or the asset value may be impaired.

Mitigating actions include:
- Comply with the Group's resources and reserves standard.
- Establishment of the Orebody Knowledge Centre of Excellence, as part of Group Technical.
- Recruit and retain skilled and experienced exploration and evaluation personnel.
- Provide stable funding for exploration activities.
- Continually review the prospects of opportunities in the exploration portfolio, and prioritise spend accordingly.
- Utilise new technologies where appropriate for exploration and evaluation of reserves/resources.
- Develop, leverage and manage third-party partnerships.

Principal risks and uncertainties
continued

Health, safety, environment and security risks

Our operations are inherently hazardous. We seek to achieve operational excellence to ensure that our employees and contractors go home safe and healthy, and that there are no adverse impacts on the communities and the environment where we operate.

Health, safety, environment and security: risk and uncertainty
Our operations and projects are inherently hazardous, with the potential to cause illness or injury, damage to the environment, disruption to a community or a threat to personal security.

Potential impact
- Future financial performance
- HSE&S
- Communities and social performance
- Group reputation

Strategic delivery:

Portfolio **People** **Performance** **Partners**

Opportunities
Delivering leading performance in health, safety, environment and communities is essential to our business model and our success as a Group. Meeting or exceeding our commitments in these areas contributes to sustainable development for both Rio Tinto and our partners, and underpins our continued access to resources, capital and a diverse workforce to sustain the organisation.

Good performance in closure and legacy management of closed sites can enhance our reputation with stakeholders and enable us to maintain access to land, resources, people and capital, so we can continue to establish new projects with the support of local communities.

Threats
Failure to manage our health, safety, environment or community risks could result in a catastrophic event or other long-term damage that could in turn harm the Group's financial performance and licence to operate.

Mitigating actions include:
- Continued focus on HSE&S as a core priority at all operations and projects, overseen by the Sustainability Committee and supported by the Group's Risk Management Committee, as well as second and third line assurance activities.
- The second line assurance is provided by our central support functions and technical Centre of Excellence (CoE) teams to verify compliance with Group HSE&S strategy, policy and performance standards.
- Regularly review and audit HSE&S processes, training and controls to promote and improve effectiveness at managed and (where practicable) non-managed operations.
- Monitor monthly HSE&S performance at the Group level.
- Report, investigate, and share learnings from HSE&S incidents.
- Build safety targets into personal performance metrics to incentivise safe behaviour and effective risk management (see Remuneration report).
- Develop mutually beneficial partnerships with local communities and establish appropriate social performance targets.
- Report annually on performance on greenhouse gas emissions, water, and land use and rehabilitation, among others.
- Focus on fatality elimination through implementation of a programme to verify safety risk controls.

Climate change

We provide essential materials for human progress and a low-carbon future. By collaborating with our partners across the value chain, we aim to do this in a sustainable way and help address climate change challenges.

Climate change: risk and uncertainty
Climate change is a systemic challenge and will require coordinated actions between nations, between industries and by society at large. It requires a long-term perspective to address both physical climate change and low-carbon transition risks and uncertainties.

Potential impact
- Business model value
- Future financial and operational performance
- Group reputation

Strategic delivery:

Portfolio **Partners**

Opportunities
Climate change has formed part of our strategic thinking and investment decisions for over two decades. Each of the commodities we produce has a role to play in the transition to a low-carbon economy – aluminium in electric vehicles, copper in wind turbines, iron ore for critical infrastructure and minerals for rechargeable batteries, such as lithium.

Threats
Current and emerging climate regulations have the potential to result in increased costs, change supply and demand dynamics for our products and create legal compliance issues and litigation, all of which could impact the Group's financial performance and reputation. Our operations also face risk due to physical impacts of climate change, including extreme weather.

Mitigating actions include:
- Partnering to reduce the carbon footprint across the value chain. This includes the development of new partnerships to explore pathways with our customers to improve the environmental performance of our product value chains.
- Enhancing our resilience to physical climate impacts. We consider climate risks over the life of our operations, from the way we design and develop new projects through to closure and beyond. Supported by the new Energy and Climate Change Centre of Excellence (CoE), we use scenarios to assess further medium- and long-term risks.
- Implementation of a series of controls to manage the threat of extreme weather, including structural integrity programmes across all critical assets, emergency response plans and flood management plans. These controls keep our people safe and help our operations return to normal capacity as quickly as possible.
- Increasing the supply of the materials essential to building a low-carbon economy.
- Setting targets to reduce our emissions (on an absolute and intensity basis) over the short, medium and long term.

Communities and other key stakeholder risks

We recognise the value of positive engagement with a range of stakeholders, and seek to develop collaborative and mutually-beneficial partnerships though our partner-to-operate strategy.

Sovereign: risk and uncertainty
The Group's operations are located across a number of jurisdictions, which exposes the Group to a wide range of economic, political, societal and regulatory environments.

Potential impact
- Business model value
- Future financial and operational performance
- Group reputation
- Communities and social performance

Strategic delivery:

Portfolio **Performance** **Partners**

Opportunities
Proactive engagement with governments, communities and other stakeholders can increase access to new resources, support stable and predictable investment frameworks and operational environments, and shape mutually-beneficial policies and legal/regulatory frameworks.

Threats
Adverse actions by governments and other stakeholders can result in operational/project delays or loss of licence to operate. Other potential actions can include expropriation, changes in taxation, and export or foreign investment restrictions, which may threaten the investment proposition, title, or carrying value of assets. Legal frameworks with respect to policies such as energy, climate change and mineral law may also change in a way that increases costs.

Closure, reclamation and rehabilitation: risk and uncertainty
Planning for the future of our sites after they cease their operating life is a core business function governed by our Closure Steering Committee. Estimated costs and liabilities are provided for, and updated annually, over the life of each operation. However, estimates may vary due to a number of factors that either create opportunities or challenges.

Potential impact
Business model value
Future financial and operational performance
Group reputation

Strategic delivery:

Portfolio **Performance** **Partners**

Opportunities
We are actively assessing opportunities to find solutions to repurpose and reuse sites for future economic or social benefit through working collaboratively with our stakeholders. For all new asset developments, we incorporate closure into the design of our assets, as well as how to optimise decommissioning, remediation and any long-term management obligations. For existing operations, where possible, we progressively rehabilitate land throughout the life of the operations.

Threats
Plans and provisions for closure, reclamation and rehabilitation may vary over time due to changes in stakeholders' expectations, legislation, standards, technical understanding and techniques. In addition, the expected timing of expenditure could change significantly due to changes in the business environment and orebody knowledge that might vary the life of an operation.

Mitigating actions include:
- Comply with Group policies and standards which provide guidance concerning risk management, communities and social performance. This is overseen by our Sustainability Committee, and Closure Steering Committee.
- Collaborate with key stakeholders, and participate in strategic partnerships and/or governance structures to create opportunities and mitigate threats.
- Develop long-term relationships with a range of international and national stakeholders.
- In relation to sovereign risk, maintain geographically diverse portfolio to reduce concentration of exposure to changes in particular locations.
- Monitor jurisdictional risks, including sovereign risks, and take appropriate action.

Principal risks and uncertainties
continued

Governance risks

Our employees operate in compliance with *The way we work* (our global code of business conduct), Group delegation of authorities, and all other Group policies, standards and procedures.

Regulation and regulatory intervention: risk and uncertainty
The Group's reputation and regulatory licences are dependent upon appropriate business conduct and are threatened by actual or perceived breaches of law, reputation and our code of conduct.

Potential impact
- Potential impact
- Business model value
- Future financial performance
- Group reputation

Strategic delivery:

People **Partners**

Opportunities
Good corporate citizens are acknowledged to operate to a high ethical standard, thus attracting talent and securing access to resources and investment opportunities.

Threats
Fines may be imposed on Group companies for breaching anti-trust rules, anti-corruption legislation, or sanctions or for human rights violations, or for other inappropriate business conduct.

A serious allegation or formal investigation by regulatory authorities (regardless of ultimate finding) could result in a loss in share price value and/or assets or loss of business. Other consequences could include the criminal prosecution of individuals and/or Group companies, imprisonment, fines, legal liabilities and reputational damage to the Group.

Mitigating actions include:
- Comply with Group policies, standards and procedures that provide guidance to our businesses and drive compliance with regulatory obligations.
- Identify and meet our regulatory obligations and respond to emerging requirements.
- Dedicate legal and compliance teams to assist Group businesses in complying with regulatory obligations and internal standards and procedures.
- Maintain appropriate oversight and reporting, supported by training and awareness, to drive compliance with regulatory obligations.
- Continue to develop and deploy training across relevant sectors of the workforce.

Operational and people risks

We seek to achieve operational and commercial excellence through the engagement of our workforce and the deployment of effective standards, processes and systems.

Operational and commercial excellence: risk and uncertainty
Accessing, developing and retaining talent as Rio Tinto and our industry evolves presents a constant challenge. The Group's ability to maintain its competitive position is dependent on the services of a wide range of internal and external skilled and experienced personnel and contracting partners.

Potential impact
- Future financial and operational performance
- Liquidity
- HSE&S
- Communities and social performance
- Group reputation

Strategic delivery:

People **Performance**

Opportunities
Enhance productivity and business resilience through building operational and commercial excellence.

Threats
Business interruption or underperformance may arise from a lack of capability in people, standards, processes or systems to prevent, mitigate or recover from an interruption (for example, a significant weather event), which results in a material loss to the Group.

Mitigating actions include:
- Development of Centres of Excellence for key technical capability in major hazard and asset management.
- Continue to provide leadership, technical and commercial development opportunities.
- Comply with slope geotechnical, tailings management, underground mining and process safety technical and safety standards, supported by subject-matter experts and audit protocols, reducing the risk of operational failure.
- Comply with the Acceptable Use of Information and Electronic Resources standard, supported by periodic reviews of IT infrastructure and security controls by dedicated cyber-security team.
- Undertake business resilience planning and execution exercises for plausible and severe scenarios.

Five-year review

Selected financial data

The selected consolidated financial information below has been derived from the historical audited consolidated financial statements of the Rio Tinto Group. The selected consolidated financial data should be read in conjunction with, and qualified in their entirety by reference to, the 2019 financial statements and notes thereto. The financial statements as included on pages 146 to 246 have been prepared in accordance with IFRS as defined in note 1.

Rio Tinto Group

Income statement data					
For the years ending 31 December Amounts in accordance with IFRS	**2019 US$m**	2018 US$m	2017 US$m	2016 US$m	2015 US$m
Consolidated sales revenue	**43,165**	40,522	40,030	33,781	34,829
Group operating profit[a]	**11,466**	17,687	14,135	6,795	3,615
Profit/(loss) for the year	**6,972**	13,925	8,851	4,776	(1,719)
Basic earnings/(losses) for the year per share (US cents)	**491.4**	793.2	490.4	256.9	(47.5)
Diluted earnings/(losses) for the year per share (US cents)[b]	**487.8**	787.6	486.9	255.3	(47.5)
Dividends per share					
Dividends declared during the year					
US cents					
– interim	**151.0**	127.0	110.0	45.0	107.5
– interim special	**61.0**				
– final	**231.0**	180.0	180.0	125.0	107.5
– special		243.0			
UK pence					
– interim	**123.32**	96.82	83.13	33.80	68.92
– interim special	**49.82**				
– final	**177.47**	135.96	129.43	100.56	74.21
– special		183.55			
Australian cents					
– interim	**219.08**				
– interim special	**88.50**	170.84	137.7	59.13	144.91
– final	**349.74**	250.89	228.5	163.62	151.89
– special		338.70			
Dividends paid during the year (US cents)					
– ordinary	**635.0**	307.0	235	152.5	226.5
Weighted average number of shares basic (millions)	**1,630.1**	1,719.3	1,786.7	1,797.3	1,824.7
Weighted average number of shares diluted (millions)[b]	**1,642.1**	1,731.7	1,799.5	1,808.6	1,824.7
Balance sheet data					
Total assets	**87,802**	90,949	95,726	89,263	91,564
Share capital/premium	**7,968**	8,000	8,666	8,443	8,474
Total equity/Net assets	**45,242**	49,823	51,115	45,730	44,128
Equity attributable to owners of Rio Tinto	**40,532**	43,686	44,711	39,290	37,349

(a) Group operating profit or loss includes the effects of charges and reversals resulting from impairments (other than impairments of equity accounted units) and profit and loss on disposals of interests in businesses. Group operating profit or loss amounts shown above excludes equity accounted operations, finance items, tax and discontinued operations.
(b) The effects of dilutive securities has not been taken into account when calculating diluted loss per share for the year ended 31 December 2015, in accordance with IAS 33 "Earnings Per Share".

Directors' approval statement

This Strategic report is delivered in accordance with a resolution of the board, and has been signed on behalf of the board by:

S.R. Thompson

Simon Thompson
Chairman
26 February 2020

Employees at the Oyu Tolgoi copper mine in Mongolia

discipline

Board of directors

Rio Tinto plc and Rio Tinto Limited have a common board of directors. The directors are collectively responsible for the stewardship and long-term sustainable success of the Group.

Chairman, executive and non-executive directors

Simon Thompson R N
Chairman, MA, PhD. Age 60. Appointed April 2014; chairman from March 2018

Skills and experience: Simon has significant global experience in mining and metals, finance and corporate governance. Among a wide range of board appointments, Simon was an executive director of Anglo American plc, where he held the roles of Chairman and Chief Executive Officer of the Base Metals Division. He also served as chairman of Tarmac, and chairman of the Exploration Division. Earlier in his career he held various investment banking positions at S. G. Warburg and N M Rothschild.

Simon has chaired two FTSE companies: 3i plc and Tullow Oil plc. His experience as a non-executive director includes serving on the boards of AngloGold Ashanti Limited and Newmont Mining Corporation.

Current external appointments: Chairman of 3i Group plc since 2015.

Jean-Sébastien Jacques
Chief Executive, MSc. Age 48. Appointed March 2016; Chief Executive from July 2016

Skills and experience: J-S has driven significant transformation projects at Rio Tinto, including the strengthening of our portfolio, and the development of growth projects and options, such as Koodaideri and Winu in Australia and Resolution in Arizona. Since 2016, Rio Tinto has declared a record $36 billion in cash returns to shareholders while reducing net debt by $10.1 billion. J-S has cultivated ground-breaking partnerships such as the one with China Baowu Steel Group and Tsinghua University to improve environmental performance across the steel value chain.

J-S has over 25 years of experience in heavy industry and has worked across multiple commodities including aluminium, copper and steel.

Current external appointments: Member of the International Council on Mining and Metals, Global CEO Council – Beijing, Business Council of Australia and US Business Council.

Jakob Stausholm
Chief Financial Officer, Ms Economics. Age 51. Appointed September 2018

Skills and experience: Jakob has over 20 years' experience in senior finance roles in Europe, Latin America and Asia, including in capital-intensive, long-cycle businesses, as well as in innovative technology and supply chain optimisation. Jakob spent six years with the Maersk Group, where his roles included group Chief Financial Officer and executive director of the Group's integrated transport and logistics business. He was previously with Royal Dutch Shell plc, holding a range of finance positions, including chief internal auditor. In 2019, Jakob visited our operations, projects and people in 13 countries, across four continents. This allowed him to identify and better understand the opportunities that lie across our operations and to assist in evaluating the capital requirements at each business.

Current external appointments: None.

Megan Clark AC R N S
Independent non-executive director, BSc, PhD. Age 61. Appointed November 2014

Skills and experience: Megan combines expertise in the mining and metals industry with strong leadership experience in science, research and technology, and brings valuable insights on sustainable development and innovation to the Board. She was Chief Executive of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) from 2009-14. Following roles with Western Mining Corporation, Megan was a director at N M Rothschild and Sons (Australia), and a vice president at BHP Billiton. Megan received the Australian Academy of Science Medal in 2019.

Current external appointments: Non-executive director of CSL Limited since 2016 and CARE Australia since 2015. Head of the Australian Space Agency.

Former directors who served for part of the year

Dame Moya Greene
Moya stepped down from the board on 26 June 2019.

Ann Godbehere
Ann stepped down from the board on 9 May 2019.

Past external appointments over the last three years

For details of each director's past appointments, see the Directors' report on page 140.

Board committee membership key

- O Committee chairman
- A Audit Committee
- R Remuneration Committee
- N Nominations Committee
- S Sustainability Committee

David Constable A N
Independent non-executive director, BSc. Engineering. Age 58. Appointed February 2017

Skills and experience: David has strong corporate governance, board and leadership credentials. His international experience in the engineering, construction, energy, mining and chemical sectors includes the execution of major capital projects. David was Chief Executive officer of Sasol Limited from 2011-16, and held various roles at Fluor Corporation from 1982 to 2011, including Group president, Operations.

Current external appointments: Non-executive director of ABB Ltd since 2015 and Fluor Corporation since September 2019. Senior advisor, Cerberus Capital Management. Member of U.S. Council of Chief Executive Officers.

Simon Henry A N S
Independent non-executive director, MA, FCMA. Age 58. Appointed April 2017

Skills and experience: Simon has significant experience in global finance, corporate governance, mergers and acquisitions, international relations and strategy. He draws on over 30 years' experience at Royal Dutch Shell plc, where his roles included Chief Financial Officer from 2009-17.

Current external appointments: Non-executive director of Lloyds Banking Group plc since June 2014. Independent director of PetroChina Company Limited since June 2017. Member of the UK Defence Board. Member of the Advisory Board of the Centre for European Reform and the Advisory Panel of CIMA.

Sam Laidlaw R N S
Independent non-executive director, MA, MBA. Age 64. Appointed February 2017, May 2019 (senior independent director)

Skills and experience: Sam has more than 30 years' experience of long-cycle, capital intensive industries in which safety and stakeholder management are critical. Previous executive roles include: president and chief operating officer, Amerada Hess Corporation; CEO, Enterprise Oil plc; executive vice president, Chevron Corporation; CEO, Centrica plc; and membership of the UK Prime Minister's Business Advisory Group.

Current external appointments: Chairman of Neptune Energy Group Holdings Ltd. Chairman, National Centre of Universities & Business. Board member, Oxford Saïd Business School. Council member, Radley College.

Michael L'Estrange AO N S
Independent non-executive director, BA (Sydney), MA (Oxon). Age 67. Appointed September 2014

Skills and experience: Michael's distinguished public service career gives him practical experience of the geopolitical and societal trends which affect Rio Tinto. Michael served in senior roles for the Australian government, including head of the Cabinet Policy Unit and secretary of the Department of Foreign Affairs and Trade. He was High Commissioner to the United Kingdom. Michael chairs our Australia Forum, which meets twice a year.

Current external appointments: Director and deputy chancellor of the University of Notre Dame, Australia. Non-executive director of Qantas Airways Limited since April 2016.

Director appointment after 31 December 2019

Hinda Gharbi A N S
Independent non-executive director, Age 49. Appointment effective 1 March 2020.

Skills and experience: Hinda is executive vice president of Reservoir & Infrastructure at Schlumberger Limited and has some 24 years' experience for Schlumberger working in various engineering, functional and line management positions, including health and safety, human resources, technology development and operations across France, Malaysia, Nigeria, Thailand, the United Kingdom and the United States.

Current external appointments: None.

Company secretaries

Steve Allen
Group Company Secretary, BA (Modern Languages and European Studies), Solicitor (England and Wales). Age 48. Appointed January 2017

Skills and experience: Steve is company secretary of Rio Tinto plc and joint company secretary of Rio Tinto Limited. Before joining Rio Tinto, Steve was deputy general counsel at BG Group plc. He served as company secretary of BG Group from 2011-16, having previously been chief counsel, corporate, from 2008-11. Before joining BG Group in 2005, Steve was a corporate lawyer for Herbert Smith LLP in London.

Current external appointments: Vice-Chair of the Association of General Counsel and Company Secretaries working in FTSE-100 companies and a member of the Corporate Governance Council.

Simon McKeon AO A R N
Independent non-executive director, BCom, LLB, FAICD. Age 64. Appointed January 2019

Skills and experience: Simon brings insights into sectors including financial services, the law, government and charities. He practised as a solicitor before serving at Macquarie Group for 30 years, including as executive chairman of its business in Victoria, Australia. Simon served as chairman of AMP Limited, MYOB Limited and of the Australian government's research and development body, CSIRO. He was the first president of the Australian Takeovers Panel.

Current external appointments: Chancellor of Monash University. Chairman of the Australian Industry Energy Transitions Initiative Steering Group. Non-executive director of Spotless Group Holdings Limited since December 2016 and National Australia Bank Limited since February 2020.

Director appointment after 31 December 2019

Jennifer Nason R N S
Independent non-executive director, Age 59. Appointment effective 1 March 2020.

Skills and experience: Jennifer has over 30 years' of experience in corporate finance and capital markets. For the past 17 years, she has led the Technology, Media and Telecommunications global client practice at JP Morgan, based in the USA. During her time at JP Morgan, she has also worked in the metals and mining sector team in Australia.

Current external appointments: Director of the American Australian Association.

Director appointment after 31 December 2019

Ngaire Woods CBE R N S
Independent non-executive director, Age 57. Appointment effective 1 September 2020.

Skills and experience: Ngaire is the founding Dean of the Blavatnik School of Government, Professor of Global Economic Governance and the Founder and Director of the Global Economic Governance Programme at Oxford University. As a recognised expert in public policy, international development and governance, she has served as an adviser to the African Development Bank, the Asian Infrastructure Investment Bank, the Center for Global Development, the International Monetary Fund and the European Union

Current external appointments: Board member of the Stephen A. Schwarzman Education Foundation and Trustee of the Rhodes Trust.

Tim Paine
Joint Company Secretary, Rio Tinto Limited BEc, LLB, FGIA, FCIS. Age 56. Appointed January 2013

Skills and experience: Tim joined Rio Tinto in 2012 and became joint company secretary of Rio Tinto Limited in 2013. He has over 25 years' experience in corporate counsel and company secretary roles, including as general counsel and company secretary at Mayne Group, Symbion Health and Skilled Group. Tim spent 12 years at ANZ Bank, including as acting general counsel and company secretary.

Current external appointments: Company secretary for the Foundation for Australia-Japan Studies. Member of the Governance Institute of Australia's Legislation Review Committee.

Executive Committee

Day-to-day management of the business is delegated by the Board to the Chief Executive and, through him, to other members of the Executive Committee and to certain management committees.

Executive Committee

The Executive Committee is responsible for the delivery of strategy, annual plans and commercial objectives. It manages the financial and operational performance of the Group.

The following management committees support the Chief Executive in the performance of his duties:

Investment Committee
Reviews proposals on investments, acquisitions and disposals. Approves capital decisions within delegated authority limits, and otherwise recommends matters for approval to the Board, where appropriate.

Risk Management Committee
Oversees the management and mitigation of the principal risks that could materially impact the Group's business objectives and exceed its risk tolerances.

Ore Reserves Steering Committee
Responsible for standards and control procedures in the ore reserves estimation and disclosure process. Ensures that these are effective in meeting internal objectives and regulatory requirements.

Disclosure Committee
Oversees the identification of inside information and its public disclosure, including processes to ensure such disclosure is accurate and timely.

Closure Steering Committee
Oversees the process and controls designed to manage the material risks related to rehabilitation, closure and legacy operations.

Jean-Sébastien Jacques
Chief Executive

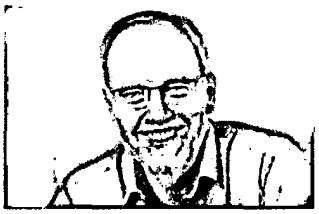
Jakob Stausholm
Chief Financial Officer

Executive Committee members
The two executive directors, **Jean-Sébastien Jacques** (Chief Executive) and **Jakob Stausholm** (Chief Financial Officer), are members of the Executive Committee. Their biographies can be found on page 84.

Bold Baatar
Chief Executive, Energy and Minerals
Bold has been Chief Executive of our Energy & Minerals (E&M) product group since 2016. Through the development of new products and markets and a responsive market approach, he has helped drive the optimisation of Rio Tinto's portfolio and generated significant shareholder value. Bold also has responsibility for the Group's Ventures M&A team that explores opportunities in the battery metals space, alongside other growth avenues. He has also re-energised the Group's focus on Africa and overseen the development of innovative new processes, including the extraction of lithium from waste rock at our boron mine in California. Bold has led the Group's commitment to the rehabilitation and closure of Ranger mine at Energy Resources Australia.

Alf Barrios
Chief Executive, Aluminium
Alf became Chief Executive of Rio Tinto Aluminium (RTA) in 2014. He has overseen a significant improvement in safety and financial performance, along with major growth projects such as the Amrun bauxite mine. Alf has championed RTA's leadership of the industry in sustainability, launching the first certified low-carbon aluminium and helping it become the first company certified by the Aluminium Stewardship Initiative for responsible production. RTA has also helped to establish ELYSYS, a partnership with Alcoa supported by Apple and the governments of Canada and Quebec, to further develop the world's first carbon-free smelting technology.

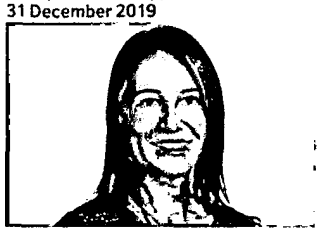
Vera Kirikova
Group Executive, Human Resources
Vera was appointed Group executive, Human Resources, in 2017. Vera brings a people-centric approach to the business and is focused on building a culture that is performance driven, inclusive and in which everyone can excel. She has been responsible for our strategy of shaping a strong workforce for Rio Tinto's future: this includes the development of a technical career framework, a strong talent pipeline, and a new Group-wide approach to performance. In 2019, Vera helped lead the significant improvement in employee engagement.



Steve McIntosh
Group Executive, Growth and Innovation and Health, Safety and Environment
Steve became Group executive of Growth & Innovation (G&I) in 2016. In 2019, his remit grew to include Health, Safety & Environment (HSE), bringing our HSE and technical experts together to deliver both safety and operational excellence. He oversees the safety and effectiveness of Rio Tinto's assets throughout their lifecycle. Under his leadership, G&I has applied innovative, leading-edge technical expertise to discover new ore deposits and develop them into assets. He leads our efforts to digitise operations, including the use of automation, artificial intelligence and data science.

Simone Niven
Group Executive, Corporate Relations
Simone was appointed Group executive, Corporate Relations, in 2017. Simone has played an important role in developing our vision of partnership aimed at delivering sustained value to Rio Tinto and to society at large. In 2019, she led the development of our sustainability strategy and supports the Group's efforts on climate change, communities and human rights, government and other stakeholder engagement. Simone also leads the development of our core integrated market and regional country strategies and teams, aligned with our commercial and business priorities.

Group Executive appointment after 31 December 2019



Barbara Levi
Group Executive, Group General Counsel
Barbara was appointed Group executive, Group General Counsel in January 2020. Alongside leading our legal teams around the world, Barbara oversees a range of governance functions including Company Secretariat, Ethics & Integrity and the Technical Evaluation Group. Barbara has extensive experience across corporate, commercial and compliance matters. Over the last 20 years, she has held a number of senior legal roles across Europe and in the US and was most recently the Group Legal Head, M&A and Strategic Transactions for Novartis.

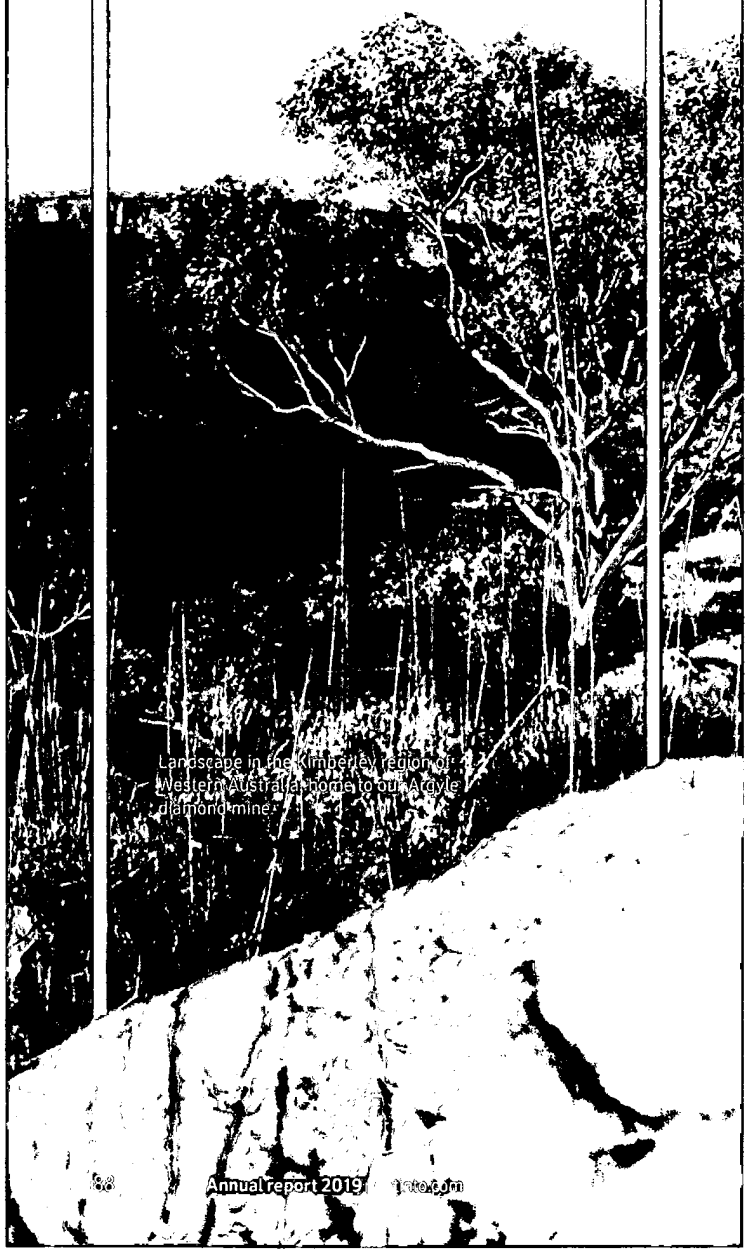
Chris Salisbury
Chief Executive, Iron Ore
Chris has been Chief Executive of our Iron Ore product group since 2016, overseeing consistent strong performance and innovation, including the development of the world's first automated, long-distance, heavy haul rail network – AutoHaul™ – and the construction of Koodaideri, our most technologically advanced mine. The 2019 launch of Australia's first nationally recognised qualifications in automation is an example of his leadership in ensuring our workforce has the skills for the future. Chris places great value on working closely with external partners to create benefit for the communities in which we operate.

Arnaud Soirat
Chief Executive, Copper and Diamonds
Arnaud was appointed Chief Executive of our Copper & Diamonds (C&D) product group in 2016. Under Arnaud's leadership, C&D has progressed its growth projects and focused on operational excellence, productivity improvement and cost reduction, deploying lean manufacturing to help achieve its strong results, and embedding sustainability in the way the product group operates. Rio Tinto diamonds are among the world's most coveted and most responsibly sourced; and our copper is part of the sustainability solution, being essential for clean energy technologies, such as electric vehicles and wind turbines, that help address climate change.

Simon Trott
Chief Commercial Officer
Simon became chief commercial officer in 2018 and oversees the selling and marketing of our products, procurement of our goods and services and management of our marine and logistics activities. Our Commercial team puts the company's value over volume approach into practice, bringing market insights generated from our customer and supplier interactions into our operational, investment and production decisions. Under Simon's leadership, we have enhanced our commercial capabilities and implemented measures to allow the business to better respond to changing market conditions, in part by using new technology and digitisation to simplify interactions.

Chairman's governance review

The role of business in society continues to be the subject of intense debate. Developing solutions to many of the great challenges facing humanity today, such as climate change, the biodiversity crisis or rising inequality, would have been regarded in the past as primarily the responsibility of national governments, in some cases working through supranational institutions.



Landscape in the Kimberley region of Western Australia, home to our Argyle diamond mine.

As politics has polarised in many countries, trust in institutions has declined, and the rules-based international order has come under increasing strain. Many people have turned instead to business to address these and other pressing environmental and social issues.

To some extent, this is familiar territory for responsible mining companies. Mining has profound impacts on the environment and society, both positive and negative. Rio Tinto provides materials that are essential for human progress; we create jobs, pay taxes, and our activities can be a catalyst for economic development. But mining can also have negative environmental and social impacts. At a local level, these may include land disturbance (which can affect biodiversity), noise, dust, air and water emissions; at a regional level, significant water consumption (sometimes in water-stressed areas); and on a global scale, climate change.

Mining also has an impact on local communities, particularly in remote regions, where the creation of well-paid jobs may trigger inward migration, increasing inequality and other social changes in communities that have had little contact with industrialised society.

At Rio Tinto, we have long recognised that mining companies exist at the will of society, and that we must earn our 'licence to operate' by minimising our environmental impact and maximising the long-term social and economic benefits that we bring to our host communities and governments.

We are also clear that our long-term, sustainable success depends upon attracting and developing the best employees to manage the ever-increasing complexity of our business, and forming long-term relationships with our customers, suppliers and technology partners to improve productivity and to take full advantage of the technological changes that are sweeping through our industry.

Whilst there is always more that we can and should do, I believe that we are making good progress at a local level. But many of the challenges that we face today, such as climate change, are global in scale and cannot be solved by individual company actions alone.

As we set out in our climate change report, Rio Tinto is determined to be part of the solution to climate change, supplying essential materials for the energy transition and reducing our direct greenhouse gas (GHG) emissions. But the decarbonisation of the full value chain, from mine to end product, requires systems to change on a global scale, involving multiple stakeholders and jurisdictions. Governments around the world, including in the UK, are setting ambitious targets to reach net zero emissions. To achieve this, enabling regulation, such as carbon pricing, is essential to incentivise the private sector to invest in decarbonising 'hard to abate' sectors, such as aluminium smelting, steel making and shipping. Since the costs of the energy transition will fall unevenly, governments also need to ensure that adversely-affected communities and regions are adequately supported. So, while business has a vital role to play, we will only succeed in addressing the unprecedented challenge of climate change through the collaborative action of governments, companies and consumers.

Perhaps the most significant challenge facing responsible boards today is to balance short-term efficiency with long-term effectiveness, including sustaining the ecosystems that support our activities. In some companies and sectors, it is clear that the balance has shifted too far towards short-term gains – cutting costs (and corners) to boost short-term profits.

At Rio Tinto, our objective is to maximise long-term sustainable profits to maintain the financial strength to invest in the future and to meet our obligations to wider society. We believe that this focus on long-term sustainable profit also delivers better risk-adjusted returns for our shareholders.

Stakeholder engagement
To maintain our long-term effectiveness, it is essential that we engage with a broad range of stakeholders, including employees, customers, suppliers, local communities, governments and civil society, to ensure that we understand their perceptions of our activities and identify opportunities to improve our future performance. Over the past year, Board members have met representatives from each of these stakeholder groups, across four continents.

In 2019, in view of the provisions of the new UK Corporate Governance Code, we have built on the extensive activities that were already in place for engaging our workforce. The mechanisms we have established are set out on page 92 and we continue to enhance these to ensure that the views of our workforce are incorporated into relevant decision-making processes.

As a Board, we have also placed a greater focus on, and oversight of, our customer and supplier relationships. We have received two separate surveys and enjoyed an insightful presentation from one of our major suppliers and technology partners. Further details are set out on page 93.

During the year, Board members joined senior executives at roundtable discussions with civil society organisations in Australia, Canada and the US to discuss support for communities locally and global advocacy on issues such as human rights and indigenous peoples' rights, climate change and extractives' transparency.

Culture, diversity and the Board
Our purpose and strategy encapsulate our longer-term aims and ambitions. The hard part is to establish the right systems and processes and, critically, to embed the right culture and behaviours to achieve these objectives. As a Board, we recognise the important role we play in modelling the values and behaviours that we wish to see embedded across Rio Tinto and in promoting a culture of openness, inclusion and diversity. This year, the Board began to review how we live those values in our everyday activities and we established a baseline for how those values can be measured as we move forward. You will find more about this on page 91.

In our succession planning, we aim to bring a diverse and complementary range of skills, knowledge and experience to the Board, so that we are equipped to navigate the operational, social, environmental, regulatory and geopolitical complexity in which our business operates. Achieving the right blend of skills to support effective decision-making is a continuing process. Further details of our succession planning are set out in the Nominations Committee report on pages 98 and 99.

I would like to express my thanks to Ann Godbehere who stepped down as Senior Independent Director and chair of the Audit Committee at the AGM in May 2019. We are grateful for Ann's wise counsel and for her outstanding stewardship of the Audit Committee. Sam Laidlaw succeeded Ann as senior independent director, while Simon Henry has taken over as chair of the Audit Committee. I would also like to thank Moya Greene, who stepped down as a Non-Executive Director in June 2019, for her contribution to Rio Tinto.

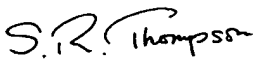
On 21 February 2020, we announced the appointment of three new non-executive directors to the Board. Hinda Gharbi, Executive Vice President of Reservoir & Infrastructure at Schlumberger Limited, and Jennifer Nason, a Global Chairman at JP Morgan Chase & Co, will join with effect from 1 March 2020. Ngaire Woods CBE, Professor of International Political Economy at Oxford University, will join with effect from 1 September 2020. The new directors will broaden the experience of the Board, bringing complementary skills and international expertise across diverse backgrounds in natural resources, finance, technology, governance and public policy.

Board evaluation and priorities for 2020
In 2019, we appointed Lintstock Limited to undertake an independent, formal and rigorous evaluation of the effectiveness of the Board and its committees. A questionnaire was completed by directors, the Group Company Secretary and certain members of the Executive Committee, who gave their views on the performance of the Board. I held one-to-one discussions with all involved and, separately, the senior independent director met with the other directors to assess my performance.

There was good alignment between the Board and the Executive on the strategic risks and opportunities, and the top priorities for the Board in 2020. Further details can be found on pages 96 and 97.

Shareholder engagement
We look forward to meeting more of our shareholders and investors at our AGMs in April and May 2020, in London and Brisbane respectively. In addition to routine matters, we will be asking our shareholders to approve the appointment of KPMG as our new auditors, for the 2020 financial year.

Finally, I am grateful to Jean-Sébastien Jacques, the executive team, our employees and my colleagues on the Board for all of their hard work, their commitment to Rio Tinto and for the exciting future that we are seeking to create for the company and our stakeholders.



Simon Thompson
Chairman
26 February 2020

"We have long recognised that mining companies exist at the will of society and that we must earn our 'licence to operate' by minimising our environmental impact and maximising the long-term social and economic benefits that we bring to our host communities and governments."

How the Board works

Good governance is, fundamentally, about considering the right things, at the right time, with the right people and insights. We have tried to structure the way the Board works to support that objective, to strengthen our strategic focus, and to improve both the challenge and the support that the Board provides to the executive team.

Considering the right things...
We want to make sure the Board is working in ways that add the most value to the business.

The principal responsibilities of the Board are to:

- Set the Group's purpose, values and strategy, and ensure that the Group's culture is aligned with these.
- Appoint the executive team (including the executive directors), who are responsible for fulfilling our purpose, upholding our values, and developing and delivering the strategy.
- Monitor the Group's performance in delivering its strategy, including ensuring that the necessary resources are in place for the Group to meet its objectives.
- Analyse external trends, and assess the opportunities and risks that they may present.
- Establish a framework of prudent and effective controls that enables these risks to be assessed and managed.
- Engage with shareholders and other stakeholders to ensure that their views and concerns are taken into account.

Much of our work over the year has been focused on strategy. This has included considering the Group's climate change strategy framework, as well as potential growth options and future partnerships. At the same time, the Board has increased its engagement with the workforce, with customers and with suppliers as part of a new programme of stakeholder initiatives. We have also considered Group culture and behaviours, while maintaining a disciplined oversight of the operational performance of our core assets and significant investment decisions.

... at the right time...
We have reduced the number of Board meetings, but increased their length and effectiveness.

To ensure that we are maintaining the right balance between monitoring past performance and thinking about the future, we have developed a detailed rolling agenda for the Board and its committees. We consider matters under four key pillars: the performance of the business; priority items relating to the Group's strategy and risk profile; items requiring a Board decision, such as prospective investments; and governance, which includes items relating to our various stakeholders, teach-ins and the monitoring of the Group's ongoing regulatory matters, as well as important developments in corporate governance.

We have reduced the number of Board meetings, but increased their length and effectiveness. Committee meetings now run consecutively, rather than concurrently, so that Board members can attend all meetings if they wish. We have also added two dedicated strategy meetings to the annual cycle – the first to review the external environment and to identify priorities for the executive team to evaluate, and the second to make decisions for the Group in that macro context.

... with the right people and insights.
We want to make sure that we are making the decisions and judgments that matter, with the skills and information we need.

Recognising that no Board can possess all the necessary skills and experience, we aim to become more effective "conveners of expertise", arranging site visits, presentations by internal and external experts, and other education programmes ahead of critical strategic or investment decisions. These initiatives are underpinned by an improved understanding of the capabilities of the current Board. We have developed a skills and competencies' matrix for the Board (summarised on page 99) which has helped us to identify potential gaps and make informed decisions on new appointments.

Within the wider organisation, we recognise the need to augment our existing technical strengths by developing or recruiting new skills and talent, in some cases from non-traditional sources. This in turn means that we have to adapt our culture, building on the great strengths that have served Rio Tinto well, while embracing new ideas and fresh approaches.

We continue to step up our engagement with a wide range of stakeholders to ensure that their ideas and concerns are better reflected in our operational and strategic decision-making. Some of these activities are described on the following pages.

Matters discussed in 2019

We set out below some of the matters which the Board has considered during 2019, grouped under the headings that we use to structure our agendas.

Subject area	Matters considered
Performance	At every Board meeting, the Chief Executive and Chief Financial Officer report on the safety, operating and business performance of the Group against our Key Performance Indicators (KPIs), as well as how certain material stakeholder issues are being managed. The Board also discusses detailed reports relating to progress on major capital projects, updates on specific operations and functions, and the wider geopolitical and commodity market developments relevant to our business. Examples in 2019 included: – In May and July, the Board considered updates on progress at the Oyu Tolgoi Underground Project. – In September, the Board discussed plans to address mine operational challenges in the Pilbara iron ore system in Western Australia, particularly at the Greater Brockman Hub. – In November, the Board reviewed an assessment of the current state of the Information Systems and Technology (IS&T) function, and its vision for the next three to five years. The Board also reviewed and approved the Group's annual and multi-year business plans and financial results announcements.
Strategy and risk	The Board discussed and confirmed the Group's strategy in two separate two-day sessions, in June and September. Topics discussed included: the strategic context for our business, China's new era, social and people trends, growth and portfolio choices for the business, climate change, energy transition and new commodities, technology and innovation, our people and culture. The Board conducted deep dive reviews of various strategic priorities and risks. In 2019, these included: – A review, in February, of the Group's evolving people strategy and culture. – In April, a detailed briefing on underground mining. – In July, into the Group's Commercial function and its strategy and priorities. – In October, an overview of the Group's principal risks and mitigating actions. – In November, the Group's climate change strategy and new GHG emissions reduction targets as well as a focus on productivity and asset integrity.
Decisions	Over the course of 2019, the Board discussed and approved over $4 billion of funding in respect of sustaining capital expenditure, new growth projects and mine closures costs. Important investment decisions in 2019 included: – In April, the Board approved a $463 million investment in the Zulti South mine development project in South Africa. – In November, the Board approved $749 million of funding to further develop the Tom Price iron ore mine in the Pilbara, Australia. – Also in November, the Board approved a $1.5 billion investment at Kennecott Copper to extend the life of that mine to 2032.
Governance	As part of its oversight of governance, the Board also considers its own constitution, composition and performance. At every meeting the Board reviews a rolling forward agenda of matters to be discussed. The Board also reviews and approves any new, or revised, Group policies. In addition, during 2019, the Board considered the following governance-related matters: – In July, the updates on the views of key stakeholder groups in the form of survey results on the Group's reputation and brand health, an externally-facilitated investor perception study, and the results of the latest six-monthly employee engagement survey. – In November, the results of the externally-facilitated evaluation of the Board and its committees (the results of which are detailed on pages 96 and 97). – In November, a first culture and values scorecard was discussed. This seeks to establish a baseline for the Board to measure the internal and external perception of how, as an organisation, we are increasingly living our values and that our work on culture and values is having a demonstrable impact.

Our stakeholders

We are acutely aware that the decisions we make affect the lives of many people. We try very hard to understand the interests of our wide range of stakeholders, and to reflect them in the choices we make in creating long-term sustainable success for our business.

In the following section, we detail our key stakeholders and summarise their interests, how the Board has engaged with them, and how what the Board has heard has influenced our decision making. This section serves as our "section 172(1) statement".

Employees[1]

Introduction
Our 46,000 people in 36 countries make Rio Tinto what it is.

We believe they want to work in a positive environment, where they are safe and respected, and have the opportunity to learn, reach their potential and develop successful careers in a company they can be proud of.

How we engage and communicate
- We held our first employee 'AGM' in Australia in 2018 and, in 2019, almost 500 employees attended our second AGM in Montreal, Canada. The event, which was webcast across the Group, featured a panel discussion with directors during which employees asked a range of questions on matters such as the Board's oversight of safety and climate change, and "pop-up" stalls showcasing various innovations across the Group's North American operations.
- Our Chief Executive held over 30 town halls and small group discussions in 20 locations during 2019, and the main themes and issues were reported regularly to the Board. The Chairman visited nine Rio Tinto mines and offices during the year and had regular townhalls and lunch and breakfast briefings with the workforce as part of these visits.
- The Board has begun a series of informal workforce engagements whenever it visits sites or attends Rio Tinto offices for meetings. Examples in 2019 include meeting employees running our 4.0 Pioneer Lab in Brisbane, and informal Q&A sessions with sections of senior management and our graduate population in Brisbane, Salt Lake (Kennecott) and in the Group's aluminium business in the Saguenay.
- We conduct a six-monthly employee engagement survey to measure how people feel about the company and its direction. The Board reviews the results and a cross-section of the comments.

How the Board has taken account of these interests

- It is clear that the workforce has appreciated the open and transparent way in which the Board has stepped up its engagement in 2019. This has begun to foster greater trust in, and understanding of, the Board, and has increased the workforce's accessibility to Board members.
- In response to feedback received during 2019, we will refocus our engagements in 2020 so that the workforce can gain greater insight into the role and workings of the Board and its committees. The Board will also structure its engagements to spend more time understanding what is on employees' minds. More informal networking opportunities will be organised and a regular standing item will be introduced at Board meetings for directors to report back on their engagements. As part of these engagement activities, the Board intends to spend more time specifically hearing from female employees to better understand their perspectives as we continue to enhance the diversity of our workplace.
- The Board was pleased to see a continued improving trend in overall employee satisfaction through employee survey results, but the real value is in those scores that offer room for improvement, and in the ideas and comments that employees submit. These suggest that we can still do better at explaining our strategy, and at breaking down silos and working collaboratively. The Board will focus on these areas in 2020.

Given the Group's size and complexity, and its geographical spread, the Board proposes to continue with a multi-faceted approach to workforce engagement that is not led by any one director or group of directors. The Board considers that this approach is appropriate, but will continue to keep engagement mechanisms under review to ensure they remain effective.

Communities and governments

Introduction
Trust and partnership between us and the communities and governments that host our operations is vital.

Their interest in the potential impacts of our business both positive and negative, spans a wide range of issues. These include the taxes we pay and the jobs we create, as well as how our operations affect the local environment. Communities and governments seek our commitment to high standards in managing our operational footprint and respecting community and human rights. More recently, global trade, the transition to a low-carbon economy, renewables and energy, disclosure of mining contracts and taxes paid, the future of work, gender inclusion and Indigenous rights have been themes of focus.

How we engage and communicate
- Our approach to communities is based on regular dialogue and engagement at every stage of the life of our assets. We openly discuss all impacts and seek community feedback and participation.
- The Board has engaged civil society organisations who support communities locally or through global advocacy.
- We have a regular dialogue with host governments at the national and provincial levels, and with international organisations such as the World Bank, the International Finance Corporation and multi-stakeholder groups like the Extractive Industries Transparency Initiative.

How the Board has taken account of these interests
- In 2019, directors and senior executives attended structured roundtables with civil society organisations in Canada and Australia to discuss support for communities locally, and global advocacy on issues such as human rights and Indigenous peoples' rights, climate change and extractives transparency.
- The Board maintains a regular discussion on social issues and the environment and, in October 2019, we announced a partnership with Chinese partners to explore ways to improve environmental performance across the entire steel value chain.
- When approving the $463 million Zulti South Project at Richards Bay in South Africa, the Board carefully considered the relationships with provincial government, municipalities and host communities that will be critical to the success of the project.
- During 2019, following government and community concern in the wake of the tailings dam disaster at Vale S.A's Feijão mine in Brumadinho, Brazil, Rio Tinto disclosed additional information relating to its global tailings facilities. This included information regarding the construction, management and monitoring of facilities, and independent reviews. The Sustainability Committee oversaw these updates on the certification and assurance processes for both tailings and water storage facilities at all current and legacy sites. A tailings validation taskforce was established which conducted a programme of technical risk reviews of the Group's facilities, and reported its findings to the Sustainability Committee.
- The Board has agreed to step up its direct engagement with local communities when visiting Rio Tinto sites in 2020.

1 See note 32 on page 206 for the definition of our workforce

Investors

Introduction
Our investors include global fund managers, pension funds and bondholders, as well as tens of thousands of individuals, all of whom have put their capital at risk and need to earn a financial return.

They are interested in understanding the purpose, values and culture of the Group, as well as the threats and opportunities that affect our strategy and performance. They also want to understand how capital is allocated.

How we engage and communicate
- We hold two AGMs each year, in Australia and in the UK, where investors have the opportunity to question and engage with the Board.
- We maintain a regular and comprehensive programme of engagement with investors and research analysts, providing current and potential new investors with an opportunity to meet executives, the Chairman and the senior independent director.
- We held an investor seminar in London in October, where the executive directors and other members of the executive team provided an update on performance and business developments.
- The Board also commissioned an independent perception study in May, seeking the views of institutional investors representing some 40% of the active Rio Tinto register in the US, the UK and Australia.

How the Board has taken account of these interests
- In response to investor feedback, the Board has continued to focus on a strategy of maximising shareholder returns, while allocating capital to invest for future growth and retaining the financial and operational resilience to position the business strongly through the macro and commodity cycles.
- Investors are interested in the theme of renewables (including electric vehicles) and how this will translate into future demand for commodities such as lithium, copper, nickel and cobalt. In response, the Board dedicated time at its strategy session to assess the portfolio decisions that support the transition to a lower-carbon economy.
- Investors have requested more access to senior executives via conferences, marketing, site visits and social events. In response, members of the Group executive team participated in the investor seminar in October and this will also be considered further in 2020.

Customers and suppliers

Introduction
Mining is a long-term business, and both our customers and our suppliers have an interest in developing mutually beneficial partnerships built on trust and transparency; they want to know that we will do what we say we will do.

The impact of changes in technology, geo-political and economic power and increasing societal demands to address climate change are creating potential structural shifts in the market. Our Commercial group, working hand-in-hand with our product groups, works closely with customers and suppliers, and in doing so, brings their voice, and the needs of a dynamic market, into our operational, investment and production decisions.

How we engage and communicate
- By extending our supply chain optionality into Chinese ports, we have enabled just-in-time deliveries, inventory management solutions and value-added services to our customers.
- In Bauxite, we combined the strong technical skills in our refineries with our deep customer relationships and insights to build a new market for our products in China.
- We are working with industry partners on the Aluminium Stewardship Initiative, leveraging the low-carbon emissions of our Canadian assets to deliver a product that is valued by our customers, such as the auto industry.
- Our Commercial group has continued to enhance how we engage with our markets and customers, in part by using technology, data and analytics. We are continuing to pilot the latest technologies, including blockchain and paperless solutions, to innovate the way we conduct our business and make our transactions more efficient, safe and cost-effective.

How the Board has taken account of these interests
In July 2019, the Board received a detailed teach-in from Simon Trott, our Chief Commercial Officer, to deepen our understanding of the supply chain and our customers' needs. The Board heard how the Commercial team aims to enhance its activities and the optionality in our portfolio to respond more dynamically to changes in the supply of and demand for of our products.

At that same meeting, the Board heard from Denise Johnson, Group President, Resource Industries at one of Rio Tinto's largest suppliers, Caterpillar, which is the world's leading manufacturer of construction and mining equipment, diesel and natural gas engines, industrial gas turbines and diesel-electric locomotives. Denise focused on three key areas: partnership, environmental and social trends and technology and innovation.

To strengthen its understanding of customers' needs, Commercial undertook a survey across its key commodities targeting 266 customer companies in 25 markets. The survey built on previous ad hoc customer surveys in some product groups. The results were presented to the Board in November 2019, and will form a baseline for the Board to measure future customer surveys. Key insights included that technical knowledge of our customers' needs is a strength, and there is an opportunity to partner further to understand the technical changes in customer operations to inform our product offerings. There is also an opportunity to further simplify our customer interactions as part of our own technology agenda, particularly related to documentation, and shipping and logistics management.

A dedicated survey of suppliers will be conducted in 2020 and the Board intends to visit major customers in Asia.

"The AGM gave people the opportunity to ask the hard questions. I loved the clarity and simplicity with which they gave their answers... Great initiative"

Employee feedback on the AGM with the Board
September 2019, Montreal, Canada.

Board effectiveness

Deepening Board members' skills and knowledge

We continue to build our Board members' understanding of the business and local operating conditions with a programme of teach-ins, deep dives and site visits. We tailor these activities so they are more relevant to directors' committee responsibilities, and time them to inform upcoming Board decisions.

Examples of how this worked in practice in 2019 are set out below.

Teach-ins

Richards Bay Minerals

We had a teach-in in advance of the Board's consideration and approval of the $463 million investment to develop the Zulti South project at Richards Bay Minerals (RBM) in South Africa. RBM sells three main products: TiO2 slag, zircon and high purity ductile iron. The teach-in provided the Board with industry, customer and demand and supply context for TiO2. The teach-in also covered potential regulatory policy changes in key customer markets such as China. The presentation examined key risks and opportunities facing the next phase of the Zulti South project, including issues relating to local communities, security, local procurement and employment expectations and contractor management. The Board noted that mitigating the local socio-political (and security) environment had been a key priority during 2018 and were briefed on a recent security threat assessment that confirmed the key potential security risks to operational stability.

Deep dives

Block caving (Oyu Tolgoi)

As the Group's development of the Oyu Tolgoi underground project has continued in 2019, the Board received a number of detailed briefings on the block cave mining method. The presentations provided historical background and context on the method and explained Rio Tinto's approach to managing major hazard risks and improving the design, construction and operation of all of our underground mines. Rio Tinto has been involved with four major block cave mining projects over the past 24 years and the deep dive covered how, from this experience, the Group has developed: (i) a global underground safety standard for all our underground mines; (ii) an Underground Centre of Excellence – a centralised function of underground mining experts; (iii) a methodology to apply lessons learned to new projects and operations; (iv) oversight of the construction and caving process by subject matter experts; and (v) ongoing monitoring of peer caving operations. In subsequent presentations during the year, the Board received a detailed teach-in on the three main components of the underground project (the above ground infrastructure; the shafts and below ground supporting infrastructure; and mine development and mine footprint infrastructure), and the governance arrangements in place to support delivery of the project.

Site visits

Kennecott

In advance of the Board's approval in November 2019 of $1.5 billion of funding to execute Slice 2 of the South Pushback at Rio Tinto Kennecott in Salt Lake, Utah, certain members of the Board visited the fully integrated mining operation in September. The Board visited Bingham Canyon mine and learned about the pending Slice 2 growth option, the crusher relocation, geo-technical risk mitigation and management. Other aspects of the visit included briefings at Barney's Canyon mine on the status of the closure pre-feasibility study, a walk around the site refinery and briefings on the management of the tailings facility.

"There was good, open discussion about the role of copper and diamonds in the Rio portfolio, the future of Kennecott, community engagement and the ESG issues facing the asset... At lunch in the mine administration offices, we were joined by a highly engaged and diverse group of graduates and had a lively Q&A session. Notably, the main subject for questioning was around sustainability and environmental stewardship strategy. Great energy in the room."

Sam Laidlaw
Senior independent director

Case study: the depth of our Board's engagement on climate change

Context
Climate change represents an unprecedented challenge for the world and for Rio Tinto. We believe that feasible pathways exist to develop a successful low-carbon economy and, as producers of the materials vital to this transition, we want to be part of the solution.

Governance
Climate change is regularly discussed at the most senior levels of management and by the Board. The Rio Tinto Board is ultimately accountable for our approach to climate change, which is part of our overall sustainability strategy and is embedded in the strategy for the business.

The Board approves our climate policy and sets the Group's ambition and emissions targets. The Sustainability Committee is responsible for monitoring performance against the targets and ensuring operational-level resilience. The Sustainability Committee also has oversight of key sustainability risk areas that may be related to climate change in areas such as biodiversity and water and of the effectiveness of associated controls.

The Board met seven times in 2019 and covered climate change on five separate occasions. The Board aims to become more effective as "conveners of expertise". In February 2019, we invited Lord Adair Turner, Chairman of the Energy Transitions Commission, to speak to the Board. Simon Thompson is also a Commissioner on the Energy Transition Commission.

At the two strategy meetings (in June and September 2019), the Board discussed:

- *The Group's long-term climate change ambition*
- Options for our 2030 carbon emissions targets following detailed analysis of abatement options and offsets
- A potential approach with regard to the emissions from our value chains
- The Group's capabilities to pursue the various components of the climate change strategy framework (see opposite).

The Board also discussed industry association memberships and approved the disclosure of our review of associations' climate policy positions. In November 2019, the Board considered and agreed in principle the long-term ambition, 2030 targets and financing of our climate change initiatives, which are set out in our climate change report.

In addition, in November 2019, Simon Thompson and Megan Clark hosted discussions focusing on climate change with civil society organisations and investors.

"One of our important decisions was to move the responsibility for climate change to the corporate strategy and business development team, which puts the issue at the heart of our business"

Simon Thompson
Chairman

Outcomes
The Board has considered the impact of climate change over the short-term, medium-term and long-term time horizons (see below). The key uncertainties are changes in the regulatory response and the speed of development and adoption of new technologies.

1. Short-term (1 year): this is the timeframe for our annual financial planning
2. Medium-term (2-10 years): our annual strategic planning cycle looks 10 years ahead
3. Long-term (beyond 10 years): this is the timeframe for our long-term outlook and scenario planning

- 76% of our electricity consumption at our managed operations is supplied from renewable sources. 29% reduction in intensity of our operations since 2008.
- Ambition of net zero emissions by 2050.
- Our new 2030 targets for scope 1 and 2 emissions for our managed and non-managed operations (on an equity share basis) are to reduce our emissions intensity by 30% and our absolute emissions by 15%, both from 2018 levels.
- In addition, our overall growth between now and 2030 will be carbon neutral.
- Underpinned by approximately $1 billion estimated spend on climate-related projects over five years.
- Our partnerships to address emissions in the value chain (see below).

Future priorities
As we look to the future, we will continue to take action in four areas:

1. Producing the materials essential for a low-carbon future
2. Reducing the carbon footprint of our operations
3. Partnering to reduce the carbon footprint across our value chain
4. Enhancing our resilience to physical climate risks.

Highlights of our recent progress

2018	Completed the sale of Rio Tinto's remaining coal businesses
2019, February	Rio Tinto joined Energy Transitions Commission
April	Published the annual update of our review of the role of industry associations
May	Supported World Bank launch of Climate-Smart Mining facility
September	– Established our Energy & Climate Centre of Excellence – Carbon Pricing Leadership Coalition published report on carbon pricing and competitiveness – Signed Memorandum of Understanding with Baowu Steel and Tsinghua University
December	Apple purchased the first commercial batch of aluminium from Elysis made without any direct CO_2 emissions in the smelting process
2020, February	Board approval of our 2030 targets for our operational *emissions and our long-term ambition to be net zero* by 2050

Evaluating our performance

An effective board depends on the personal development of individual directors and continuous improvement in the operation of the Board as a whole.

We measure our performance each year by carrying out a formal annual review of the Board, its committees and the chairman.

In 2019, we engaged Lintstock to conduct an externally facilitated, independent evaluation. The evaluation was based on a questionnaire and interview process and covered: Board composition and dynamics; oversight of key stakeholders, strategy and culture; understanding of the external environment; management of meetings, including time allocation and Board support; quality of management information on performance and investment decisions; risk management; effectiveness of succession planning and human resource management; and priorities for change. All Board members and the Group Company Secretary participated in the review. In addition, certain members of the Group Executive were requested to contribute to the review by answering a shorter form questionnaire and conducting an interview. Lintstock is a specialist corporate advisory firm with no other connection to Rio Tinto.

The Board reviewed the evaluation outcome at its November 2019 meeting in Brisbane and agreed an action plan, summarised below. Overall, respondents agreed that the performance of the Board had improved since the last review, and observed a steady improvement in Board dynamics.

Individual assessments

The Chairman is responsible for evaluating the performance of non-executive directors. In 2019, he met each non-executive director to review their views on and contribution to the Board, as well as their training requirements.

The non-executive directors, led by the senior independent director, are responsible for the performance evaluation of the Chairman. The senior independent director met with the non-executive directors and, separately, the executive directors to gather feedback to provide to the Chairman on his performance.

Topic	2019 progress on 2018 actions	Actions for 2020
Board composition / dynamics	The appointments of Hinda Gharbi, Jennifer Nason and Ngaire Woods bring expertise in natural resources, finance, technology, governance and public policy to the Board. Prudent planning was undertaken to begin identifying internal successors for the roles of Chief Executive and Chief Financial Officer.	Preserve more time for informal debate, for example during Board dinners.
Strategy	The involvement of the Board in strategy, the clarity of the Group's strategy and the communication of strategy externally were positively rated, as was the Board's oversight of strategic implementation.	The Board will continue to focus on the following strategic priorities in 2020: – Risk appetite, particularly in the context of growth opportunities in new countries – China – Continued focus on Commercial and markets – People, culture and the Group's operating model – Technology – Resource nationalism – ESG factors including climate change – The Group's licence to operate in key jurisdictions. The Chief Financial Officer will continue to consider an enhanced framework of financial metrics against which the Board can analyse and stress test strategic options, new investments and business plan scenarios. Further involvement of the executive team in strategic discussions.
Board reporting	Overall, the quality of Board documentation received a positive rating, with papers generally viewed as well written and clear.	– Create a template for Board and committee papers to provide greater brevity, clarity and consistency. – Continue to combine and enhance Chief Executive/ Chief Financial Officer reports. – Short presentations to allow more time for discussions of key issues and risks – On key investment decisions, improve discussion of upside / downside risks and alternative strategies – Focused 'teach-ins' on key issues – Shift agendas to focus more on external factors affecting the business.
Stakeholders	The Board's understanding of stakeholders was rated positively overall, although a greater understanding of China was considered desirable. The Board's understanding and oversight of workforce views was assessed as good through the various mechanisms that have been established. Oversight of culture was also rated positively, although the need to ensure that a supportive culture amongst senior management was stressed.	– Engage with customers/suppliers during a Board visit to China – Increase Board engagement with top talent and senior management – Increase engagement with US investors – Increase Board awareness of government views in key countries of operation – Increase engagement with local communities on Board site visits The Board and its committees will continue to utilise external speakers and subject-matter experts to enhance understanding, including of China, climate change and the energy transition. Further workforce engagement initiatives will seek to build understanding, across different jurisdictions, of employee attitudes to work practices and to the company in general.

Directors' attendance at scheduled Board and committee meetings during 2019[1]

	Committee appointments	Board	Audit	Nominations	Remuneration	Sustainability
Chairman and executive directors						
Simon Thompson	N R	7/7		5/5	4/4	
Jean-Sébastien Jacques		7/7				
Jakob Stausholm		7/7				
Non-executive directors						
Megan Clark	N R S	7/7		5/5	4/4	4/4
David Constable	A N	7/7	6/6	5/5		
Ann Godbehere- retired 9 May 2019	A N	3/3	2/2	2/2	2/2	
Moya Greene- retired 26 June 2019	A N R	3/3	2/2	2/2	2/2	
Simon Henry	A N S	7/7	6/6	5/5		4/4
Sam Laidlaw	N R S	7/7		5/5	4/4	4/4
Michael L'Estrange	N S	7/7		5/5		4/4
Simon McKeon- appointed 1 January 2019	A N R	7/7	6/6	5/5	4/4	

1 Outside of the scheduled meetings of the Board and committees for 2019, certain ad hoc meetings took place to consider more urgent matters.

Our plans and priorities for 2020

The Board has identified the following focus areas for 2020:

Focusing on strategy and growth options
- Continue to consider the Group's three- to five-year strategy against a number of different external scenarios and a maturing financial framework
- Seek to identify appropriate growth options for the business, while maintaining the Group's disciplined approach to capital allocation.

Operational excellence and efficiency
- Monitor the Group's operational performance
- Review the Group's technology roadmaps.

Supporting Board dynamics
- Support the on-boarding of the newly appointed non-executive directors
- Continue to enhance relations between executive and non-executive members of the Board, creating an informal, challenging but supportive environment
- Provide support and advice on Group initiatives and emerging issues, including community engagement models, strategic scenario planning, digitalisation and the Group's technology strategy
- Increase Executive Committee involvement in strategic discussions.

Culture, capacity and capability
- Continue to enhance the Board's oversight of culture and behaviours
- Ensure that the Group has the organisational capacity and capabilities to deliver its strategic objectives
- Review the executive and senior management talent pipeline and succession plans
- Consider the Group's employee value proposition.

Stakeholder engagement
- Improve the Board's understanding of key customers and suppliers
- Continue to formalise mechanisms to hear the views of the Group's workforce, and to shape decision-making accordingly.

Training and development
- Continue to enhance the Board's knowledge of Asia, and China in particular
- Conduct deep dives into the Group's commercial (marketing, logistics and procurement) activities and our Aluminium product group
- Teach ins will be organised in 2020 in relation to technology, exploration and closure (with a programme of deep dives into each of the Group's major closure projects).

Nominations Committee report

The Nominations Committee seeks to ensure that the Board has the right mixture of skills, experience and background to enable it to identify and respond appropriately to current and future opportunities and challenges.

It reviews the composition of the Board and leads the process for appointments, making recommendations to the Board as part of succession planning for both non-executive and executive directors. It oversees the development of a diverse pipeline for succession. It approves proposals for appointments to the Executive Committee and monitors the succession plans and talent pipeline for Executive Committee members and their direct reports.

S.R. Thompson

Simon Thompson
Nominations Committee chairman
26 February 2020

Building an inclusive culture
Rio Tinto is committed to promoting behaviours that support an inclusive and diverse workplace and that reflect our values of safety, teamwork, respect, integrity and excellence. This commitment is set out in our global code of conduct, *The way we work*.

The Board leads by example and recognises that it has an important role to play in creating an environment in which all contributions are valued, different perspectives are embraced, and biases are acknowledged and overcome. The Board shares ownership with the Executive Committee of the Group's inclusion and diversity policy, which can be found on the Group's website.

Membership of the Committee
All non-executive directors are members of the Nominations Committee. The Chief Executive and the Human Resources Group Executive are invited to attend all or part of most meetings. The Committee is chaired by the Chairman of the Board, unless the matter under consideration relates to the role of the Chairman.

Appointments to the Board – our policy
We base our appointments to the Board on merit, and on objective selection criteria, with the aim of bringing a range of skills, knowledge, and experience to Rio Tinto. This involves a formal and rigorous process to source strong candidates from diverse backgrounds, and conducting appropriate background and reference checks on the shortlisted candidates. We aim to appoint people who will help us address the operational and strategic challenges and opportunities facing the company now and in the future, and ensure that our Board is diverse in terms of gender, nationality, social background and cognitive style.

We believe that an effective Board provides a range of perspectives, combining the experience of directors who have developed a deep understanding of our business over several years, with the fresh insights of newer appointees. We aim for our Board composition to reflect the global nature of Rio Tinto's business: currently seven different nationalities are represented, including from our major countries of operation. The key skills and experience of our Board are set out on the table on the opposite page.

We only engage recruitment agencies that are signed up to the Voluntary Code of Conduct on diversity best practice and this commitment has underpinned the search criteria for the three new appointments to the Board that we announced in February 2020.

Achieving and maintaining greater female representation on the Board
Last year, we reported that 27% of our Board members were women. This was a significant step towards achieving the recommendations of the Hampton Alexander review that 33% of the Board is comprised of female directors, and our succession planning at this time last year was structured to deliver on this recommendation.

In 2019, we had planned for the recruitment of an additional non-executive director to replace Ann Godbehere, who stood down from the Board in May 2019. In June 2019, Moya Green resigned unexpectedly from the Board, having underestimated the time commitment involved. As a result, we re-doubled our search efforts, appointing two separate search firms, Russell Reynolds Associates and Spencer Stuart to conduct a parallel search for the vacant positions. Neither firm has any other connection with Rio Tinto. As at the end of 2019, there were eight men and one woman on the Board.

On 21 February 2020, we announced the appointment of three new independent non-executive directors to the Board. Hinda Gharbi and Jennifer Nason will join with effect from 1 March 2020. Ngaire Woods CBE will join with effect from 1 September 2020.

Hinda Gharbi is Executive Vice President of Reservoir & Infrastructure at Schlumberger, a position she assumed in February, 2019. She has been on the Schlumberger executive committee for the last three years and has been with the company for 24 years, working in various engineering, functional and line management positions, including health and safety, human resources, technology development and operations across France, Malaysia, Nigeria, Thailand, the United Kingdom and the United States. Hinda has dual Australian-Tunisian nationality.

Jennifer Nason is a Global Chairman at JP Morgan, with over 30 years' experience of corporate finance and capital markets. For the past 17 years, she has led the Technology, Media and Telecommunications global client practice, based in the USA. During her time at JP Morgan, she has also worked in the metals and mining sector team in Australia. Jennifer has dual Australian-US nationality and is a current director and former chair of the American Australian Association.

Ngaire Woods is the founding Dean of the Blavatnik School of Government, Professor of Global Economic Governance and the Founder and Director of the Global Economic Governance Programme at Oxford University. She has been a Fellow of University College, Oxford for the past 17 years. She has also been a visiting lecturer at Harvard University and the Central European University. As a recognised expert in public policy, international development and governance, she has served as an adviser to the African Development Bank, the Asian Infrastructure Investment Bank, the Center for Global Development, the International Monetary Fund and the European Union. She serves on the board of the Stephen A. Schwarzman Education Foundation and as a Rhodes Trustee. Ngaire is a dual New Zealand and British citizen.

The new directors will broaden the experience of the Board, bringing complementary skills and international expertise from diverse backgrounds in natural resources, finance, technology, governance and public policy.

Once the appointments all take effect later this year, we will have achieved the Hampton Alexander recommendation that one third of our Board members are female.

The Group has continued to set measurable gender diversity objectives for the composition of senior management and graduate intake. As part of the Chief Executive's individual objectives for 2020 there is a commitment to improving gender diversity in senior management and operational roles, and to continuing to build an inclusive culture. This forms part of his short-term incentive plan and is cascaded down to the Executive Committee and senior management. Performance by the Chief Executive against his individual objectives is reviewed and agreed by the Board. In 2019, female representation within senior management remained at 22.6% (112 women and 385 men), against a target of 24.4%. We made a significant improvement in the gender diversity of graduates, and the female graduate intake was 54% (against a

target of 50%). For the total workforce population, gender balance improved from 17.7% to 18.4% (7,332 women and 32,628 men). As a Committee, we have reviewed and endorsed the gender diversity objectives for 2020 and we will monitor progress on the programmes and initiatives designed to achieve them. Further information with regard to the performance against the targets set for 2019 and on our 2020 objectives can be found on page 62.

Our Executive Committee is currently 27% female and includes nine different nationalities.

Year in review

Succession planning

The Committee, on behalf of the Board, regularly assesses the balance of executive and non-executive directors, and the composition of the Board in terms of skills, experience, diversity and capacity. We have recently increased to 30 the number of days that we expect non-executive directors to commit to the role.

The way in which we look at succession planning is as follows:

- Long-term Board succession – planning for the refreshment of the Board and its committees
- Ensuring that the Board is sufficiently resilient to take account of unexpected changes
- Executive director succession planning – including internal 'ready-now' candidates from amongst the Executive Committee
- The internal pipeline and external candidates for positions on the Executive Committee
- Succession of the Chairman, senior independent director and committee chairs, taking into account the requirement to be able to demonstrate sufficient experience and time commitment for these roles, and our aim to achieve diversity
- Engagement with key stakeholders on our succession plans.

Our recent Board evaluation exercise considered our succession planning process. As we move forward we will continue to consider the balance of experience and skills on the Board, and ensure that over the longer term there is sufficient mining experience and knowledge of our key jurisdictions. Further details of the Board evaluation are on pages 96 and 97.

Executive Committee succession planning

During 2019, the Committee received regular presentations from the Chief Executive on the composition and performance of the Executive Committee. These updates included detailed consideration of the performance and development requirements of individual members of the Executive Committee, and a review of their direct reports and other high-potential individuals who could become members of the Executive Committee in due course. The discussions included a review of the diversity of the senior management pipeline, and how the approach taken at all levels of seniority can support increased diversity.

Changes to our committees

Following the resignation of Ann Godbehere in May 2019, the Committee agreed to the following appointments:

- Sam Laidlaw was appointed to the role of senior independent director
- Simon Henry was appointed as chair of the Audit Committee.

The Committee undertook a review of committee appointments following the new appointments of Hinda, Jennifer and Ngaire as non-executive directors and made the following recommendations to the Board:

- Hinda will be appointed to the Audit and Sustainability Committees
- Jennifer will be appointed to the Remuneration and Sustainability Committees
- Ngaire will be appointed to the Remuneration and Sustainability Committees.

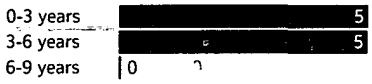
Board re-election and Board composition

Directors are accountable to shareholders. Each director is subject to election by shareholders at the first AGMs after their appointment, and is then required to seek re-election at each year's AGMs.

In planning the composition of the non-executive part of the Board, a balance must be struck between retaining a collective understanding of the company and its business with a progressive refresh of the Board's composition. The tenure of the current non-executive directors (including the Chairman) is shown in the chart below:

Non-executive director tenure

Tenure / number of directors



Skills and experience of the Chairman and non-executive directors

		Subject-matter expert	Key strength	Significant experience	Total
Business leadership	Sustainable success in business at a senior executive level.	–	2	6	8
Capital projects	Experience working in an industry with projects involving large-scale long-cycle capital outlays.	1	3	2	6
Financial	Proficiency in financial accounting and reporting, corporate finance and internal controls, corporate funding, and associated risks.	1	2	3	6
Mergers & acquisitions	Experience in corporate transactions and actions and joint ventures.	2	3	–	5
Global experience	Experience in multiple global locations, exposed to a range of political, cultural, regulatory and business environments.	–	8	1	9
Corporate governance	Experience with a major organisation that demonstrates rigorous governance standards.	–	6	1	7
Government and International relations	Interaction with government and regulators and involvement in public policy decisions.	2	–	2	4
HSSE/ESG	Familiarity with issues associated with workplace health and safety, asset integrity, environment and social responsibility, and communities.	–	5	2	7
Marketing	Senior executive experience in marketing, and the development of product and/or customer management strategies.	–	–	2	2
Mining	Senior executive experience in a large, global mining organisation involved in the discovery, acquisition, development and marketing of natural resources.	–	3	–	3
HR/Remuneration	Understanding the link between strategy, performance and remuneration outcomes.	–	1	4	5
Technology/Digital	A strong understanding of technology and innovation, and the development and implementation of initiatives to enhance production.	–	3	–	3

This data takes account of the appointments of Hinda Gharbi, Jennifer Nason and Ngaire Woods announced on 21 February 2020.

Audit Committee report

I am pleased to present my first report on the activities of our Audit Committee having succeeded Ann Godbehere, who stepped down as the chair of the Committee after the 2019 AGM.

2019 was a busy year for the Committee. In addition to our continued focus on financial reporting and the framework for internal control and risk management, we spent considerable time on the accounting treatment and external disclosures related to our Oyu Tolgoi underground project in Mongolia.

In July 2019, we announced an impairment charge to the carrying value of the project, reflecting potential changes in the project cost and schedule. Oyu Tolgoi is set to become one of the largest copper mines in the world, and is a huge and highly complex development project. The Committee held three additional meetings in the first half of 2019 to ensure we sufficiently understood the geotechnical complexity of the project in order to reach our accounting judgement on the impairment assessment and disclosures. I am grateful to my Committee colleagues for their time and diligence on this important matter, and to management for the quality of analysis provided to support the assessment.

We announced in 2018 that KPMG would succeed PwC as the Group's auditors following completion of the 2019 audit. The Committee has carefully monitored the orderly transition as KPMG have shadowed the half-year and year-end audits during 2019. I would like to record my thanks to PwC for the high quality audit service they have provided to Rio Tinto over the years.

The Committee has also continued to closely follow regulatory developments in the UK audit market, in particular in relation to the Kingman, Brydon and CMA reviews. While the three reviews address different questions, they share a common aim in promoting high quality audits and restoring public trust and confidence in the statutory audit function. We support that objective, and will continue to engage with the review processes to try to ensure that any recommended changes help to achieve it.

I would like to record my sincere thanks to Ann Godbehere for her excellent stewardship of this Committee, and also to Moya Greene who stepped down as a director, and member of the Committee, in June 2019. I am also extremely grateful to David Constable and Simon McKeon for the support they have given me in this, my first year as chair of the Committee.

Simon Henry
Audit Committee chairman
26 February 2020

Membership
The members of the Committee are all non-executive directors. Each was, at all times, independent and free of any relationship that would affect their impartiality. You can find biographies of the current Committee members on pages 84 and 85. The Chairman of the Board is not a member of the Committee.

As Rio Tinto's securities are listed in Australia, the UK and the US, we follow the regulatory requirements and best practice governance recommendations for audit committees in each of these markets.

Australian listing requirements
In Australia, the members, and the Committee as a whole, meet the independence requirements of the ASX Principles. Specifically, the Committee members between them have the accounting and financial expertise and a sufficient understanding of the industry in which the company operates to be able to discharge the Committee's mandate effectively.

UK listing requirements
In the UK, the members meet the requirements of the FCA's Disclosure Guidance and Transparency Rules, and the provisions of the Code relating to audit committee composition. Simon Henry, the chair of the Committee, is considered by the Board to have recent and relevant financial experience. Simon Henry and David Constable both have extensive prior experience of the natural resources sector. Simon McKeon has gained experience of the mining sector by serving on the Board and on the Committee, and through regular site visits, reports and presentations. The Committee as a whole has competence relevant to the sector in which the company operates.

US listing requirements
In the US, the requirements for the Committee's composition and role are set out in SEC and NYSE rules. The Board has designated Simon Henry as an "audit committee financial expert". The Board also believes that the other members of the Committee are financially literate by virtue of their wide business experience.

Induction for new members
New members receive a tailored induction. As part of his induction, Simon McKeon met the Group Financial Controller, the heads of Group Internal Audit, Ethics & Integrity and Investor Relations, as well as the lead audit engagement partners in the UK and Australia. He also took part, with other Committee members, in teach-ins on new accounting standards, and on the process for measuring and reporting on mineral resources and ore reserves.

Committee remit
The Committee's objectives and responsibilities are set out in our terms of reference (see the Rio Tinto website). These follow the relevant best practice recommendations in Australia, the UK and the US.

Our main duties are:
- Financial reporting – we review the key judgments needed to apply accounting standards and to prepare the Group's financial statements. We also review the narrative reporting that goes with these, with the aim of maintaining integrity in the Group's financial reporting. Finally, we monitor any exclusions made in deriving alternative (non-GAAP) performance measures such as underlying earnings.
- External audit – we oversee the relationship with the external auditors and review all the non-audit services they provide, and the fees for these, to safeguard the auditors' independence and objectivity. We also assess the effectiveness of the external audit and, when necessary, carry out a formal tender process to select new auditors.
- Framework for internal control and risk management – we monitor the effectiveness of the Group's internal controls, including those over financial reporting. We also oversee the Group's risk management framework.
- Group Internal Audit (GIA) – we oversee the work of GIA, and its head, who reports functionally to our Committee chair.
- Ethics and integrity – we oversee the work of the Group's Ethics & Integrity function.

These duties feed into an annual work plan that ensures we consider issues on a timely basis. The Committee has authority to investigate any matters within our remit. We have the power to use any Group resources we may reasonably require, and we have direct access to the external auditors. We can also obtain independent professional advice at the Group's expense, where we deem necessary. No such advice was required during 2019.

The Committee chairman reports to the Board after each meeting on the main items discussed, and the minutes of our meetings are circulated to the Board.

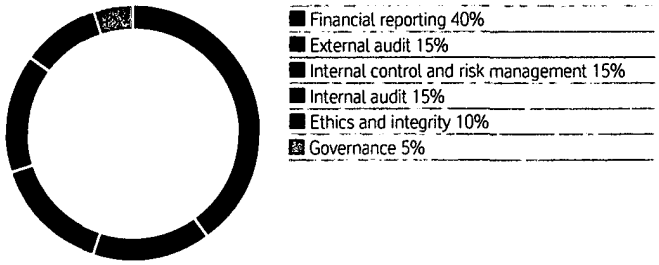
We had six regular meetings in 2019, plus four additional meetings. Of the additional meetings, three related to the Oyu Tolgoi underground project, and one to the transition of external auditor. Attendance at these meetings is included in the table on page 97. The Committee has met twice to date in 2020.

The Chairman of the Board, the Chief Financial Officer, the Group financial controller and the heads of GIA, Ethics & Integrity and Risk regularly attend our meetings, as do the Group General Counsel and the Group Company Secretary. We invite other senior executives and subject-matter experts as needed.

The external auditors were present at all of the scheduled Committee meetings during the year, and at all but one of the additional meetings. The auditors review all materials on accounting or tax matters in advance of each meeting, and their comments are included in the papers circulated to Committee members. The audit partners also meet with our Committee chair ahead of each meeting to discuss key issues and raise any concerns.

The Committee meets regularly in private session. We also hold regular private discussions with the Chief Financial Officer, the heads of GIA and Ethics & Integrity, and the external auditors. Management do not attend these sessions. The Committee chair also has regular contact and discussions with these stakeholders outside the formal meetings.

Use of Committee meeting time in 2019



Other focus areas in 2019

In addition to our scheduled workload, the Committee also considered:

- An annual review and benchmarking of Rio Tinto's accounting policies and an overview of newly issued IFRS standards and interpretations
- An independent third party review of Rio Tinto's cyber security posture and resilience and the management response to the key findings and recommendations
- A summary of the key financial measures relating to the Group's pension plans and the factors affecting those figures
- A 'teach-in' on the process for measuring Mineral Resources and Ore Reserves and for their public reporting under the Joint Ore Reserves Committee Code (described on page 94)
- After a robust process, in early 2020 the Committee recommended to the Board that the draft 2019 Annual report is, taken as a whole, fair, balanced and understandable.

We also reviewed the quality and effectiveness of the Group's internal control and risk management systems with members of the Sustainability Committee, who oversee a number of key corporate risks. This review included the effectiveness of the Group's internal controls over financial reporting, and the Group's disclosure controls and procedures in accordance with sections 404 and 302 of the US Sarbanes-Oxley Act 2002. The Committee also considered reports from GIA and PwC on their work in reviewing and auditing the control environment.

Significant issues relating to the financial statements

There were four significant issues considered by the Committee in relation to the financial statements:

Matters considered	Conclusion
Review of carrying value of cash-generating units and impairment charges/reversals	The Committee assessed management's determination of cash-generating units, review of impairment triggers and consideration of potential impairment charges and reversals over the course of the year. For cash-generating units where impairment indicators were identified (Oyu Tolgoi and Yarwun alumina refinery), the Committee considered the key judgments made by management in relation to discount rates, forecasted commodity prices and specifically for Oyu Tolgoi the range of mine design options. The Committee reviewed disclosures related to impairment reviews in note 6 and the impairment charges of $1.7 billion.
Application of the policy for items excluded from underlying earnings	The Committee reviewed the Group's policy for exclusion of certain items from underlying earnings and confirmed the consistent application of this policy year on year. The items excluded from underlying earnings comprised income of $0.1 billion and expenses of $2.5 billion. A reconciliation of underlying earnings to net earnings is presented in note 2.
Estimate of provision for closure, restoration and environmental obligations	The Committee reviewed the significant changes in the estimated provision for closure, restoration and environmental obligations by product group and legacy management. The Committee received an update on the closure cost estimate for Rio Tinto Kennecott, where this major pre-feasibility study has been ongoing for more than three years. At 31 December 2019, the Group's balance sheet included provision for close-down, restoration and environmental obligations of $11.1 billion as described in note 26.
The Group's tax exposures	The Committee considered management's assessment of the Group's tax exposures, including the recoverability of deferred tax assets which are uncertain due to the timing of expiry of tax loss carry-forwards in certain jurisdictions. The Committee received updates on the status of ongoing discussions with the Australian Tax Office relating to the transfer pricing of certain transactions with the Group's commercial centre in Singapore and considered the appropriateness of provisions for uncertain tax positions.

Audit Committee report continued

Contact with regulators
During the year, the Company engaged with the FRC's Corporate Reporting Review team in relation to disclosures made in respect of the Oyu Tolgoi cash-generating unit in previous years. Management's written responses were reviewed by the Committee chairman and discussed with the external auditors. In reporting the Oyu Tolgoi impairment charge in the interim financial statements to 30 June 2019, we considered this feedback and extended the disclosure to include description of the mineral resources contributing to the assessment of recoverable amount. In August 2019, the FRC wrote again to the Company confirming that their enquiries, based on a limited scope review of the Annual report and Accounts on this matter, had been satisfactorily concluded.

External auditors
Engagement of the external auditors
For the current financial year, PwC remain our auditors. The UK entity of PwC audits Rio Tinto plc, and the Australian entity audits Rio Tinto Limited. The UK audit engagement partner, Paul Barkus, was appointed in 2016, and the Australian partner, Debbie Smith, was appointed in 2017.

This year, as usual, we agreed the scope of the auditors' review of the half-year accounts, and of their audit of the full-year accounts taking into consideration the key risks and areas of material judgment for the Group. We also approved the fees for this work and the engagement letters for the auditors.

Safeguarding independence and objectivity, and maintaining effectiveness
In our relationship with the external auditor we need to ensure that they retain their independence and objectivity, and to be effective in performing the statutory audit.

Use of the external auditors for non-audit services
The external auditors have significant knowledge of our business and of how we apply our accounting policies. That means it is sometimes cost-efficient for them to provide non-audit services. There may also be confidentiality reasons that make the external auditors the preferred choice for a particular task.

However, safeguarding the external auditor's objectivity and independence is an overriding priority. For this reason, and in line with the FRC's Ethical Standard, the Committee ensures that the external auditors do not perform any functions of management, undertake any work which they may later need to audit or rely upon in the audit, or serve in an advocacy role for the Group.

We have a policy governing the use of the auditors to provide non-audit services. The cap on the total fees that may be paid to the external auditors for non-audit services in any given year is 70% of the average of the audit fees for the preceding three years. This is in line with the FRC's Ethical Standard. Non-audit assignments fall into two broad categories:
- Audit, audit-related or other "pre-approved" services where we believe there is no threat to auditors' independence and objectivity, other than through the fees payable.
- Other services that have not been "pre-approved".

We apply different approval regimes to these areas of work. Approval of "pre-approved" services is as follows:
- Up to $50,000 – subject to prior notification to management, this work can be awarded.
- From $50,001 to $100,000 – requires the Chief Financial Officer's approval.
- Over $100,000 and with a tender process – if the external auditors are successful in the tender, the appointment requires the Chief Financial Officer's approval.
- From $100,001 to $250,000 without a tender process – requires the Chief Financial Officer's approval.
- Over $250,000, without a tender process – requires the Committee's or Committee chair's approval.

In each case, the nature of the assignment and the fees payable are reported to the Committee.

The Chief Financial Officer can approve other services that are not "pre-approved" up to the value of $50,000 and an aggregate value of no more than $100,000. Fees exceeding $100,000 in aggregate require approval from the Committee or the Committee chair.

At the half-year and year-ends, the Chief Financial Officer and the external auditors report to the Committee on non-audit services performed and the fees payable.

All of the non-audit services provided by PwC in 2019 were either within the predetermined approval levels or approved by the Committee. We are satisfied that the provision of non-audit services by PwC in accordance with this procedure is compatible with the general standard of independence for auditors and the other requirements of the relevant Australian, UK and US regulations.

Fees for audit and non-audit services
The amounts payable to the external auditors, PwC, in each of the past two years were:

	2019 $m	2018 $m
Audit fees	**16.4**	16.7
Non-audit fees:		
Assurance services	**2.7**	4.2
Taxation services	**0.1**	0.0
All other fees	**0.0**	0.2
Total non-audit fees	**2.8**	4.4
Non-audit: audit fees (in-year)	**17%**	26%

For further analysis of these fees, please see note 39.

None of the individual non-audit assignments was significant, either in terms of the work done or the fees payable. We have reviewed the non-audit work in aggregate. We are satisfied that neither the work done, nor the fees payable, compromised the independence or objectivity of PwC as our external auditors.

Independence of the external auditors
PwC are required to provide a declaration to the directors in relation to their compliance with the independence requirements of the Australian Corporations Act 2001 and the professional code of conduct for external auditors. A copy of this is on page 257.

No person who served as an officer of Rio Tinto during 2019 was a director or partner of PwC at a time when they conducted an audit of the Group.

Effectiveness of the external auditors
We reviewed the effectiveness of PwC as auditors at our meeting in June 2019. We considered the results of a survey containing questions on PwC's objectivity, quality and efficiency. It was completed by a range of operational and corporate executives across the business, and by Committee members. The overall rating of PwC's effectiveness was positive.

Appointment of the auditors
As announced in June 2018, subject to shareholder approval, KPMG LLP will be appointed as Rio Tinto plc's external auditors and KPMG will be appointed as Rio Tinto Limited's external auditors with effect from the 2020 financial year. These appointments will be proposed as a joint resolution at the 2020 AGMs, with a separate resolution seeking authority for the Committee to determine the external auditors' remuneration.

Risk management and internal controls
We review Rio Tinto's internal control systems and the risk management framework. We also monitor risks falling within our remit, especially those relating to the integrity of financial reporting. A summary of the business's internal control and risk management systems, and of the principal risks and uncertainties we face, is in the Strategic report on pages 74 to 80.

Importantly, responsibility for operating and maintaining the internal control environment and risk management systems sits at asset level. Leaders of our businesses and functions are required to confirm annually: that adequate internal controls are in place; that these are operating effectively and are designed to identify any failings and weaknesses that may exist; and that any required actions are taken promptly.

Two management committees, the Executive Committee and the Disclosure Committee, review reports on the Group's control framework. The work they do satisfies the relevant requirements of the Code, the ASX Principles, the NYSE Standards and section 404 of the US Sarbanes-Oxley Act 2002.

GIA runs an annual testing programme on the internal control environment, and presents its findings to the Audit Committee, Sustainability Committee and the Executive Committee.

The Audit Committee also regularly monitors our risk management and internal control systems (including internal financial controls). We aim to have appropriate policies, standards and procedures in place, and ensure that they operate effectively.

As part of considering the risk management framework, the Committee receives regular reports from the Group financial controller, the General Counsel and the head of Group Tax on material developments in the legal, regulatory and fiscal landscape in which the Group operates.

The Board, supported by the Audit Committee, has completed its formal annual review of the effectiveness of our risk management and internal control systems. This review included consideration of our material financial, operational and compliance controls. The Board concluded that the Group has an effective system of risk management and internal control.

Internal control over financial reporting
The main features of our internal control and risk management systems in relation to financial reporting are explained on pages 142 and 143.

Internal audit
Programme structure
GIA provides independent and objective assurance of the adequacy and effectiveness of risk management and internal control systems. It also may recommend improvements.

While the head of GIA reports administratively to the Chief Executive, appointment to, or removal from, this role requires the consent of the Audit Committee Chair. The head of GIA is accountable to the chairs of both the Audit and Sustainability Committees, communicates regularly with both, and attends all regular committee meetings. Our GIA team therefore operates independently of management. Their mandate is set out in a written charter, approved by the Audit Committee. GIA uses a formal internal audit methodology, which is consistent with the Institute of Internal Auditors (IIAs) internationally- recognised standards.

When needed, the team brings in external partners to help achieve its goals. There is a clear policy to address any conflicts of interest, which complies with the IIA's standards on independence. This policy identifies a list of services which need prior approval from the head of GIA.

Governance of the annual plan
Each year's internal audit plan is approved by the Audit Committee and the Sustainability Committee. The plan is focused on higher-risk areas and any specific areas or processes chosen by the Committees. It is also aligned with any risks identified by the external auditors. Both committees are given regular updates on progress, including any material findings, and can refine the plans as needed.

Effectiveness of the internal audit programme
The Audit Committee monitors the effectiveness of the GIA function throughout the year, with updates on performance at every meeting.

We are satisfied that the quality, experience and expertise of GIA is appropriate for the business and that GIA was objective and performed its role effectively. We also monitored management's response to internal audits during the year. We are satisfied that improvements are being implemented promptly in response to internal audit findings, and believe that management supports the effective working of the internal audit function.

Ethics, integrity and the whistleblowing programme
The business has a long-established ethics programme, known as *The way we work*, supported by a whistleblowing programme branded as "Talk to Peggy". The whistleblowing programme enables employees, in confidence, to raise concerns about possible improprieties.

The head of Ethics & Integrity attended two of our Committee meetings during 2019. His reports covered a broad range of areas, including ethics, regulatory and compliance issues.

Committee effectiveness
The Committee reviews its effectiveness annually, In 2019, this was accomplished through an independent, externally facilitated evaluation of the Board and its Committees.

The performance of the Audit Committee was highly rated, with no areas of concern raised. In terms of improvements, it was agreed that the Committee's programme should continue to develop to ensure an appropriate focus on risk management and risk appetite. While the current composition of the Committee was found to be good, it was felt an additional member would be beneficial.

Audit transition
Following a tender process in the first half of 2018, the Committee recommended the appointment of KPMG to replace PwC as our external auditors with effect from the 2020 financial year. Their appointment will be subject to the approval of shareholders at our upcoming AGMs.

In July 2019, KPMG confirmed to the Committee that they had exited all prohibited services with the Group and formally declared their independence.

During 2019, the Committee has overseen activities to prepare and plan for the transition in time for the 2020 half year review. This has included extensive interaction between management and the KPMG team to help them build their knowledge of the group and develop their audit plan. KPMG partners and teams have visited a number of operations and group locations and held a two day global planning workshop in London. In parallel, KPMG have shadowed PwC through the 2019 half year review and 2019 audit and begun their review of PwC's audit files. They have also attended a number of Audit Committee meetings. Detailed planning and preparation work will continue through 2020.

Sustainability Committee report

Our business's long-term future is inextricably linked to our responsibility to our people, our communities and the global environment in which we operate.

The role of the Sustainability Committee is to support the board in promoting and monitoring Rio Tinto's fulfilment of this responsibility. I thank the members of the Committee, Sam Laidlaw, Simon Henry and Michael L'Estrange, for their support.

The Committee oversees the Group's integrated approach to sustainability. This approach has three pillars: running a safe, responsible and profitable business; collaborating with others to enable long-term benefits where we operate; and helping to pioneer a more sustainable future. We do this by monitoring the Group's performance on health, safety, environment, asset security, and communities, including human rights. We set the governance framework for the oversight of these important areas, and we monitor management's progress on each of them. We review how management assesses the Group's most material sustainability risks, and the associated controls and mitigating actions deployed by management for those risks.

In this way, the Committee helps support the sustainable development of Rio Tinto's businesses, as well as Rio Tinto's contribution to both local and global sustainable development.

Safety of our people remains our first priority. In 2019, this commitment saw a continued improvement across key safety metrics, most importantly delivering a year where we experienced zero fatalities. However, the Committee recognises that there is no room for complacency. Our teams at every site are dedicated to eliminating fatalities in our business. This has meant over one million verifications to check that controls were in place to address our critical risks and prevent an incident or injury occurring. I commend our teams and thank them on behalf of the Committee for their efforts and dedication. The Committee also recognises that we must continue to embed critical risk management, and learn from both actual and potential significant incidents to prevent them happening again.

This year we have prioritised deep dives into our control frameworks for the management of the risks of underground safety, process safety and health risks in the business. The Committee has maintained a vigilant oversight of our controls in place for tailings dams and water storage. We received further updates on our certification and assurance processes for our tailings and waste water facilities at all current and legacy sites. A tailings validation taskforce was established, which oversaw a programme of technical risk reviews of the Group's facilities.

Other areas of focus for the Committee in its monitoring of Rio Tinto's impacts on the local environments in which we operate have been the development of Rio Tinto's closure strategy and risk framework, and oversight of the next phase of our water stewardship targets. The Committee also reviewed progress on the Group's Communities and Social Performance strategy implementation, and our approach to understanding and monitoring the impacts our operations have on our communities.

We are committed to being part of the solution on climate change and the transition to a low-carbon future. The bushfires in Australia this year have been a stark reminder of the impact that human actions are having on the climate. The Committee supports the Board in its strategic response to climate change and in monitoring the Group's performance against our targets and aspirations. We have made good progress, with 76% of the Group's electricity coming from renewable energy sources in 2019 and our portfolio repositioned to focus on the resources of the future. However, we recognise there are significant challenges, such as the long-term energy supply in parts of our business, and the pathways for low-carbon steel production. We are committed to being open about our own performance and strategies in addressing these challenges. To that end, in 2019 the Committee oversaw the publication of our climate change report and the completion of abatement curves for each of our assets to guide investments that will support a transition to a low-carbon future, and to inform our targets. Following completion of this work, the Board has approved a new ambition to reach net zero emissions by 2050. We have also set new emissions targets: to reduce absolute emissions by 15% by 2030 and emissions intensity by 30% over the same period. Rio Tinto will spend around $1 billion over five years in emissions reduction projects, research and development, and activities to enhance the climate resilience of our business.

In 2019, your directors visited our Kennecott Copper Mine in Utah, our Aluminium operations in the Saguenay in Quebec, and the Yarwun alumina operations and Boyne smelters in Gladstone, Queensland. These visits gave directors valuable insights into how the Group's focus on safety and the local environments in which we operate is implemented in practice.

We listen to our stakeholders to understand their evolving priorities. Simon Thompson and I met with various non-government and civil society organisations in Australia to ascertain their priorities and concerns. This work has assisted us in developing our sustainability strategies, and in enhancing our disclosure on Rio Tinto's sustainability practices and key risks.

Megan Clark
Sustainability Committee chairman
26 February 2020

Our key responsibilities

The purpose of the Sustainability Committee is to promote, support and monitor the sustainable development of Rio Tinto's businesses, as well as Rio Tinto's contribution to the sustainable development of the communities and countries in which we operate, and to global sustainable development.

The Committee does this by overseeing, on behalf of the Board, key sustainable development areas including in particular health, safety, environment (including climate change, and closure and legacy management), asset security, and relationships with communities (including human rights of communities, employees, and contractors; and sustainable development issues as they relate to suppliers and supply chains). In relation to these important areas we oversee Rio Tinto's performance, monitor Rio Tinto's compliance with its responsibilities and commitments, and review the effectiveness of controls designed to manage the associated risks.

The Committee has the authority and access to resources to investigate all matters falling within its terms of reference. These terms of reference are published on the Rio Tinto website, and feature a full list of our responsibilities, which include:

- Reviewing the Group's relevant policies, and overseeing the management processes designed to ensure compliance with them.
- Monitoring management's commitment to the behaviours required by those policies and standards.
- Assessing the Group's health, safety, security, environment and communities framework.
- Reviewing reports from management on fatalities and other serious incidents, considering recommendations for improvement, and receiving follow-up reports on their implementation.
- Reviewing the measures for the safety component of the short-term incentive plans for the executive team, and assessing performance against them, making recommendations to the Remuneration Committee as a result.

- Reviewing and approving the proposed annual plan for independent audit and assurance projects within our scope, and reviewing their outcomes and recommendations.
- Carrying out a formal review each year of the role and responsibilities of our Committee, its organisation and effectiveness, and its terms of reference.

Our year in review
We met four times in 2019, covering a wide range of activities, which are summarised below.

Health and safety
Recognising that we must continue to learn from both actual and potential significant incidents to prevent them happening again, the Committee examined the circumstances leading to, and key learnings from, the following incidents in 2019:
- A fire in January at the screen house at our Cape Lambert A port facility in the Pilbara
- An incident in March on the railway mainline of the Iron Ore Company of Canada in which a rail maintenance worker suffered a permanent disabling injury
- A potentially fatal incident in March in which two technicians were trapped inside a reactor at a gas treatment centre at the Kitimat aluminium smelter in British Columbia, Canada.

Other work relating to health and safety undertaken by the Committee this year included:

- Overseeing a review of the control framework for the management of the risk of a major underground safety event
- Overseeing the expansion of critical risk management implementation through the introduction of the Safety Maturity Model
- Reviewing strategies to manage and minimise exposure to per- and poly-fluroroakyl substances (PFAS) at Rio Tinto sites
- Receiving a report on the safety improvement efforts within the Copper and Diamonds product group
- Monitoring the progress of an independent study undertaken by the University of Manchester at the request of Rio Tinto to investigate concerns about a potential increased risk of cancer in the Rössing Uranium Mine mine workforce
- Reviewing the implementation of key recommendations from the 2018 review of the process safety control environment
- Reviewing the outcomes of the Group's 2018 short-term incentive plan in relation to safety, and the design for the 2019 targets.

We also assessed Rio Tinto's safety and health performance compared with mining industry peers within the ICMM, and peers with comparable risk profiles across other industries. This demonstrated that safety strategy is aligned with industry best practice and our performance on occupational illness rates is on a par with our ICMM peers.

Environment, including climate change
In addition to the work the Committee has done in monitoring the progress of our tailings validation taskforce, our work supporting the Board on environmental and climate change issues has included the following:
- We received an update on the development of Rio Tinto's water stewardship targets for 2019-2023, being the third set of global water targets for Rio Tinto, since reporting against water targets commenced in 2008. We also reviewed our water disclosures.
- We monitored progress against our climate change targets, commissioned reports on investor trends, and reviewed and oversaw the publication of Rio Tinto's first climate change report.
- We received a presentation on the long-term implications of climate change for the mining sector.

Communities and social performance
We continued to provide oversight of the Group's communities and social performance strategy, with a particular focus on relationships with communities and human rights, including in our supply chains.

We supported the Board in its review of our 2018 modern slavery statement.

Some of the initiatives we have overseen in relation to human rights, and the work being done to contribute to our local communities, is set out in the Sustainability section on pages 60 to 70 of this report.

Closure and remediation
We received an overview of the development and execution of Rio Tinto's strategy and risk framework for closure, and received an update on important works being progressed at selected closure assets.

Governance, assurance and disclosure
Each year, we review the Group's key risks associated with health, safety, security, environment, and community and social performance.

We reviewed and approved the Group's assessment of its most material sustainability topics, a process which combines feedback from internal leaders and subject-matter experts, and considers stakeholder expectations as well as an analysis of the external environment.

The Committee sees transparency as an important part of Rio Tinto's approach to sustainability, and we encourage disclosure of sustainability related information both proactively and in response to regulatory requirements.

Our other work included:
- Reviewing the 2018 Sustainable development report, the Sustainable development sections of the 2018 Annual report, and Rio Tinto's 2018 slavery and human trafficking statement.
- Overseeing implementation of changes to Rio Tinto's operating model for the health, safety, environment and security functions.
- Receiving a report on the annual review of Rio Tinto's whistleblowing programme and, in particular, an examination of the data on claims related to issues directly concerned with sustainability.
- Evaluating the Committee's performance and reviewing its scope and responsibilities as reflected in its terms of reference.

Use of Committee meeting time in 2019

This illustration does not include time spent by the Committee on administrative items or attending site visits.

Our process
The Chairman of the Board, the Chief Executive, the Global Head of HSES, the Corporate Relations Group Executive and the Group General Counsel regularly attend our meetings.

The Committee chair reports to the Board after each meeting, and our minutes are tabled before the Board. All directors have access to the Committee's papers.

Our sustainable development strategy and performance are described in detail on pages 60 to 70 of this report as well as in our climate change report, which can be found on our website.

Compliance with governance codes and standards

Application of and compliance with governance codes and standards
This section sets out our compliance with the applicable governance codes and standards. As our shares are listed on both the Australian and London Securities/Stock Exchanges, we set out how we have complied with the codes and standards governing those bodies on the following pages:
- London Stock Exchange – UK Corporate Governance Code (2018 version) (the UK Code), see pages 106 to 108.
- Australian Securities Exchange – ASX Corporate Governance Council's Corporate Governance Principles and Recommendations (3rd edition) (the ASX Principles), see pages 108 to 109.

In addition, as explained within the Chairman's governance review, as a foreign private issuer (FPI) with American Depository Receipts (ADRs) listed on the New York Stock Exchange (NYSE), we need to report any significant corporate governance differences from the NYSE listing standards.

Statement of compliance with the Code and ASX Principles
Throughout 2019 and as at the date of this report, the Group has applied the Principles of the UK Code and the ASX Principles. The UK Code is available at **www.frc.org.uk**, and the ASX Principles at **www.asx.com/au**. For the purposes of ASX Listing Rule 4.10.3 and the ASX Principles, pages 84 to 109 of this report form our "Corporate Governance Statement". This statement is current as at 26 February 2020, unless otherwise indicated, and has been approved by the board. Corporate governance documents and policies referenced can be found at **riotinto.com/invest/corporategovernance**.

We have complied with all relevant provisions of the UK Code throughout 2019.

Difference from NYSE listing standards
We have reviewed the NYSE Standards and consider that our practices are broadly consistent with them, with the following exceptions where the literal requirements of the NYSE Standards are not met due to differences in corporate governance between the US, UK and Australia:
- The NYSE Standards state that companies must have a nominating/ corporate governance committee composed entirely of independent directors which, in addition to identifying individuals qualified to become board members, develops and recommends to the board a set of corporate governance principles applicable to the company. Our Nominations Committee comprises the Chairman and independent non-executive directors, information about which is set out on pages 98 to 99. This Committee does not develop corporate governance principles for the board's approval. The board itself develops such principles.
- Under US securities law and the NYSE Standards, the company is required to have an audit committee that is directly responsible for the appointment, compensation, retention and oversight of the work of external auditors. While our Audit Committee makes recommendations to the board on these matters, and is subject to legal and regulatory requirements on oversight of audit tenders, the ultimate responsibility for the compensation of the external auditors and the appointment of the external auditors of Rio Tinto rests with the shareholders.
- Under US securities law and the NYSE Standards, an audit committee is required to establish procedures for the receipt, retention and treatment of complaints regarding accounting, internal accounting controls and audit matters. The whistleblowing programme enables employees to raise any concerns confidentially or anonymously. The board has responsibility to ensure that the programme is in place and to review the reports arising from its operations.

The UK Code
Board leadership and company purpose
A. Making the board effective
Our board provides effective and entrepreneurial leadership. It is collectively responsible for the stewardship and long-term success of the Group. There is a framework of prudent and effective controls that enable risk to be assessed and managed. The Chairman's governance statement on pages 88 to 89 sets out how we assess our impact on wider society. See page 91 for the key activities undertaken by the board during the year and the factors that were considered when making decisions. In 2019, the board undertook an externally facilitated effectiveness review and details of this are provided on pages 96 to 97 of the Governance report.

B. The company's purpose, values and strategy and alignment with culture
Through our *The way we work* framework, the board sets the company's purpose, values, and standards for the Group's employees. The board is committed to acting in accordance with these values, championing, and embedding these in the organisation. The board considers how the culture of the company is aligned with these values and standards. How this is achieved is explained in detail on pages 8 to 9, 88 to 89 and 92 to 93.

C. Company performance and risk management
The board leads the development of long-term investment plans for the company. It aims to make good quality decisions at the right time, to achieve the company's objectives, in alignment with our purpose, values and strategy. The role of the board in establishing and monitoring the internal control environment is set out in the Audit Committee report on pages 100 to 103. The way in which the company manages risk is set out on pages 71 to 73. For information on the delegation of business to management please refer to pages 86 to 87.

The formal schedule of matters reserved for the board's decision, available on our website, covers areas including: setting the Group's purpose and strategic vision; monitoring performance of the delivery of the approved strategy; approving major investments, acquisitions and divestments; the oversight of risk and the setting of the Group's risk appetite; and reviewing the Group's governance framework.

D. Stakeholder engagement
The Chairman undertakes regular engagement with our major shareholders, in addition to that carried out by the Chief Executive, the Chief Financial Officer and investor relations team. The committee chairs also engage with their relevant stakeholders and details of this engagement is provided in each of the committee reports. We have mapped our key stakeholders and continually work to understand their views and we take account of our responsibilities to our stakeholders when making business decisions. We explain more about this in our section 172 (1) statement, set out on on page 92 to 93.

Details of how the board undertakes workforce engagement are set out on page 92. The board as a whole is responsible for workforce engagement. Information on workforce engagement is therefore reported to the board and engagement activities are undertaken either by the full board (such as employee town halls or AGMs) or by individual directors. Our directors are geographically diverse and this allows us to engage with a greater number of employees on an ongoing basis. As we have not selected one of the methods in the UK Code, we have explained on page 92 why our arrangements are effective and appropriate for Rio Tinto. We will continue to review that they are effective.

At the 2019 AGM Resolution 19 'Authority to purchase Rio Tinto plc shares' was passed with less than 80% of votes in favour and Shining Prospect (a subsidiary of the Aluminium Corporation of China ("Chinalco")) voted against. Chinalco has not sold any Rio Tinto plc shares and now has a holding of over 14% given its non-participation in Rio Tinto's significant share buy-back programmes over the last three years. This places Chinalco close to the 14.99% threshold agreed with the Australian government at the time of Chinalco's original investment in 2008. An update was given in the Interim financial statement provided on 1 August 2019, which was within the six month period.

E. Our workforce policies and practices
Workforce Group policies are approved by the board. All the policies relating to our workforce take account of the global nature of our company. Our whistleblowing process is overseen by the board and every member of the workforce has access to the 'Talk to Peggy' programme and details of this programme are on page 68. The Treasury Laws Amendment (Enhancing Whistleblower Protections) Bill 2018 came into effect in Australia in July 2019 and given the global nature of the company, the whistleblowing processes were reviewed to ensure compliance. Additional training was given to the relevant members of the workforce.

Division of responsibilities

F. The role of the Chairman

The Chairman leads the board and is responsible for its overall effectiveness. He was independent on the date of his appointment. He recognises the importance of creating a boardroom culture which encourages openness and debate and ensures constructive relations between executive and non-executive directors. Further information on how this influences the board's decision-making, can be found in *How the board works* on page 90.

The Chairman is responsible for: the management of the board and its committees; director performance; induction; training and development; succession planning; engagement with external stakeholders and attendance by the board at shareholder meetings. The Chairman is supported by the senior independent director, the Group company secretary and the Chief Executive. The senior independent director is responsible for acting as a sounding board for the Chairman and engages with shareholders to develop a balanced understanding of their interests and concerns. For further details, please see our *Board Charter* which sets out the role, responsibilities, structure, compositions and conduct of the board, as well as the role of the Chairman, the senior independent director and the Chief Executive – **riotinto.com/en/invest/corporate-governance/board-governance**.

G. Composition of the board

As at the date of this report, the board comprises of 9 members: 6 independent NEDs, the Chairman, the Chief Executive and the Chief Financial Officer. On 21 February 2020, we announced the appointment of three additional non-executive directors: Hinda Gharbi, Jennifer Nason and Ngaire Woods. Once the appointments are effective, the board will comprise 12 members and 9 independent NEDs. This is considered to be an appropriate size for the business, and to provide the right balance of executive and non-executive directors. It allows for sufficient diversity of experience on the board, and ensures that we can also have individuals with specific expertise. The Nominations Committee report considers appointments, succession planning and the mix of skills and experience of the board on pages 98-99. The board is satisfied that it has the appropriate balance of skills, experience, independence, and knowledge of the company to enable its members to discharge their respective duties and responsibilities effectively, and that no individual or group can dominate the board's decision-making. Only the Chairman and committee members have the right to attend the meetings of the Nominations, Audit and Remuneration Committees. Attendance by all other individuals is by invitation only.

There is a clear division of responsibilities between the leadership of the board and the executive leadership of our business. The Chief Executive is responsible for the day-to-day management of the business and, under a Group delegation of authority framework, delegates to other members of the Executive Committee.

H. Role of non-executive directors

We list all of the non-executive directors that we consider to be independent on page 84 to 85 of this report. Over 50% of the board (excluding the chair) are non-executive directors. The non-executive directors constructively challenge and help develop proposals on strategy. They are also responsible for scrutinising management performance and ensuring that financial information, risks and controls, and systems of risk management are robust. Sam Laidlaw was appointed as the senior independent director (SID) during 2019. The board met once without the chair present and a full assessment of the chair's capability was carried out as part of the externally facilitated board evaluation process, details of which are on pages 96 to 97. Each director has undertaken to allocate sufficient time to the Group in order to discharge their responsibilities effectively, and this is kept under review by the Nominations Committee. The directors' other appointments are listed on pages 84 to 85.

I. Board processes and role of the Company Secretary

How the board works on page 90 explains the decision-making process of the board and the steps it takes to function efficiently, including how it considers stakeholders in this process.

The Group company secretary is the trusted interlocutor within the board and its committees, and between senior management and the non-executive directors. He is responsible for advising the board, through the Chairman, on all governance matters. He supports the Chairman in ensuring that the information provided to the board is of sufficient quality and appropriate detail in order for the board to function effectively and efficiently.

Composition, Succession and Evaluation

J. Appointments to the board

The Nominations Committee ensures a formal, rigorous and transparent procedure for the appointment of new directors. It is also responsible for board succession planning, regularly assessing the balance of skills, experience, diversity and capacity required to oversee the delivery of Rio Tinto's strategy. It reviews proposals for appointments to the Executive Committee, and monitors executive succession planning. All non-executive directors are members of the Nominations Committee. The committee is chaired by the Chairman, apart from when the committee is dealing with the appointment of his or her successor. The Nominations Committee report on pages 98 to 99 sets out the board's approach to succession planning and how this supports the development of a diverse pipeline, at all levels. All directors are subject to annual re-election at the AGM.

Details of external search consultancies used for board appointments can be found in the Nominations Committee report on pages 98 to 99.

K. Skills, experience and knowledge of the board and its committees

In our succession planning, we aim to bring a diverse and complementary range of skills, knowledge and experience to the board, so that we are equipped to navigate the operational, social, regulatory and geopolitical complexity in which our business operates. Achieving the right blend of skills and diversity to support effective decision-making is a continuing process. Further details on tenure and experience of the board are set out in the Nominations Committee report on pages 98 to 99.

L. Board evaluation

A board and committee effectiveness evaluation is carried out each year. The evaluation considers (but is not limited to): the balance of board members' skills and experience; independence; diversity; the running of the board; and directors' knowledge of the company. Every third year, the board evaluation is externally facilitated. An externally facilitated board evaluation was carried out in 2019. The terms of reference for this review and the outcomes are discussed on pages 96 to 97.

Audit, risk and internal control

M. Internal and external audit

The Audit Committee monitors the independence and effectiveness of the internal audit function and external auditors. Following an audit tender process in 2018, the board endorsed the appointment of KPMG as external auditor for the 2020 financial year. PwC will step down as auditors in 2020. The appointment of KPMG is subject to the approval of shareholders at our AGMs in 2020. The Audit Committee is responsible for reviewing key judgements within the Group's financial statements and narrative reporting, with the aim of maintaining the integrity of the Group's financial reporting. For further detail, please refer to the Audit Committee report on pages 100 to 103.

N. Fair, balanced and understandable assessment

The board is responsible for the presentation of a fair, balanced and understandable assessment of the company's position and prospects, not only in the Annual report. We have a robust process in place including through the Disclosure Committee, to ensure that this is the case.

O. Risk management and internal control framework

The board is ultimately responsible for aligning the risk appetite of the company with our long-term strategic objectives, taking into account the principal and emerging risks faced by the company. Please refer to pages 71 to 73 for further details on our business planning cycle and risk management framework and how these support our longer-term viability statement. For further details on our approach to risk, please refer to the Group's Risk policy.

Compliance with governance codes and standards continued

Remuneration

P. Remuneration policies and practices

The Remuneration Committee supports the board by setting our Remuneration Policy. Through long-term and short-term incentives, our Remuneration Policy is designed to help drive a performance culture which incentivises executives to deliver the Group's long-term strategy and create superior shareholder value over the short, medium and long term. The overarching aim is to ensure our remuneration structure and policies reward fairly and responsibly with a clear link to corporate and individual performance, and to the company's long-term strategy and values. We have worked to ensure that we have a clear policy that can be understood by shareholders and stakeholders.

Q. Procedure for developing Remuneration Policy

We have a formal and transparent procedure for developing our Remuneration Policy, and no director is involved in deciding their own remuneration. Executive remuneration is set with regard to the wider workforce and through market benchmarking. For further detail, please refer to the Remuneration Committee report on pages 110 to 138. The Remuneration Committee is supported by remuneration consultant Deloitte. The board received assurance from the Remuneration Committee and from Deloitte that they did not have any connections with Rio Tinto or the board that would have impaired its independence. Please refer to page 116 of this Annual report for further detail.

R. Exercising independent judgement

The Remuneration Committee is comprised of 4 non-executive directors to ensure independent judgement with regard to remuneration outcomes. The Remuneration Committee considers remuneration on an annual basis and determines outcomes by assessing executive performance against performance criteria, details of which can be found on pages 110 to 138 of this Annual report. This states how our Remuneration Policy has been applied and sets out details of any adjustments made or discretions exercised.

ASX Principles

Principle 1: Lay solid foundations for management and oversight

Recommendation 1.1

Rio Tinto plc and Rio Tinto Limited have a common board of directors. The principal role of the board is to set the Group's strategy and to review its strategic direction regularly. The board also has responsibility for corporate governance. A formal schedule of matters reserved for the board is available on our website.

The board delegates responsibility for day-to-day management of the business to the Chief Executive and other members of the Executive Committee. A number of management committees support the Chief Executive and the Executive Committee. The structure of these committees is set out on page 86.

Recommendation 1.2

The Nominations Committee, on behalf of the board, ensures a formal, rigorous and transparent procedure for the appointment of new directors. Further information on the appointment approach is set out on pages 98 to 99.

The Notice of annual general meeting includes a statement that the board considers that all directors continue to perform effectively and demonstrate appropriate levels of commitment. It also provides reasons why each director is recommended for re-election, highlighting the director's relevant skills and experience. Further information on the skills and experience of each director is set out on pages 84 to 85 of the Annual report.

Recommendation 1.3

The company has written agreements setting out the terms of appointment for each director and senior executive. Non-executive directors are appointed by letters of appointment. Executive directors and other senior executives are employed through employment service contracts. Further information is set out on pages 123 and 128 of the Annual report.

Recommendation 1.4

The Group company secretary is accountable to the board and advises the Chairman, and, through the Chairman, the board on all governance matters. The appointment and removal of the Group company secretary is a matter reserved for the board.

Recommendation 1.5

Rio Tinto has a Group-wide, board-endorsed Inclusion and diversity policy. A summary of the policy is available on our website. The board sets objectives for achieving diversity for the board and the Group and states that the board and Executive Committee will annually review the Group's performance against them. Page 62 of the Annual report sets out the measurable objectives and our performance against them. The respective proportions of men and women on the board, in senior executive positions and across the whole organisation is reported on pages 62 and 98 to 99 of the Annual report.

Recommendation 1.6

The performance of the board, and of each of its committees and individual directors, was reviewed in 2019, as it is each year. Detailed information on the board and committee evaluation and the evaluation of the Chairman and the non-executive directors is set out on page 96 to 97 of the Annual report.

Recommendation 1.7

The performance of Executive Committee members, including executive directors, is continually evaluated as part of the Group's performance evaluation cycle. Further details are set out in the Remuneration report on pages 110 to 138.

Principle 2: Structure the board to add value

Recommendation 2.1

The Nominations Committee includes all non-executive directors and is chaired by the Chairman of the board. The board is satisfied that all non-executive directors, including the Chairman (as appropriate), continue to meet the test for independence under the UK Code, the ASX Principles and the NYSE Standards. The Nominations Committee's terms of reference are available on our website. The Nominations Committee report on pages 98 to 99 provides further details on its role and responsibilities. Details on membership, the number of times the Committee met, and the attendance of members are set out on page 97.

Recommendation 2.2

A board skills matrix showing key attributes in terms of skills, experience and diversity that are relevant to the board is set out on page 99 of the Annual report.

Recommendations 2.3, 2.4, 2.5

The Nominations Committee is responsible for assessing the independence of each non-executive director against an independence framework which combines the requirements of the Code, the ASX Principles and NYSE Standards. The Nominations Committee reviews and approves this framework each year.

The board is satisfied that all of its non-executive directors are independent in character and judgment and are free from any relationships (material or otherwise) or circumstances that could create a conflict of interest.

The Chairman was considered independent upon his appointment and, in the board's view, he continues to satisfy the tests for independence under the ASX Principles and the NYSE Standards.

The name, skills and experience of each director, together with their terms in office, are shown in the biographical details on pages 84 to 85.

Recommendation 2.6

On joining Rio Tinto, all directors receive a full, formal induction programme. It is delivered over a number of months, and tailored to their specific requirements, taking into account their prospective committee responsibilities. Further details are set out on pages 100 and 107 of the Annual report.

All directors are expected to commit to continuing their development during their tenure. This is supported through a combination of: site visits; internal business; and operational briefings provided in or around scheduled board and committee meetings. In addition, the Group company secretary provides regular updates on corporate governance developments in the UK, Australia and the US. Further details are set out on page 94 of the Annual report.

Principle 3: Act ethically and responsibly
Recommendation 3.1
Rio Tinto's commitment to integrity and compliance is set out in *The way we work*, a global code of conduct for all employees. This is available on our website.

Principle 4: Safeguard integrity in corporate reporting
Recommendation 4.1
The Audit Committee report on pages 100 to 103 provides details on the role and responsibilities of the Committee. The Audit Committee's terms of reference are available on our website. Further details on membership, the number of times the Committee met during 2019 and the attendance of members are set out on page 97.

Recommendation 4.2
Details on compliance with the financial reporting requirements contemplated under this recommendation are set out on pages 142 and 143 of the Annual report.

Recommendation 4.3
Rio Tinto's external auditors, PwC, attend Rio Tinto's AGMs and are available to answer questions about the conduct of the external audit and the preparation and content of the independent auditors' report.

Principle 5: Make timely and balanced disclosure
Recommendation 5.1
Rio Tinto recognises the importance of effective and timely communication with shareholders and the wider investment community.

It is our policy to make sure that all information disclosed or released by the Group is accurate, complete and timely and complies with all continuous and other disclosure obligations under applicable Listing Rules and other relevant legislation.

To ensure that trading in our securities takes place in an informed and orderly market, we have established a Disclosure Committee to oversee compliance with our continuous disclosure obligations. The group disclosure and communications policy, terms of reference of our Disclosure Committee, together with our adopted procedures in relation to disclosure and management of relevant information, support compliance with our disclosure obligations. A copy of the group disclosure and communications policy is available on our website.

The Group's Disclosure Committee is responsible for determining whether information relating to Rio Tinto may require disclosure to the markets under the continuous disclosure requirements in the jurisdictions in which Rio Tinto is listed. In accordance with its terms of reference, the specific focus of the Disclosure Committee is to consider and determine on a timely basis whether information would, to the extent that the information is not public and relates directly or indirectly to Rio Tinto, be likely to have a material effect on the price of Rio Tinto securities if that information was generally available.

The members of the Committee are the Chief Executive; Chief Financial Officer; Group company secretary; the Group general counsel; the head of investor relations and the Corporate relations Group executive.

Principle 6: Respect the rights of security holders
Recommendation 6.1
Our website includes pages dedicated to corporate governance, providing information on compliance with governance codes and standards (the Code, ASX Principles and the NYSE Standards); the terms of reference of the committees; risk management and financial reporting; and board governance including selection, appointment and re-election of directors, director's independence and board performance evaluation.

All information released to the markets is posted in the media section of our website. Our website also provides general investor information. Annual and half-year results, as well as any major presentations, are webcast and the materials are available on our website, which also contains presentation material from investor seminars.

Recommendation 6.2
Our main channels of communication with the investment community are through the Chairman, Chief Executive and Chief Financial Officer, who have regular meetings with the Group's major shareholders. The senior independent director has a specific responsibility to be available to shareholders who have concerns which have not been resolved through contact with the Chairman, Chief Executive or Chief Financial Officer, or for whom such contact is inappropriate. We have a number of processes and initiatives to ensure that members of the board understand the views of major shareholders. The Chief Financial Officer reports to the board at each meeting, and provides regular investor updates. In addition, the head of investor relations reports regularly to the board, and an annual survey of major shareholders' opinions is presented to the board by the Group's investor relations advisers. Further information on engagement with shareholders and investors during 2019 is set out on pages 92 to 93 of the Annual report.

Recommendation 6.3
The AGMs present an opportunity to provide a summary business presentation, to inform shareholders of recent developments, and to give them the opportunity to ask questions. Generally, the chairs of all board committees are available to answer questions raised by shareholders, and all directors are expected to attend where possible. In 2019, all the directors attended the AGMs. The AGMs are webcast and transcripts of the Chairman's and Chief Executive's speeches are made available on our website. A summary of the proceedings at the meetings, and the results of voting on resolutions, are made available as soon as practicable after the meetings.

Recommendation 6.4
Shareholders can choose to communicate electronically with the companies and the share registrars. The contact details for the registrars are on page 299 and on our website.

Principle 7: Recognise and manage risk
Recommendations 7.1, 7.2
The board is ultimately responsible for risk management and internal controls and for ensuring that the systems in place are robust and take into account the principal risks faced by the Group. The board delegates certain matters relating to the Group's risk management framework to the Audit Committee, and the Audit Committee provides updates to the board on matters discussed at each meeting. Further details on the Group's governance framework for risk management and internal control are set out on pages 71 to 73 of the annual report.

Recommendation 7.3
Further information on Rio Tinto's Group Internal Audit function is set out on page 103 of the annual report.

Recommendation 7.4
A description of the principal risks and uncertainties that could affect Rio Tinto (including economic, environmental and social sustainability risks), and of the Group's governance framework for risk management and internal control, are on pages 74 to 80 of the Annual report.

Principle 8: Remunerate fairly and responsibly
Recommendation 8.1
The Remuneration report on pages 110 to 138 provides details on the role and responsibilities of the committee. The Remuneration Committee's terms of reference are available on our website. Further details on membership, the number of times the Committee met during 2019 and the attendance of members are set out on page 97.

Recommendation 8.2
Rio Tinto's policies and practices regarding remuneration of non-executive directors, executive directors and senior executives are set out on pages 110 to 138 in the Remuneration report.

Recommendation 8.3
Rio Tinto's approach on participating in equity based remuneration schemes is set out on pages 110 to 138 and page 142 of the Annual report.

Annual Statement by the Remuneration Committee Chairman

A train runs along the Iron Ore of Canada (IOC) rail line, taking some of the world's highest-quality iron ore to market.

On behalf of the Board, I am pleased to introduce our 2019 directors' remuneration report (Remuneration report).

This year we have further simplified the format of our Remuneration report by using more charts and tables. The Remuneration report is in two parts. Our "Remuneration At a glance" section provides a summary of our Remuneration Policy (Policy), which was approved by shareholders in 2018, and other key information and performance highlights from 2019. Our full Policy remains available on the company website. The main part of the Remuneration report sets out how the Policy was applied in 2019 and related remuneration outcomes (Implementation report) for which we seek your support at our Annual General Meetings (AGMs).

We will also be seeking shareholder approval for a resolution relating to potential termination benefits that may apply to a departing executive. This resolution seeks to renew existing approvals previously granted by shareholders in accordance with Australian requirements. We are not proposing any material changes to the previously granted approvals, nor any increase in the amounts we pay on termination to any departing executive.

Remuneration Policy

The Committee's overarching purpose is to ensure the remuneration structure and policies reward fairly and responsibly with a clear link to corporate and individual performance, aligning remuneration outcomes with the delivery of long-term strategy and value. We aim to provide competitive rewards that attract, retain and motivate executives based on policies which are competitive in the market and are appropriately stretching and incentivise the right behaviours. We also ensure that there is alignment between executive remuneration and wider company pay policies, with a particular focus on gender pay differential and general pay equity.

During 2019, I met with several shareholders and institutions for discussions related to governance and broader executive remuneration. In preparation for our Policy review in 2020, I took this opportunity to explore initial views on what role alternative pay models such as restricted stock might play in the compensation mix as we seek to balance the challenges associated with a cyclical business with the need to provide long-term incentives for our senior executive team. It is quite clear that shareholder perspectives on directors' remuneration continue to vary not only by investor but also geographically between our UK and Australian investor bases. I look forward to continuing this dialogue in preparation for an updated Policy for approval at the 2021 AGMs.

The Committee continues to monitor closely the evolving governance landscape and investor views. From a UK perspective, we recognise shareholder sentiment around aligning executive pension contributions with those of the broader employee population. Current contribution levels for our UK-based Executive Directors are slightly below 25% and are broadly consistent with the majority of our UK employees. We will consider this aspect further as part of a holistic review of the arrangements as we develop our next Policy.

Climate change represents perhaps the greatest long-term threat to our business and we are determined to be part of the solution. The Committee will be including climate change-related objectives for our Executive Directors in the 2020 Short-Term Incentive Plan (STIP).

With respect to post-employment shareholding, our current long term incentive plans ensure that our Executive Directors are materially aligned and exposed to the shareholder experience for a number of years after leaving the company. A five-year vesting period applies under the Long-Term Incentive Plan (LTIP) and a three-year vesting period under our bonus deferral plan. Vesting is not accelerated for eligible leavers whilst awards lapse for ineligible leavers. In addition, effective from 1 January 2020, Executive Directors will be required to continue to meet their shareholding requirement for a period of two years after ceasing employment. Further details are set out on pages 114 and 117.

2019 remuneration outcomes in the context of broader business performance

In 2019 we had zero fatalities. The implementation of critical risk management (CRM) across all our operations and increased sharing and deeper analysis of incidents that have the potential to result in a fatality has been the foundation of this.

In an effort to move towards leading indicators, the safety maturity model (SMM) framework included in the 2019 STIP expands on CRM to include a more holistic inclusion of our safety management system. In 2019, all of our safety performance indicators improved, resulting in a Group STIP safety result above target at 64% of maximum.

Despite a number of challenges on the operational side, our value over volume strategy, good capital discipline, and strong markets for some of our key commodities enabled us to deliver a robust financial performance in 2019. This resulted in a combined adjusted earnings and cash flow result of above target. Significant adjustments related to the unbudgeted early cancellation of a power purchase agreement at Escondida, which was replaced with a lower cost and carbon footprint energy source, and an increase in remediation provisions for water management at Kennecott in the US. During the year, iron ore shipments were impacted by several tropical cyclones across north West Australia which significantly exceeded previous experience and 2019 plan assumptions. Using the standard methodology for calculating the weather adjustment (which has in the past resulted in both upward and downward adjustments), the outcome would have been 56%. The Committee agreed that the impact of these weather events could not have been further mitigated in 2019. Nevertheless, in view of the rising frequency of extreme weather events and the need to increase resilience to climate change, the Committee exercised downward discretion, reducing the post-adjustment outcome to 51%.

From a shareholder perspective, over the five-year performance period of the 2015 performance share award (PSA), Rio Tinto outperformed both the EMIX Global Mining Index and the MSCI World Index. Over the same period, the share price for Rio Tinto plc increased by 50% and for Rio Tinto Limited by over 70%, reaching its highest ever level during 2019. The estimated vesting for the 2015 award, combining the two TSR and EBIT margin portions is 67.9% of maximum. This includes an estimate for the EBIT margin measure as the reported data for all the comparator companies is not currently available.

In the context of the Group's overall performance during the five-year performance period and the shareholder experience over that timeframe, the Committee concluded that the vesting of awards was justified. Accordingly, the portion of the award relating to TSR will vest on 27 February 2020. The Committee will make a final determination of the relative improvement in EBIT margin measure when the final EBIT margin performance of the comparator group companies becomes available in May 2020. If applicable, this portion of the award will vest on 31 May 2020.

2020 remuneration decisions

With effect from 1 March 2020, the annual base salary for Executive Directors has been increased by 2.11%. This is in line with the UK consumer price index (CPI) and below the salary increase budget applied to UK employees which was in excess of 3%. The increases reflected country CPI for half of the Executive Committee, and a modest market adjustment for the remaining half. The approach used by the Committee to assess the level and appropriateness of these increases was consistent with that applied to the broader employee population taking account of, among other factors, an assessment of market competitiveness against relevant peer companies and pay equity, in particular gender pay, considerations.

The maximum opportunity for our executives under the STIP remains unchanged. For the 2020 safety measures, the weighting of SMM and all injury frequency rate (AIFR) will become 40% and 20% respectively (30% and 30% in 2019). The adjustment in weighting strengthens the holistic focus on improving our safety culture and performance. The applicable targets are disclosed on page 126. We expect to disclose the 2020 financial and individual targets retrospectively in the 2020 Implementation report. The level of PSAs, as a percentage of base salary, to be granted in March 2020, is unchanged from 2019 for the Chief Executive and will be 410% for the Chief Financial Officer. Awards to other Executive Committee members vary from between 375% and 410% of base salary.

Pay in the broader context

During 2019, the Committee materially expanded its review of reward structures and outcomes across the Group covering all elements of pay. In addition, as part of the broader employee engagement at board level, we visited a range of operational sites across three continents, and held our 2019 employee AGM in Montreal. These are valuable channels of engagement between the Board, the Committee and our employees on a broad range of topics including pay. As we review our Policy this year, we will remain sensitive to and cognisant of this broader context to ensure the Policy we put forward in 2021 continues to have all the desired attributes of fairness, transparency, simplicity, proportionality, alignment to culture and a robust risk adjustment framework.

The CEO pay ratio of 66:1 is primarily driven by the percentage of total remuneration for the Chief Executive that is performance related and reflects the slightly higher STIP pay-out and the estimated 24 percentage point increase in the LTIP vesting outcome for 2019 compared to 2018. As most of the variable compensation for the Chief Executive is delivered in company shares, the ratio is also impacted by changes in the share price which provides alignment to the shareholder experience. The Committee continues to be mindful of the relationship between executive remuneration and that of our broader employee population.

During 2019 and as part of the 2020 remuneration review, gender pay continued to be a key focus at all levels of the organisation. The Committee monitors both equal pay and the gender pay gap across our employee population, and maintains a focus on the gender diversity in senior management roles as a means to address the gender pay gap across the Group. We are pleased with the broader initiatives being implemented across the Group in this area and note that the Group-wide equal pay and gender pay gaps remain at less than 2% and 1% respectively. Further details, together with the steps we are taking in this area, are provided on page 69 of this report.

As always, I welcome shareholder feedback and comments on the 2019 Remuneration report. I look forward to engaging further with shareholders during the course of 2020 for the review of our next Policy.

Yours sincerely

Sam Laidlaw
Remuneration Committee Chairman
26 February 2020

Annual statement by the Remuneration Committee Chairman continued

About our reporting

As our shares are listed on both the Australian and London Stock Exchanges, the information provided within our Remuneration report must comply with the reporting requirements of both countries.

Our regulatory responsibilities impact the volume of information we provide, as well as the complexity. In Australia, we need to report on a wider group of executives, as described in the following paragraph. In addition, as set out in our visual below, the two reporting regimes follow different methodologies for calculating remuneration.

In the UK, we need to report remuneration for the Board, including the Executive Directors. The Australian legislation requires disclosures in respect of "key management personnel", being those persons having authority and responsibility for planning, directing and controlling the activities of the Group. The key management personnel are, in addition to the directors, all members of the Executive Committee. Throughout this Remuneration report, the members of the Executive Committee are collectively referred to as "executives". They are listed on page 86, with details of the positions held during the year and dates of appointment to those roles.

Structure of our Remuneration report

We have included an At a glance section that summarises key information in one place, resulting in our Remuneration report being organised into the following parts:

Annual statement by the Remuneration Committee Chairman	110
Remuneration At a glance including a summary of the Remuneration Policy	113
Implementation report, which shows how the Policy has been applied as required under the legislation including Tables 1a-3a incorporating additional disclosures required under the Australian regulations	116

Shareholder voting

As required under UK legislation, the full Remuneration Policy section of the 2017 report was subject to a binding vote at our 2018 AGMs on 11 April 2018 in London, and 2 May 2018 in Melbourne. It passed with votes for the Policy of 95.6%, and will apply for three years, until a new Policy is presented at the 2021 AGMs. A summary of our Policy is provided in this report, and the full Policy can be found at: https://www.riotinto.com/invest/reports/annual-report.

The Implementation report, together with the annual statement by the Remuneration Committee Chairman, is subject to an advisory vote each year as required by UK legislation. Under Australian legislation, the Remuneration report as a whole is subject to an advisory vote. All remuneration-related resolutions will be voted on at the AGMs as Joint Decision Matters by Rio Tinto plc and Rio Tinto Limited shareholders.

The differing approaches explained

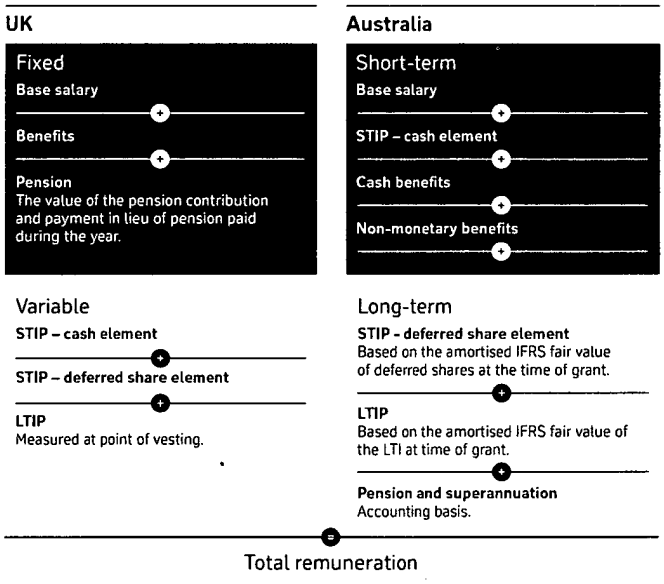
As well as the difference in methodology for measuring remuneration, there are also key differences in how remuneration is reported in the UK and Australia.

UK

- For reporting purposes, remuneration is divided into fixed and variable elements.
- We report remuneration in the currency it is paid, eg, where a UK executive is paid in pound sterling, remuneration is reported in pound sterling.

Australia

- For reporting purposes, remuneration is divided into short and long term elements.
- All remuneration is reported in US dollars, so using the previous example, the UK executives' remuneration would be converted to US dollars using the average exchange rate for the financial year (except STIP, which is converted at the year end exchange rate).
- The visual below summarises the elements of each component of remuneration, as well as the significant differences in the approaches to measurement.



Remuneration at a glance

Base salary
Short-Term Incentive Plan
Long-Term Incentive Plan
Share ownership guidelines

This section sets out key elements of our Policy, performance and remuneration outcomes for 2019.

Remuneration Policy: at a glance

Our Remuneration Policy applies to our Executive and non-executive directors and to the Chairman. In accordance with Australian law, it also sets out the broad policy principles that apply to members of the Executive Committee who are not directors. Our full Policy as approved at our 2018 AGMs can be found at: https://www.riotinto.com/invest/reports/annual-report.

Our five priorities:

Safety | People | Cash | Partnerships | Growth

Element	Purpose and link to strategy	Operation and opportunity
Base salary	We pay competitive salaries to hire, motivate and retain highly competent people.	– Base salaries are reviewed annually by the Committee. – Any increase is normally aligned with the wider workforce. – Maximum individual increase of 9%, or inflation if higher, per annum. – An increase above the maximum for executives who are not directors may be made in the event of internal promotion or increase in responsibility or where the executive's base salary is significantly below market positioning.
Pension or superannuation	We provide locally competitive post-employment benefits in a cost-efficient manner in order to hire and retain.	Rio Tinto may choose to offer: – Participation in a pension plan, superannuation fund; or – Cash payments in lieu of pension contributions. – For appointments made from 1 June 2018, the maximum level of company contribution to an Executive Director's scheme annually is 25% of base salary. – For appointments prior to 1 June 2018 the maximum was 35%.
Other benefits	We provide competitive benefits in a cost-efficient manner in order to hire and retain.	– Executives are eligible to receive benefits which may include healthcare, allowance for professional tax services, company car or car allowance, and international relocation allowance and benefits.
Short-Term Incentive Plan (STIP) including Bonus Deferral Award (BDA)	STIP focuses participants on achieving demanding annual performance goals, which are based on the Group's five priorities, in pursuit of the creation of sustainable shareholder value. We demand that sustainable business practices are adhered to, particularly in the context of safety.	– At least 50% of the measures will relate to financial performance and a significant component will relate to safety performance. – 25% of maximum is awarded for threshold performance; 50% for target; and 100% for outstanding. Between threshold and target, and between target and outstanding, the award is pro-rated on a straight-line basis. In the case of the Executive Directors, the percentage award is multiplied by 1.2 subject to the 200% cap. – The Committee retains the right to exercise discretion, both upwards and downwards, to ensure that the level of award payable is appropriate. – 50% of the STIP is delivered in shares that are deferred for three years as a BDA with the remainder of the STIP delivered in cash with no deferral. – Maximum opportunity is capped at 200% of salary for each executive. – Malus, claw-back and suspension provisions apply to the STIP and BDA.
Performance Share Awards (PSA) under the Long-Term Incentive Plan (LTIP)	PSA are designed to provide a simple and transparent mechanism for aligning executive reward with the execution of an effective business strategy that delivers superior long-term shareholder returns.	All executives are eligible to participate in the LTIP. Performance is measured against TSR relative to the EMIX Global Mining Index (50%) and to the MSCI World Index (50%). – For PSAs granted from 2013 until 2017, there was an additional performance condition of improvement in EBIT margin relative to the global mining comparators. This condition is not applicable on awards granted in 2018 and beyond. – Awards have a maximum face value of 438% of base salary (excluding dividend equivalents). – The awards have an expected value of approximately 50% of face value. – The maximum expected value of PSA is 219% of base salary (ie 438% x 50%). The maximum threshold value is 98.6% of base salary (ie 438% x 22.5%). – Award levels are set to incentivise long-term performance and to contribute towards the competitiveness of the overall remuneration package. – How performance is generated is as important as what level of performance is delivered. Before vesting, the Committee will satisfy itself that relative TSR is an appropriate measure of the underlying performance of the business, and may adjust vesting accordingly. – Malus, claw-back and suspension provisions apply to LTIP awards.

Element	Purpose and link to strategy	Operation and opportunity

Shareholding guidelines	Aligning executives' interests with those of shareholders through the requirement to build up and maintain a material shareholding in the company.	– Over a five-year period, executives should aim to reach a share ownership in Rio Tinto shares equivalent in value to:
		  – Chief Executive: four times base salary
		  – Other Executives: three times base salary
		– From 1 January 2020, Executive Directors will be expected to retain a holding for two years after leaving the Group.

Termination policy	Appropriately reward eligible and ineligible leavers.	– Notice period is normally 12 months, during which executives will receive their base salary, STIP and other benefits. – An eligible leaver may be awarded a discretionary STIP award on a pro rata basis, payable on the normal STIP payment date in cash. – Any unvested BDA from prior year awards will normally vest on the scheduled vesting date. – Unvested LTIPs will normally be retained by eligible leavers and vest on the scheduled vesting date, subject to performance conditions where applicable. – PSA and Management Share Awards (MSA), where applicable, will be reduced where the executive leaves within 36 months of grant. – PSA granted prior to 2018 are subject to malus and claw-back following termination, and all LTIP awards granted from 2018 are subject to malus, claw-back and suspension following termination.
Malus, claw-back and suspension	Enables the Committee to use its discretion to reduce awards where actions could lead to reputational damage to the Group.	Under both the malus and claw-back provisions, where the Committee determines that an exceptional circumstance has occurred, it may at its discretion, reduce the number of shares to be received on vesting of an award, or, for a period of two years after the vesting of an award, the Committee can claw-back value from a participant. The circumstances under which the Committee exercises such discretion may include, inter alia: – fraud or misconduct; – an error in the Group's financial statements which requires a material downward restatement; – personal performance of a participant, of their product group or of the Group does not justify vesting or where the participant's conduct or performance has been in breach of their employment contract, any laws, rules or codes of conduct applicable to them or the standards reasonably expected of a person in their position; – misstatement or misrepresentation of performance; – where any team, business area, member of the Group or profit centre in which the participant works or worked has been found guilty in connection with any regulatory investigation or has been in breach of any laws, rules or codes of conduct applicable to it or the standards reasonably expected of it; or – a catastrophic safety or environmental event. Under the suspension provisions, the Committee may suspend the vesting of an award (for up to five years) until the outcome of any internal or external investigation is concluded and may then reduce or lapse the participant's award based on the outcome of that investigation. Note that where suspension applies, the 24-month claw-back period will not extend beyond the period commencing from the original vesting date.
Remuneration mix	We provide an appropriate balance between fixed and variable components with a focus on long-term variable pay which reflects the long-term nature of the business.	For the Chief Executive: – 83% of the maximum remuneration and 55% of threshold remuneration is performance-based (STIP and LTIP). – 70% of maximum performance-based pay and 44% of threshold performance-based pay is delivered as deferred shares. For the other Executives: – 82% of the maximum remuneration and 52% of threshold remuneration is performance-based (STIP and LTIP). – 69% of maximum performance-based pay and 43% of threshold performance-based pay is delivered as deferred shares.

2019 performance

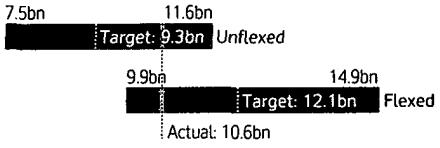
STIP
70% of the STIP award for executives is determined based on safety (20%) and financial performance (50%).

Safety
Safety performance is assessed in three areas:
- All injury frequency rate (AIFR)
- Binary fatality measure
- Implementation of safety maturity model (SMM)

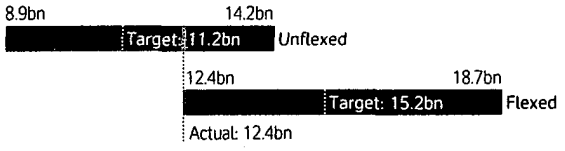
For 2019, the total assessment for the Group's safety performance was above target, at 64% of maximum.

Financial
Two measures are used to assess financial performance, with both unflexed and flexed targets (adjusted for commodity prices) for each measure. We also adjust for exceptional and non-controllable items. Overall, the net impact of all adjustments was a Group financial STIP outcome of 51% of maximum. Actual performance against threshold, target, and outstanding performance for each measure is set out in the charts below:

Underlying earnings target range (threshold to outstanding) – US$



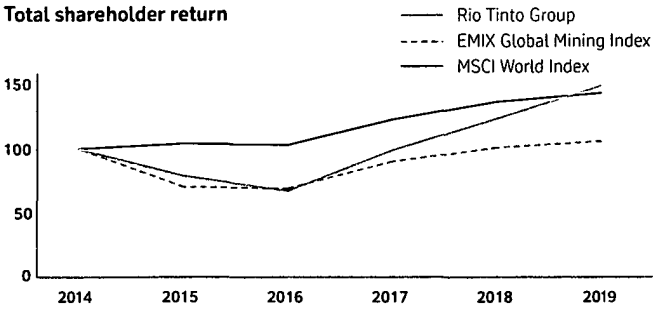
STIP free cash flow target range (threshold to outstanding) – US$



LTIP
Rio Tinto outperformed against the EMIX Global Mining Index and the MSCI World Index, resulting in a vesting of 45.6% under these two components, out of a maximum of 66.7%. This outcome reflects the design intention that executives should not unduly benefit from windfall gains when commodity prices are high, nor suffer when prices are low.

The estimated performance against the EBIT margin measure is that Rio Tinto is ranked 4th against a comparator group of 11, which would result in a vesting of 22.3% out of a maximum 33.3% for this measure. The estimated performance will be recalculated following the vesting of the EBIT margin measure in May 2020.

Total shareholder return



2019 remuneration outcomes

Executive Director remuneration (£'000)
The charts below set out the maximum and actual executive remuneration, as calculated under the UK regulations. As explained on page 112, there are differences in both reporting and methodology for measuring remuneration under the Australian regulations.

Jean-Sébastien Jacques
Chief Executive

2019 Actual remuneration (percentage of maximum)
£1,484 (100%) | £1,701 (74.8%) | £2,611 (67.9%)
Fixed | STIP | LTIP — £5,796

2019 Threshold remuneration (percentage of maximum)
£1,484 (100%) | £683 (30.0%) | £865 (22.5%)
Fixed | STIP | LTIP — £3,032

2019 Maximum remuneration
£1,484 | £2,276 | £3,845
Fixed | STIP | LTIP — £7,605

Jakob Stausholm
Chief Financial Officer

2019 Actual remuneration (percentage of maximum)
£1,009 (100%) | £873 (56.3%)
Fixed | STIP — £1,882

2019 Threshold remuneration (percentage of maximum)
£1,009 (100%) | £388 (25.0%)
Fixed | STIP — £1,397

2019 Maximum remuneration
£1,009 | £1,550
Fixed | STIP — £2,559

Share ownership requirements

Jean-Sébastien Jacques meets his share ownership requirement and Jakob Stausholm is on target to reach his share ownership requirements within five years of appointment as an Executive Director.

Jean-Sébastien Jacques
Appointed July 2016 — x gross base salary

2019 4.3x
Target 4.0x

Jakob Stausholm
Appointed September 2018 — x gross base salary

2018 0.8x
2019 0.9x
Target 3.0x

Implementation report

This Implementation report is presented to shareholders for approval at our AGMs. It outlines how our Remuneration Policy was implemented in 2019, and how we intend to operate it in 2020.

Introduction
The single total figure of remuneration tables on page 118 shows remuneration for our Executive Directors, gross of tax and in the relevant currency of award or payment.

In table 1a on page 130, we report information regarding executives in accordance with Australian statutory disclosure requirements. The information is shown gross of tax and in US dollars. The remuneration details in table 1a include accounting values relating to various parts of the remuneration package, most notably PSAs granted under the Group's LTIP arrangements, and require a different methodology for calculating the pension value. The figures in the single total figure of remuneration table on page 118 are therefore not directly comparable with those in table 1a. Where applicable, amounts have been converted using the relevant average exchange rates included in the notes to table 1a.

In table 1b on page 132, we report the remuneration of the Chairman and the non-executive directors.

Certain information contained within the Remuneration report is audited, as outlined on page 138.

Remuneration Committee responsibilities
The Committee's responsibilities are set out in our terms of reference, which we review each year and are published in the corporate governance section of the Rio Tinto website. Our responsibilities include:
- determining the Group's remuneration structure and policies, and assessing their cost, including pension and superannuation arrangements for executives;
- determining the mix and use of short and long term incentive plans for executives;
- overseeing the operation of the Group's short and long term incentive plans for executives, including approving awards, setting performance criteria, and determining any vesting;
- determining contractual notice periods and termination commitments, and setting retention and termination arrangements for executives;
- determining awards under the Group's all-employee share plan;
- monitoring gender pay; and
- determining the terms of service upon appointment for the chairman and executives, and any subsequent changes.

We consider the level of pay and conditions for all employees across the Group when determining executive remuneration.

Committee membership
The members of the Committee during the year and to the date of this report were:

Sam Laidlaw (Chairman)	
Megan Clark	
Ann Godbehere	(to 9 May 2019)
Moya Greene	(to 26 June 2019)
Simon McKeon	(from 1 January 2019)
Simon Thompson	

How we work
The Group Company Secretary attends meetings as secretary to the Committee. The Chief Executive, Group Executive Human Resources and Head of Reward attend appropriate parts of the meetings at the invitation of the Chairman of the Committee. No individual is in attendance during discussions about their own remuneration.

Independent advisers
Until October 2019, the Committee engaged Willis Towers Watson as independent advisers; from October 2019, the Committee appointed Deloitte as independent advisers, following a competitive tender. Willis Towers Watson and Deloitte were the only remuneration consultants that provided advice to the Committee during 2019.

The Committee has a protocol for engaging and working with remuneration consultants to ensure that "remuneration recommendations" (being advice relating to the elements of remuneration for key management personnel, as defined under the Australian Corporations Act) are made free from undue influence by key management personnel to whom they may relate. We monitored compliance with these requirements throughout 2019. Willis Towers Watson and Deloitte gave declarations to the effect that any remuneration recommendations were made free from undue influence by key management personnel to whom they related, and the Board has received assurance from the Committee and is satisfied that this was the case.

Willis Towers Watson and Deloitte are members of the Remuneration Consultants' Group, and voluntarily operate under its Code of Conduct (the Code) in relation to executive remuneration consulting in the UK. The Code is based upon principles of transparency, integrity, objectivity, competence, due care and confidentiality. Willis Towers Watson and Deloitte have confirmed that they adhered to the Code throughout 2019 for all remuneration services provided to Rio Tinto. The Code is available online at **remunerationconsultantsgroup.com.**

The Committee are satisfied that the Willis Towers Watson and Deloitte engagement partners and advisory teams that provided remuneration advice to the Committee, do not have any connections with the company or individual directors that may impair their independence. During 2019, Willis Towers Watson and Deloitte's services also included attending Committee meetings and giving advice in relation to management proposals. Willis Towers Watson was paid US$160,131 (2018: US$259,919) and Deloitte was paid US$53,164 for these services. Fees were charged on the basis of time and expenses incurred.

In addition to remuneration recommendations, Willis Towers Watson also provided general and technical executive remuneration services. These services included advice about remuneration of employees other than key management personnel. We received other services and publications relating to remuneration data from a range of sources. During the year Deloitte also provided internal audit, tax compliance and other non-audit advisory services. These services were provided under separate engagement terms and the Committee is satisfied that there were no conflicts of interest.

How the Committee spent its time in 2019
During 2019, the Committee met four times. We fulfilled our responsibilities as set out in our terms of reference.

Our work in 2019 and in the early part of 2020 included:
- reviewing and determining any base salary adjustments for executives;
- reviewing and determining "threshold", "target" and "outstanding" targets for the safety and financial components of the 2019 STIP;
- reviewing actual performance against the targets for the 2019 STIP and assessing applicable adjustments;
- reviewing and determining the final EBIT margin outcome for PSA with a performance period ending 31 December 2018;
- reviewing and determining the total shareholder return (TSR) outcome and the estimated EBIT margin outcome for PSA with a performance period ending 31 December 2019;
- reviewing and determining LTIP grants for executives in 2020;
- determining the terms of appointment for the new Group Executive, Group General Counsel, Barbara Levi;
- determining the terms of retirement for the outgoing Group Executive, Health Safety & Environment, Joanne Farrell, and the outgoing Group Executive, Group General Counsel, Philip Richards;
- acting in accordance with the terms of the deferral agreement for the former Chief Executive, Sam Walsh and other impacted executives;
- reviewing the strategy and annual reports on the Group's global benefit plans;
- considering the Group's response to the changes in UK legislation, including the UK Corporate Governance Code, in respect of executive remuneration;
- reviewing progress towards the Group's share ownership requirements
- determining the 2020 STIP targets;
- appointing Deloitte as the new independent advisers to the Committee; and
- preparing the Remuneration report (including this Implementation report).

Performance review process for executives
Rio Tinto conducts annual performance reviews for all its executives.
Our key objectives for the performance review process are to:
- improve organisational effectiveness by creating alignment between the executive's objectives and Rio Tinto's strategy; and
- provide a consistent, transparent and balanced approach to measure, recognise and reward executive performance.

The Chief Executive conducts the review for members of the Executive Committee, and recommends the performance outcomes to the Committee. The Chief Executive's performance is assessed by the Chairman of the Board. Performance reviews for all executives took place in 2019 or early 2020.

Share ownership policy for executives
The Group understands the importance of aligning executives' interests with those of shareholders and expects executives to build up and maintain a material shareholding. Executives should aim to reach a share ownership (defined below) in Rio Tinto shares equivalent in value to:

	Share ownership requirement
Chief Executive	4 x base salary
Other Executives	3 x base salary

The Committee expects executives to build up their shareholding over a five-year period by holding shares that vest under the LTIPs. We may accept longer periods for new hires, given the five-year vesting periods for PSA.

Shares are treated as "owned" if they are not subject to restriction, which includes shares directly held by an executive and any shares where there is a beneficial interest. A beneficial interest includes any shares for which an executive receives the benefit of ownership (such as a right to receive dividends) without directly owning the shares. Given its mandatory nature and the absence of performance conditions, a value for unvested BDA is included with a 50% discount for the likely effects of taxation.

We also have shareholding requirements for senior management who are not members of the Executive Committee.

From 1 January 2020, Executive Directors will be expected to continue to meet the share ownership policy (or if the holding requirement is not met at this date, the relevant holding at the time) for two years after stepping down from the Board. When considered alongside the existing leaver provisions for share awards, the Committee believes that the policy will ensure that executives will remain aligned with shareholders for an extended period after ceasing employment.

We set out details of executives' beneficial interests in Rio Tinto shares in table 2 on page 133. Awards of shares under long term incentive plans are shown in tables 3 and 3a on pages 134 to 137.

Executives' external and other appointments
Our executives may be invited to become non-executive directors of other companies. Our policy is that such appointments can bring benefits to the Group by broadening the experience and knowledge of executives. Therefore where there is no likelihood of a conflict of interest, the Board will normally consent. Our policy limits each executive's external appointment to one FTSE 100 company directorship or equivalent. The executive typically retains any fees earned.

Neither of the Executive Directors currently has an external directorship.

UK Corporate Governance Code
During the year and when determining Executive Director remuneration the Committee took into account the relevant requirements of the UK Corporate Governance Code. As set out throughout the Remuneration report we consider that our arrangements are clear, simple, predictable, proportionate and aligned to our culture. The Committee also takes steps to ensure that risks associated with excessive rewards are identified and mitigated.

Implementation report continued

Base salary
Short-Term Incentive Plan
Long-Term Incentive Plan

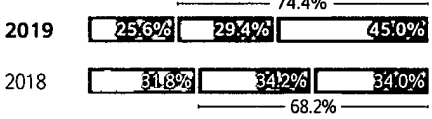
Single total figure of remuneration (£'000)

Executive Director (£'000)	Year	Base salary	Benefits	Pension	Total fixed	Bonus – STIP payment: Cash	Bonus – STIP payment: Deferred shares	Value of LTIP awards vesting: Face value	Value of LTIP awards vesting: Share price appreciation	Total variable	Single total figure	% change
Jean-Sébastien Jacques	**2019**	**1,133**	**71**	**280**	**1,484**	**850**	**851**	**1,984**	**627**	**4,312**	**5,796**	**27.4%**
(Chief Executive)	2018	1,105	68	274	1,447	778	778	1,114	434	3,104	4,551	-
Jakob Stausholm[a]	**2019**	**775**	**62**	**172**	**1,009**	**436**	**437**	**0**	**0**	**873**	**1,882**	**86.9%**
(Chief Financial Officer)	2018	258	440	57	755	126	126	0	0	252	1,007	-

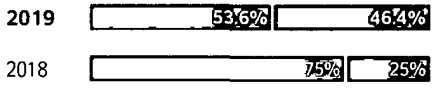
(a) The details for 2018 reflect remuneration for the period 3 September to 31 December 2018

At the end of the performance period, LTIP values are based on estimates of both the number of shares that will ultimately vest, as well as share price. These estimates are restated in the following year, once actual values are known. See LTIP section for further detail.

Jean-Sébastien Jacques



Jakob Stausholm



Key: Percentage of total remuneration earned as:

Non-performance related:
☐ Base salary, benefits and pension

Performance related:
☐ STIP ☐ LTIP

Base salary (2019)

Consistent with prior practice, annual salary increases for executives are generally in line with the base pay increases applying to the broader employee population. Salaries are reviewed with effect from 1 March.

Executive Director	Annual base salary at 1 January 2019 £'000	Annual base salary at 1 March 2019 £'000	**Total base salary paid in 2019 £'000**	Annual base salary at 1 March 2020 £'000	% change
Jean-Sébastien Jacques	1,110	1,138	**1,133**	1,162	2.11
Jakob Stausholm	775	775	**775**	791	2.11

Benefits (2019)

Includes healthcare, allowance for professional tax compliance services, car and fuel allowances, and non-performance based awards under the all-employee share plans.

Pension

Pension benefits can either be paid as contributions to Rio Tinto's company pension fund or as a cash allowance. In line with the applicable policy, cash allowances may be reduced by the value of the employer's national insurance payable on cash allowances.

In addition to the payments set out in the accompanying table, under Australian Superannuation Guarantee legislation the company pays superannuation contributions to an Australian superannuation fund in respect of Jean-Sébastien Jacques' working days in Australia. The pound sterling equivalent of these superannuation contributions is offset against the cash allowance paid to Jean-Sébastien Jacques.

Executive Director	Pension contributions paid to the Rio Tinto pension fund £'000	Cash in lieu of pension contributions paid £'000	**Total £'000**	Pension provision as percentage of base pay
Jean-Sébastien Jacques	10	270	**280**	24.8%
Jakob Stausholm	12	160	**172**	22.2%

STIP

Outcome for 2019

For an individual executive's STIP outcome, the weighted safety, financial and individual STIP result are added to determine the total result. The resultant STIP is delivered equally in cash and deferred shares.

	Weighted result								Delivered in:		Percentage of:		
Executive Director	Safety (20%)	Financial (50%)	Individual (30%)	**Total**	Apply 1.2 multiplier	**Total STIP (% of base pay)**	Base pay £'000	**Total STIP £'000**	Cash £'000	Deferred shares £'000	Maximum STIP awarded	Maximum STIP forfeited	Target STIP awarded
Jean-Sébastien Jacques	12.8	25.5	24.0	**62.3**	74.8	**149.5**	1,138	**1,701**	850	851	74.8%	25.2%	124.6%
Jakob Stausholm	12.8	25.5	18.0	**56.3**	56.3	**112.6**	775	**873**	436	437	56.3%	43.7%	112.6%

Maximum STIP is capped at 200% of base salary with awards of:

- 25% of maximum for threshold
- 50% of maximum for target
- 100% of maximum for outstanding performance
- In the case of the Chief Executive, the percentage award is multiplied by 1.2, subject to a 200% cap, in accordance with his contractual terms and the 2018 Remuneration Policy. Under the recruitment terms for the Chief Financial Officer, the percentage award is not multiplied by 1.2.

Half of the STIP award will be paid in cash in March 2020, and the remainder will be delievered in deferred shares as a BDA, vesting in December 2022. If the executive resigns or is dismissed for misconduct, or for any other reason that the Committee decides, the deferred shares will lapse.

Safety and financial measures for 2019

Performance categories	Weighting	Commentary
Safety	20%	Our goal is zero harm, including, above all, the elimination of workplace fatalities, so we consider safety as a key performance measure. We include Group safety measures alongside Group financial measures in the STIP for Executive Directors and other executives. The STIP measures for Product Group Chief Executive Officers (PGCEOs) include product group financial and safety measures in addition to Group financial measures. Safety measures for all executives in 2019 included a standalone binary fatality measure (40%), with the remainder split between all injury frequency rate (AIFR) (30%) and measures relating to our safety maturity model (SMM) (30%).
Financial	50%	Our current financial measures are based on KPIs that are used in managing the business. The first, underlying earnings, gives insight to cost management, production growth and performance efficiency on a like-for-like basis. This reflects the fact that Rio Tinto is focused on reducing operating costs, increasing productivity and generating maximum revenue from each of our assets. A reconciliation of net earnings/(losses) to underlying earnings is provided in note 2 (Operating segments) on page 167. The second, STIP free cash flow, is also an important measure to the business. It demonstrates how we convert underlying earnings to cash, and provides further insight into how we are managing costs and increasing efficiency and productivity. STIP free cash flow comprises net cash generated from operating activities, less purchases of property, plant and equipment and intangible assets, plus sales of property, plant and equipment and intangible assets, adjusted to exclude dividends paid to holders of non-controlling interests in subsidiaries and development capital expenditure. When we measure financial performance against the annual plan, half is measured against the original plan, and half is "flexed" to exclude factors that are outside management's control, such as the impact of fluctuations in exchange rates, or quoted metal and other prices. "Flexed" financial targets are typically higher than the "unflexed" targets set by the Board when commodity prices rise, as was the case in 2019, and lower when commodity prices fall. Actual underlying earnings and STIP free cash flow results are compared against equally weighted "flexed" and "unflexed" targets.

Actual performance

Calculation of total STIP award

The following tables summarise the calculation of STIP award for the Executive Directors. Below threshold (25% relative performance) payout is zero on the Group safety and financial measures.

Group safety measures

	Weight (out of 100%)	2019 performance	Result (% of maximum)	Weighted result	Commentary
Binary fatality	8.0	Maximum **Actual 0** Maximum 0	100.0	8.0	In 2019 there were zero fatalities across the Group. Performance against the binary fatality measure was therefore maximum for all executives.
All injury frequency rate (AIFR)	6.0	Threshold **0.42** | 0.38 Target | Maximum	25.0	1.5	AIFR target performance was set at 0.38 with threshold at 0.42 and maximum at 0.30. In line with normal procedures, the Committee sought guidance from the Sustainability Committee on safety performance for 2019. Injury rates as measured by AIFR remained similar to 2018, with the AIFR in 2019 at 0.42, compared to 0.44 in 2018.
Safety maturity model (SMM)	6.0	**4.5** | Target=4.4	55.0	3.3	In 2019 the SMM framework was introduced to include a more holistic inclusion of our safety management system. Target performance was set at 4.4 with threshold at 3.4 and maximum at 5.7. All sites showed strong improvement over their baseline assessments, particularly in leadership and engagement. We saw an improvement across the Group to an average maturity of 4.5 (evolving) from a baseline of 3.4 (basic). See page 63 for more detail on the measurement of SMM.
Total group safety	**20.0**		**64.0**	**12.8**	

Group financial measures

	Weight (out of 100%)	2019 performance ($bn) Threshold Target Maximum	Result (% of maximum)	Weighted result	Commentary on financial measures
Underlying earnings	12.5	9.3 | **10.6**	78.0	9.8	The "flexed" earnings and "flexed" cash flow results were below target, and the "unflexed" earnings and "unflexed" cash flow results were between target and outstanding. This resulted in an overall adjusted financial outcome of 51% of maximum compared to the unadjusted financial outcome of 42% of maximum. The performance targets for financial measures are disclosed on page 115.
Underlying earnings – flexed	12.5	**10.6** | 12.1	33.0	4.0	The most significant adjustments related to the early cancellation of a power purchase agreement at Escondida, which was replaced with a lower cost and carbon footprint energy source, and an increase in remediation provisions for water management at Kennecott in the US. During the year, iron ore shipments were impacted by several tropical cyclones across northern Western Australia which significantly exceeded prior experience and 2019 plan assumptions. Using the standard methodology for calculating the weather adjustment (which has in the past resulted in both upward and downward adjustments), the outcome would have been 56%. The Committee agreed that the impact of these weather events could not have been further mitigated in 2019. Nevertheless, in view of the rising frequency of extreme weather events and the need to increase resilience to climate change, the Committee exercised downward discretion, reducing the post-adjustment outcome to 51%.
STIP free cash flow	12.5	11.2 | **12.4**	70.0	8.8	
STIP free cash flow – flexed	12.5	**12.4** | 15.2	25.0	3.0	
Total group financial	**50.0**		**51.0**	**25.5**	The Committee considers the final adjusted result to reflect the appropriate balance between underlying business performance, a strong market for key commodities and recognition of events outside of management's control.

Individual objectives

	Weight (out of 100%)	Result (% of maximum)	Weighted result	Commentary
Jean-Sébastien Jacques	30.0	80.0	24.0	Refer to page 121.
Jakob Stausholm	30.0	60.0	18.0	Refer to page 121.

Commentary on individual performance against personal objectives.

	Jean-Sébastien Jacques	Jakob Stausholm
Safety	– Zero fatalities during the year. – Reduction in Tier 1 process safety and environmental incidents and further strengthening the Group's critical risk management process. – Strong leadership of climate change strategy, including preparation of the TCFD2 Report and revised emissions-reduction targets for 2030. – Construction and commissioning of Elysis pilot plant to test new technology for decarbonisation of the aluminium smelting process. – Strong leadership response to the Brumadinho disaster in Brazil, initiating an in-depth audit of tailing management facilities worldwide, industry-leading disclosure, and strong advocacy for higher industry-wide standards through the ICMM.	– Zero fatalities during the year. – Demonstrated leadership and commitment to the safety agenda through visits to multiple sites.
People	– Improved employee engagement, achieving positive eNPS scores for the first time, and eSAT scores at benchmark levels. Yammer participation across the Group is best in class at > 30,000 users. – Recognition through employee engagement survey of continued improvement in wellbeing across the Group. – Strong leadership of our Purpose ('Pioneering Human Progress') and values, enhanced by the roll-out of a critical Behaviours framework across the organisation. – Improved Executive Committee succession planning and leadership development, including the recruitment of several high-potential, diverse, senior operational and functional leaders. – Embedded the Group's Operating Model, including Centres of Excellence.	– Contributed to improved employee engagement in the achievement of positive eNPS scores for the first time, and eSAT scores at benchmark levels. – Actively led succession planning and leadership development across the Finance function. – Progress made towards diversity and gender targets, but further improvement needed. – Clear demonstration of personal commitment to 'The way we work' and our ethics and integrity priorities. – Embedded the Group's Operating Model and continued to pursue efficencies.
Cash	– TSR of 41%, reflecting record average annual share price performance. – Good shareholder understanding of performance and strategic priorities confirmed by third party investor survey. – M2M productivity target missed (for a variety of reasons), but management of asset integrity strengthened to drive future performance. – Led strong response to operational challenges in Iron Ore in H1. – Commercial activities developing in accordance with plan to support future productivity objectives.	– Maintained our strong balance sheet and improved our credit rating. – Strong engagement across the investor portfolio, with improvement in risk exposure to enhance our economic interests. – Achieved working capital targets for 2019. – Developed management information system enhancing visibility of data in the organisation.
Partnership	– Strong engagement with key stakeholders in Australia, Canada, China and the USA. – Launched a range of innovative partnerships, including with FutureSkills in Australia (technical education), and with Baowu and Tsinghua University in China (climate change). – Maintained strong ranking on reputation indices, including Alva, IPSOS MORI and Alva ESG.	– Continued to strengthen critical relationships with shareholders. – Led our investor relations engagement strategies to reinforce our presence in key markets.
Growth	– Good project management performance at Koodaideri (Australia) and Resolution Shaft 9 (USA). Cost overrun and delay at Oyu Tolgoi in Mongolia largely due to unforeseeable geotechnical conditions. Delay at Zulti South in South Africa as a result of community unrest. – Good progress with the Winu copper deposit in Australia, including fast-track process to accelerate appraisal. – Ventures presented several options for inorganic growth, but none considered to be value-accretive on a risk-adjusted basis.	– Contribution to growth pipeline, primarily through the Evaluation Committee and Investment Committee processes, with a clear focus on Tier 1 potential projects.

LTIP

PSAs granted in 2015 were based on three performance conditions, all measured over a five-year performance period:
- TSR relative to the EMIX Global Mining Index – one-third
- TSR relative to the MSCI World Index – one-third
- Improvements in EBIT margin relative to global mining comparators – one-third

Performance against the improvement in the EBIT margin measure cannot be finalised until May in the year following the end of the five-year performance period. This is due to the reporting timeframes for companies in the EBIT margin comparator group and the time taken for the external source (currently S&P Capital IQ) to report the relevant data.

Accordingly, the value of the shares vesting included in the single total figure of remuneration table for 2019 is an estimate, which is then adjusted once the actual figures are known. The original estimate is based on:
- the TSR portion of the award (with estimated associated dividend equivalent shares) which vest in February following the end of the five-year performance period
- an estimate of vesting of the EBIT margin portion of the award (with estimated associated dividend equivalent shares) based on latest available EBIT margin ranking as at the date of this report
- the average share prices for Rio Tinto plc and Rio Tinto Limited over the last quarter of the relevant year, as the market value price of shares at the date on which all shares vest is not ascertainable by the date on which the Remuneration report is approved by the directors

The actual values associated with the LTIP vesting is then recalculated following the vesting of the EBIT margin portion of the award at the end of the following May based on the actual share prices on the date of vesting. The estimated LTIP values are then restated, if applicable, in the following Remuneration report, as shown below:

				Estimated					Actual			
Executive Director	Year included in single figure	Award	Granted shares	EBIT margin rank out of 11[a]	Overall vesting %	Shares, (including dividend equivalents)	Share price	LTIP outcome (£'000)	EBIT margin rank out of 11[b]	Overall vesting %	Share price	LTIP outcome (£'000)
Jean-Sébastien Jacques	**2019**	**2015 PSA**	**72,768**	**4th rank**	**67.9%**	**62,117 (12,691)**	**£42.04**	**2,611**		**Will be determined in May 2020**		
	2018	2014 PSA	70,057	5th rank	41.3%	34,537 (5,581)	£37.44	1,293	5th rank	42.98%	£43.27 for TSR element £45.103 for EBIT element	1,548

(a) Estimated vesting of the EBIT margin portion in 2019 is 67.07% (2018 estimate: 24%).
(b) Actual vesting of the EBIT margin portion of the 2014 PSA was 28.93%.

Jakob Stausholm's first LTIP award was made in September 2018, with a performance period ending 31 December 2022.

Calculation of 2015 PSA vesting

Our remuneration consultants, Deloitte, calculated performance against the TSR measures. The dual TSR measures recognise that the company competes in the global market for investors as well as within the mining sector, and aligns to the philosophy of rewarding executives for stable returns over the long-term relative to the broader market and the mining sector.

2019 vesting	Performance	Vesting	Weighting	Weighted achievement
TSR relative to EMIX Global Mining index				
Threshold	Equal to index	22.5%		
Maximum	Outperformance of the index by 6% per annum	100.0%	One third	
Actual	**7.5% per annum**	**100.0%**		33.33%
TSR relative to MSCI World index				
Threshold	Performance equal to index	22.5%	One third	
Maximum	Outperformance of the index by 6% per annum	100.0%		
Actual	**1.1% per annum**	**36.7%**		12.23%
Improvement in EBIT margin				
Threshold	Above the sixth ranked company	Nil		
Estimate	**4th**	**67.07%**	One third	
Maximum	Rank of 1st or 2nd	100.0%		22.36%
Overall vesting				67.92%

PSAs granted in 2019

Executive Director	Type of award	Grant date	Face value of award (% of base salary)	Face value of award (£'000)	% of vesting at threshold performance	Average share price over 2018	Conditional shares awarded	Vesting month	End of the period over which the performance conditions have to be fulfilled
Jean-Sébastien Jacques	PSA	18 March 2019	430%	4,893	22.5%	£38.94	125,665	Feb 2024	31 Dec 2023
Jakob Stausholm	PSA	18 March 2019	400%	3,100	22.5%	£38.94	79,609	Feb 2024	31 Dec 2023

PSAs to be granted in March 2020

Executive Director	Type of award	Face value of award (% of base salary)	Face value of award (£'000)	% of vesting at threshold performance	Average share price over 2019	Conditional shares to be awarded	Vesting month	End of the period over which the performance conditions have to be fulfilled
Jean-Sébastien Jacques	PSA	430%	4,997	22.5%	£43.43	115,049	Feb 2025	31 Dec 2024
Jakob Stausholm	PSA	410%	3,245	22.5%	£43.43	74,711	Feb 2025	31 Dec 2024

Executive Directors' shareholding

In line with our share ownership policy, Executive Directors' shareholdings are calculated using the closing price of Rio Tinto shares on the latest practicable date each year before the report is published. For the purposes of this 2019 report, the closing price on 14 February 2020 has been applied.

	Multiple of base salary					Holding of ordinary shares	
Executive Director	31 December 2019	31 December 2018	Guidelines	Year guideline needs to be met	On target	31 December 2019	31 December 2018
Jean-Sébastien Jacques	4.3	3.3	4.0	2021	Meets	97,578	64,740
Jakob Stausholm	0.9	0.8	3.0	2023	Yes	15,078	15,000

The multiple of base salary shown above includes the value of 50% unvested Bonus Deferred Awards (BDA).

Service contracts

Executive Director	Position held during 2019	Date of appointment to position	Notice period
Jean-Sébastien Jacques	Chief Executive	2 July 2016	12 months
Jakob Stausholm	Chief Financial Officer	3 September 2018	12 months

Either party can terminate their contract with notice in writing, or immediately by paying the base salary only in lieu of any unexpired notice.

Chief Executive pay ratio

The ratio of the total remuneration of the Chief Executive to the median total remuneration of all Rio Tinto employees for 2019 was 66:1 (2018: 48:1, restated for actual 2014 PSA vesting). This has been calculated using the single total figure of remuneration for the Chief Executive and the median employee in the Group.

The ratio is primarily driven by the percentage of total remuneration that is performance related, and reflects the increased STIP and LTIP vesting outcomes for 2019 compared to 2018. This further demonstrates the alignment to the shareholder experience as measured by total shareholder return. The Committee continues to be mindful of the relationship between executive remuneration and that of our broader employee population. The Committee's decision making will continue to be supported by regular and detailed reporting on these matters.

As the company employs fewer than 250 employees in the UK, the analysis has been provided on a voluntary basis.

Chief Executive's pay and employee pay

In the table below we compare the changes from 2018 to 2019 in salary, benefits and annual incentives of the Chief Executive to that of the Australian employee population (chosen because approximately 40% of our employees are employed in Australia, more than in any other country).

Changes to the Chief Executive's base salary, benefits and annual incentive are explained in the single total figure of remuneration table on page 118.

	Percentage change in salary paid	Percentage change in other benefits paid	Percentage change in annual incentive[a]
Chief Executive	2.5%	4.4%	9.3%
Australian employees	4.3%	1.5%	7.1%

(a) The percentage change in annual incentive compares the incentive outcomes for the 2018 performance year, to that for the 2019 performance year.

Chief Executive's remuneration over time: summary

Year	Chief Executive[a]	Single total figure of remuneration ('000)	Annual STIP award against maximum opportunity	Long-term incentive vesting against maximum opportunity (SOP)[b][c]	Long-term incentive vesting against maximum opportunity (PSA)[c]
2010	Tom Albanese	£4,512	87.8%	0.0%	24.3%
2011	Tom Albanese	£4,256	0.0%	100.0%	0.0%
2012	Tom Albanese	£4,040	0.0%	100.0%	61.7%
2013	Tom Albanese	£53	0.0%		–
	Sam Walsh	A$9,993	72.1%		50.0%
2014	Sam Walsh	A$10,476	88.4%		49.0%
2015	Sam Walsh	A$9,141	81.9%		43.6%
2016	Sam Walsh	A$1,657	–		–
	Jean-Sébastien Jacques	£3,116	82.4%		50.5%
2017	Jean-Sébastien Jacques	£3,821	73.4%		66.7%
2018	Jean-Sébastien Jacques[d]	£4,551	70.1%		43.0%
2019	Jean-Sébastien Jacques	£5,796	74.8%		67.9%

(a) Tom Albanese held the role of Chief Executive until 17 January 2013, and left the Group on 16 July 2013. The single total figure of remuneration for Tom Albanese for 2013 is for the period up until 17 January 2013. Sam Walsh took over as Chief Executive from 17 January 2013, having previously been Chief Executive, Iron Ore and Australia. The single total figure of remuneration for Sam Walsh for 2016 is for the period up until 1 July 2016. Jean-Sébastien Jacques took over as Chief Executive on 2 July 2016, having previously been Chief Executive, Copper & Coal.

(b) In 2011 and 2012, Sam Walsh elected to receive his full LTIP awards under the PSP and as a result he has no options granted in 2011 or 2012 under the SOP and which had performance periods that ended on 31 December 2013 and 31 December 2014 respectively. The SOP ceased operation from 2013 and LTIP awards from 2013 have been made as PSA.

(c) All outstanding but unvested LTIP awards earned in previous years lapsed and were forfeited when Tom Albanese left the Group.

(d) The 2018 single total figure of remuneration for Jean-Sébastien Jacques reported in the 2018 Annual report was £4,289 based on the estimated vesting of the 2014 PSA of 41.3%. The restated 2018 single total figure of remuneration is £4,551 based on the actual vesting of the 2014 PSA of 43.0%

TSR

We use relative TSR against the EMIX Global Mining Index and the MSCI World Index as two-thirds of our performance measures when we determine the vesting of PSA granted in 2015. The remaining third is based on the improvement in EBIT margin relative to the comparator group.

The effect of this performance on the value of shareholdings, as measured by TSR delivered over the past five years, based on the sum of dividends paid and share price movements during each calendar year, is detailed in the table below.

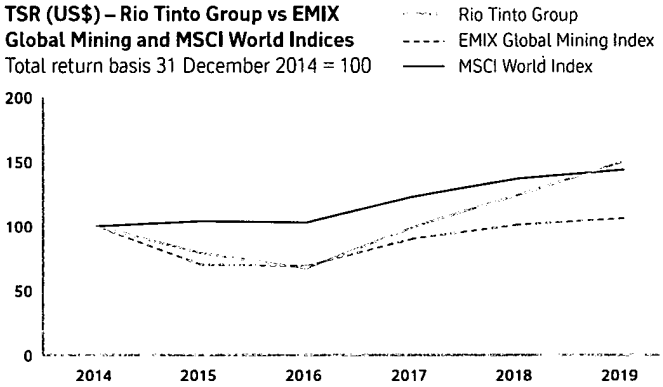
Year	Dividends paid during the year US cents per share	Share price – Rio Tinto plc pence 1 Jan	Share price – Rio Tinto plc pence 31 Dec	Share price – Rio Tinto Limited A$ 1 Jan	Share price – Rio Tinto Limited A$ 31 Dec	Total shareholder return (TSR) Group %
2015	226.5	3,000	1,980	58.00	44.71	(32.5%)
2016	152.5	1,980	3,159	44.71	59.90	41.4%
2017	235.0	3,159	3,942	59.90	75.81	43.8%
2018	307.0	3,942	3,730	75.81	78.47	(4.4%)
2019	635.0	3,730	4,503	78.47	100.40	38.5%

The data presented in this table reflects the dual corporate structure of Rio Tinto. We weight the two Rio Tinto listings to produce a Group TSR figure in line with the methodology used for the 2015 PSA.

The performance conditions for PSA are provided in the notes to table 3 on pages 136 and 137.

The graph below shows Rio Tinto's TSR performance for awards granted under the 2015 PSA. It uses the same methodology as that used to calculate the vesting for the PSA granted in 2015 with a performance period that ended on 31 December 2019.

TSR (US$) – Rio Tinto Group vs EMIX Global Mining and MSCI World Indices
Total return basis 31 December 2014 = 100



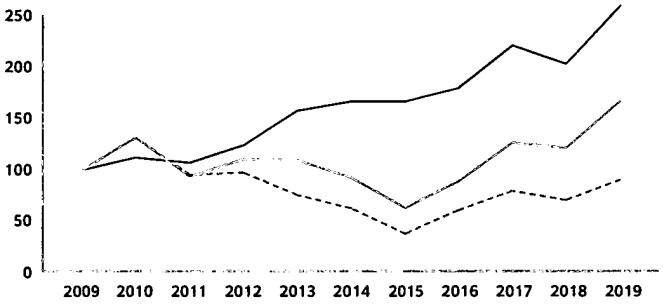
(a) TSR for the MSCI and EMIX indices has been calcualted using 12 month average Return Index data for the year sourced from DataStream.

(b) Rio Tinto's Group TSR has been calculated using a weighted average for Rio Tinto plc and Rio Tinto Limited. The weighting is based on the free-float market capitalisation of each entity as at the start of the period.

The following graph illustrates the TSR performance of the Group against the EMIX Global Mining Index and the MSCI World Index over the ten years to the end of 2019.

The graph meets the requirements of Schedule 8 of the UK Large and Medium-sized Companies and Groups (Accounts and Reports) Regulations 2008 (as amended) and is not an indication of the likely vesting of PSA granted in 2015.

TSR (US$) – Rio Tinto Group vs EMIX Global Mining and MSCI World Indices
Total return basis 31 December 2009 = 100



(a) TSR has been calculated using spot Return Index data as at the last trading day for the year sourced from DataStream. The indices chosen are those used for measuring PSA performance.

(b) Rio Tinto's Group TSR has been calculated using a weighted average for Rio Tinto plc and Rio Tinto Limited. The weighting is based on the free-float market capitalisation of each entity as at the start of the period.

The following table summarises the average vesting of performance shares for Executive Directors since 2016. The estimated outcome for the 2014-2018 performance period, reported in the 2018 Annual report of 41.3%, has been restated with the actual outcome of 42.98%. The overall vesting level for the 2015-2019 performance period is an estimate based on the estimated EBIT margin outcome.

Performance period	Vesting year	% of maximum shares vested
2012-15	2016	43.6
2013-16	2017	50.5
2013-17	2018	66.7
2014-18	2019	43.0
2015-19	2020	67.9
Average vesting	–	54.3

The Share Option Plan (SOP) ended for new awards from 2013. No awards of share options have been made since 2012 and no executives hold any vested and unexercised options.

Past-director payments
As disclosed previously, a deed of deferral was entered into with the former Chief Executive, Sam Walsh. This was in connection to the investigations concerning the Simandou project.

At the date of this report, regulatory investigations are still not complete. The Committee remains of the view that the further deferral of amounts that would otherwise have been payable on 31 December 2018 is appropriate.

What we paid our Chairman and non-executive directors
Positions held
We list the non-executive directors who held office during 2019 below. Each held office for the whole of 2019 unless otherwise indicated. Their years of appointment are reported in "Board of directors" on pages 84 to 85.

Name	Title
Simon Thompson	Chairman
Megan Clark	Non-executive director
David Constable	Non-executive director
Ann Godbehere	Non-executive director to 9 May 2019
Moya Greene	Non-executive director to 26 June 2019
Simon Henry	Non-executive director
Sam Laidlaw	Non-executive director
Michael L'Estrange	Non-executive director
Simon McKeon	Non-executive director

Annual fees payable
The table below shows the annual fees paid in 2019 and payable in 2020, to the Chairman and non-executive directors.

	2020	2019
Director fees		
Chairman's fee	**£730,000**	£730,000
Non-executive director base fee	**£95,000**	£95,000
Non-executive director base fee for Australian residents	**£105,000**	£105,000
Senior independent director	**£45,000**	£45,000
Committee fees		
Audit Committee Chairman	**£40,000**	£40,000
Audit Committee Member	**£25,000**	£25,000
Remuneration Committee Chairman	**£35,000**	£35,000
Remuneration Committee Member	**£20,000**	£20,000
Sustainability Committee Chairman	**£35,000**	£35,000
Sustainability Committee Member	**£20,000**	£20,000
Nominations Committee Member	**£7,500**	£7,500
Meeting allowances		
Long distance (flights over 10 hours per journey)	**£10,000**	£10,000
Medium distance (flights of 5-10 hours per journey)	**£5,000**	£5,000

The Chairman's fee is determined by the Committee, and was last increased on 1 July 2013. All other fees are subject to review by the Board on the recommendation of the Chairman's Committee.

The Chairman's Committee conducted a review of non-executive director fees in November 2019. Following this review, it was determined that all fees and travel allowances remain unchanged effective from 1 January 2020.

The additional £10,000 allowance for eligible Australian directors is to compensate them for additional UK National Insurance contributions which, unlike directors based in other jurisdictions, they are not able to offset against their local tax payments.

We set out details of each element of remuneration, and the single total figure of remuneration, paid to the Chairman and non-executive directors during 2019 and 2018 in US dollars in table 1b on page 132. No post-employment, termination or share-based payments were made. Statutory minimum superannuation contributions for non-executive directors are deducted from the director's overall fee entitlements when these are required by Australian superannuation law.

The total fee and allowance payments made to the Chairman and non-executive directors in 2019 are within the maximum aggregate annual amount of £3 million set out in the Group's constitutional documents, approved by shareholders at the 2009 AGMs.

Share ownership policy for non-executive directors
Rio Tinto has a policy that encourages non-executive directors to build up a shareholding equal in value to one year's base fee within three years of their appointment. Details of non-executive directors' share interests in the Group, including total holdings, as set out in table 2 on page 133.

Non-executive directors' share ownership
The non-executive directors' shareholdings are calculated using the market price of Rio Tinto shares on the latest practicable date before this report is published:

Director	**Share ownership level at 31 December 2019 as a multiple of base fee (or Chairman's fee)**	Share ownership level at 31 December 2018 as a multiple of base fee (or Chairman's fee)
Simon Thompson[a]	**3.3 (0.4)**	3.4 (0.4)
Megan Clark	**2.9**	2.6
David Constable	**1.1**	1.1
Simon Henry	**0.2**	0.2
Sam Laidlaw	**3.3**	3.4
Michael L'Estrange	**1.5**	1.5
Simon McKeon	**5.0**	–

(a) The multiple of Chairman's fee is represented in brackets following Simon Thompson's appointment as Chairman from 5 March 2018

In some cases, the value of the shares and the multiple of base fee as at 31 December 2019 is higher than the multiple reported as at 31 December 2018 as a result of higher share prices.

Base salary

We reviewed the base salaries for the Executive Committee and the resulting adjustments are set out below. The approach used to assess the level and appropriateness of any adjustments was consistent with that applied to the broader employee population. This included an assessment of market competiveness against relevant peer companies, a focus on gender pay equity and maintaining purchasing power with country consumer price index used as a proxy.

(Stated in '000)	2020	2019	% change
Bold Baatar	**£564**	£537	5.00%
Alfredo Barrios	**C$1,044**	C$1,024	1.99%
Vera Kirkova	**£451**	£422	7.00%
Barbara Levi	**£440**	–	–
Stephen McIntosh	**A$1,055**	A$1,036	1.85%
Simone Niven	**£451**	£422	7.00%
Chris Salisbury	**A$1,055**	A$1,036	1.85%
Arnaud Soirat	**£564**	£537	5.00%
Simon Trott	**S$ 975**	S$946	3.00%

STIP

Overview of STIP weightings and measures for 2019

The following table shows the measures and weightings used to determine STIP awards for executives in 2019.

	Weighting for Executive Directors and Group Executives	Weighting for PGCEOs
Safety – split between standalone binary measure for fatality, AIFR and SMM	20%	20%
Financial measures split equally between underlying earnings and STIP free cash flow for the Group	50%	20%
Financial measures split equally between underlying earnings and STIP free cash flow for the relevant product group	0%	30%
Individual measures based on key strategic initiatives of each role and contribution to overall company performance	30%	30%

The Group safety result was 64% of maximum and the average performance against safety goals for executives was above "target".

Detailed commentary on the performance of each product group is on pages 40 to 59. Average performance against the individual product group financial goals was below "target".

The Committee reviewed the individual performance of executives who are not Executive Directors and, on average, considered them above "target". This reflected performance against our safety, people, cash, partnership and growth objectives.

The 2019 STIP awards are detailed in the table below.

			Percentage of:		
(000's)	2019 STIP award (% of salary)[a]	2019 STIP award	Maximum STIP awarded	Maximum STIP forfeited	Target STIP awarded
Bold Baatar	112.6%	£605	56.3%	43.7%	112.6%
Alfredo Barrios	97.8%	C$1,001	48.9%	51.1%	97.8%
Joanne Farrell	106.6%	A$925	53.3%	46.7%	106.6%
Vera Kirikova	112.6%	£475	56.3%	43.7%	112.6%
Stephen McIntosh	114.2%	A$1,183	57.1%	42.9%	114.2%
Simone Niven	124.6%	£525	62.3%	37.7%	124.6%
Philip Richards	106.6%	£505	53.3%	46.7%	106.6%
Chris Salisbury	106.8%	A$1,106	53.4%	46.6%	106.8%
Arnaud Soirat	131.8%	£708	65.9%	34.1%	131.8%
Simon Trott	118.6%	S$1,122	59.3%	40.7%	118.6%

(a) Results out of 100% have been rounded to one decimal place and STIP awards have been rounded to the nearest thousand units. As the actual STIP awards do not use rounding conventions, small rounding variances may occur.

STIP measures, weightings and targets for 2020

As in 2019, the STIP measures and weightings for executives will be 50% for financial, 30% for individual and 20% for safety measures. The individual targets include objectives relating to safety, people, cash, partnership and growth. For the Executive Directors these will include climate change-related objectives.

The financial and individual targets that have been set for 2020 are considered by the Board to be commercially sensitive. As such, the specific targets for these measures, and the performance against them, are expected to be described retrospectively in the 2020 Implementation report. The Group financial targets relate to underlying earnings and STIP free cash flow.

2020 safety measures, weightings and targets

Rio Tinto had a fatality free year in 2019. Our primary objective in 2020 is to maintain this focus on fatality prevention.

In 2019, SMM was introduced to provide a roadmap to improve safety culture and performance. The SMM builds on the CRM approach by including leadership, overall risk management, work planning and execution, and learning and improvement. Strong improvement was observed across all elements, with the greatest improvement in site leadership and coaching. The 2019 year-end SMM assessments provided the business with valuable insight on the effectiveness of key safety management controls which enable targeted support and areas of focus.

Safety maturity in this context has resulted in a change to the weighting of our safety remuneration measures for all executives in 2020. This will include an increase in the weighting of our measure relating to SMM (40%), with the remainder split between the standalone binary fatality measure (40%) and AIFR (20%).

The standalone measure for fatality will continue to be assessed as follows:
- If a fatality occurs, there is no payment made in relation to this measure.
- An outcome of outstanding is paid if no fatality occurs.
- The metric will apply equally across all executives, regardless of the location of any fatality.

For the SMM measure, "target" performance for the Group has been set at 5.5. The "threshold" number for calculation purposes is 4.5 and "outstanding" performance has been set at 6.5.

For the AIFR measure, "target" performance for the Group has been set at 0.37. The "threshold" number for calculation purposes is 0.42, and "outstanding" performance has been set at 0.31.

LTIP

Outcomes for the period ended 31 December 2019

Eligible executives will receive shares in Rio Tinto plc or Rio Tinto Limited in 2020 from the vesting of PSA granted in 2015. All executives who were granted these awards will also receive additional shares equal to the dividends that would have been paid on the PSA shares that vest had they owned them during the five-year performance period. No dividends will be paid in respect of the share awards that lapse.

An estimate of the total value of PSA that will vest is included in the single total figure of remuneration. The actual PSA values will be recalculated following the vesting of the EBIT margin portion of the award, based on the actual share prices on the date of vesting (31 May 2020). The estimated PSA values will be restated, if applicable, in the 2020 Annual report.

LTIP awards granted in 2019

The maximum potential value of PSA granted in 2019 was 438% of base salary. The Committee decided that the PSA granted in 2019 would have a face value as shown in the table below. The eventual value received will depend on the Group's relative TSR performance during the years 2019-2023 and the share price at vesting. The 2019 PSA may vest after five years in 2024. The performance conditions for the awards granted in 2019 are consistent with the performance conditions for awards to be granted in 2020 as set out on this page.

LTIP awards for 2020

The Committee sets award levels to incentivise executives to meet the long-term strategic goals of the Group, to support retention and to contribute towards the competitiveness of the overall remuneration package. With this in mind, we determined that LTIP awards consist of conditional shares in 2020 and will have the face values shown in the table below.

Consistent with prior years, we calculated the awards using the average share price over the previous calendar year to mitigate the impact of short-term volatility in the share price. The awards granted in 2020 will therefore be calculated using the 2019 average share prices for Rio Tinto plc and Rio Tinto Limited of £43.43 and A$94.22 respectively.

Maximum value (% of 1 March base salary)	2020	2019
Bold Baatar	**410**	375
Alfredo Barrios	**375**	375
Vera Kirikova	**410**	375
Barbara Levi	**375**	–
Stephen McIntosh	**375**	375
Simone Niven	**410**	410
Chris Salisbury	**375**	375
Arnaud Soirat	**410**	410
Simon Trott	**410**	375
Average	**394**	384

The expected value of the awards is equal to 50% of the face value. The percentage vesting at "threshold" performance is 22.5%. The 2020 award will vest after five-years in 2025, subject to the Group's performance against the relative TSR measures.

The performance conditions for the PSAs granted since 2019 are set out below. TSR performance is measured equally against the EMIX Global Mining Index and the MSCI World Index.

Outperformance of the index by 6% per annum	100% of award vests
Performance between equal to the index and 6% outperformance	Proportionate vesting between 22.5% and 100% vesting
Performance equal to the index	22.5% of award vests
Performance less than the index	Nil vesting

Management Share Awards (MSA)

Executives are not eligible to receive MSA after their appointment. However, Bold Baatar, Joanne Farrell, Vera Kirikova, Stephen McIntosh, Simone Niven, Chris Salisbury, Arnaud Soirat and Simon Trott received grants prior to their appointments as executives that vested during the year.

Plan period	Plan period that ended 28 February 2019
Vesting period	11 March 2016 – 28 February 2019
% of shares vested	100%
% of shares forfeited	–

Share ownership

The following table shows the share ownership level for members of the Executive Committee as a multiple of base salary.

	Share ownership level at 31 December 2019 as a multiple of base salary
Bold Baatar	2.8
Alfredo Barrios	3.3
Vera Kirikova	1.2
Stephen McIntosh	3.6
Simone Niven	1.6
Chris Salisbury	4.2
Arnaud Soirat	3.4
Simon Trott	2.1

Share ownership level is calculated using the market price of Rio Tinto shares on the latest practicable date before this report was published (14 February 2020), and we define "share ownership" on page 117.

All current executives who were employed as at 31 December 2018 have increased their holding of ordinary shares during 2019, and are making progress towards their share ownership requirements. The value of the shares has also increased due to higher share prices.

Post-employment benefits

Executives may participate in the pension, superannuation, and post-employment medical and life insurance benefits which are typically offered to employees in similar locations.

Departures from the Executive Committee

Joanne Farrell left the Executive Committee on 30 September 2019 and will leave the Group on 31 March 2020. She will receive her normal base salary and other contractual benefits until 31 March 2020. She remained eligible to receive a STIP award for the period 1 January 2019 to 31 December 2019, which has been calculated on actual business and individual performance and will be paid fully in cash in March 2020. Joanne is ineligible for a base salary review or LTIP grant in March 2020. Outstanding LTIP awards will be treated, where required, in accordance with eligible leaver provisions of each plan with pro-rating, where applicable, up to 31 March 2020. Joanne will receive a payment of A$217,694 for unused and accrued annual leave and long-service leave as at her termination date in line with Australian legislation and policy.

Implementation report continued

Philip Richards left the Executive Committee and the Group on 31 December 2019. He received his normal base salary and contractual benefits until 31 December 2019. He remained eligible to receive a STIP award for the period 1 January 2019 to 31 December 2019, which has been calculated based on actual business and individual performance and will be paid fully in cash in March 2020. He received a payment equivalent to 6 months' base salary, paid in December 2019, to remain available to assist with transitional arrangements for a period of up to 12 months following his termination. Outstanding LTIP awards were treated, where required, in accordance with eligible leaver provisions of each plan with pro-rating, where applicable, up to 31 December 2019. Philip received a payment of £937 for unused and accrued annual leave as at his termination date in line with UK legislation and policy.

Service contracts

All executives have service contracts which can be terminated by the company with 12 months' notice in writing, or by the employee with six months' notice in writing, or immediately by the company by paying base salary only in lieu of any unexpired notice.

Positions held and date of appointment

Name	Position(s) held during 2019	Date of appointment to position
Other executives		
Bold Baatar	Chief Executive, Energy & Minerals	1 December 2016
Alfredo Barrios	Chief Executive, Aluminium	1 June 2014
Vera Kirikova	Group Executive, Human Resources	1 January 2017
Stephen McIntosh	Group Executive, Growth & Innovation	2 July 2016
Simone Niven	Group Executive, Corporate Relations	1 January 2017
Chris Salisbury	Chief Executive, Iron Ore	2 July 2016
Arnaud Soirat	Chief Executive, Copper & Diamonds	2 July 2016
Simon Trott	Chief Commercial Officer	1 January 2018

Other share plans

All employee share plans

The Committee believes that all employees should be given the opportunity to become shareholders in our business, and that share plans help engage, retain and motivate employees over the long-term. Rio Tinto's share plans are therefore part of its standard remuneration practice, to encourage alignment with the performance of the Group. Executives may participate in broad-based share plans that are available to Group employees generally and to which performance conditions do not apply.

A global employee share purchase plan is normally offered to all eligible employees unless there are local jurisdictional restrictions. Under the plan, employees may acquire shares up to the value of US$5,000 (or equivalent in other currencies) per year, or capped at 10% of their base salary if lower. Each share purchased will be matched by the company, providing the participant holds the shares, and is still employed, at the end of the three-year vesting period.

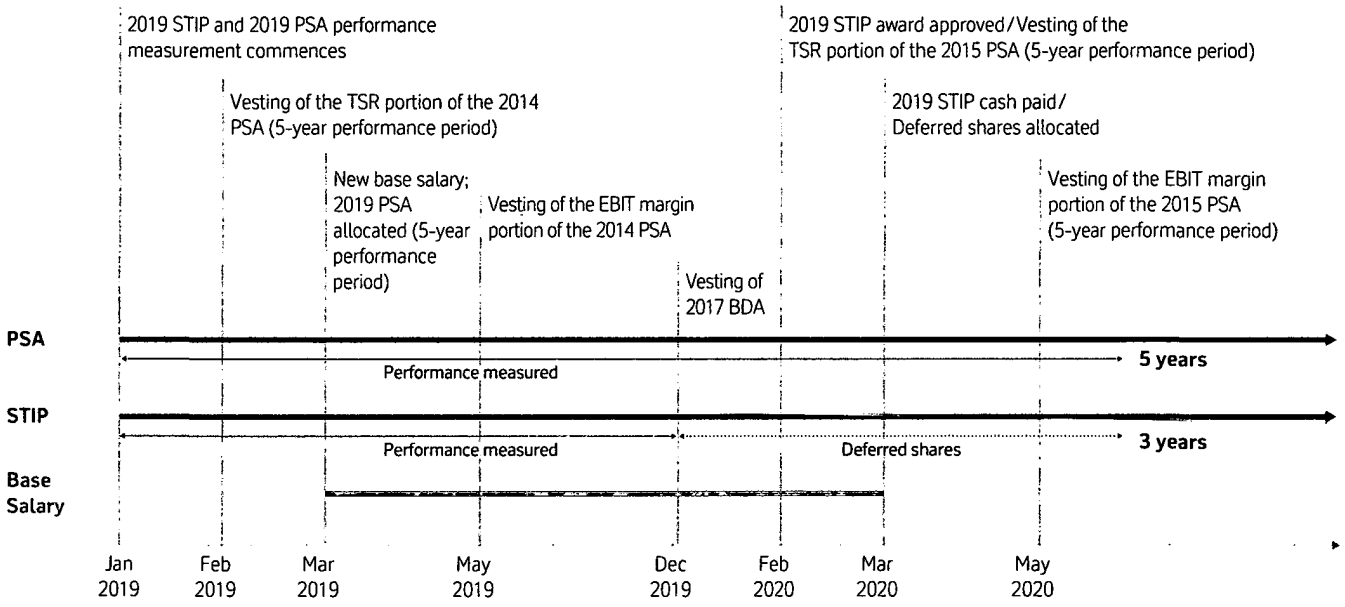
Approximately 19,000 (44%) of our employees are shareholders as a result of participating in this plan. In the UK, these arrangements are partially delivered through the Share Ownership Plan which is a UK tax approved arrangement. Under this plan, eligible participants may also receive an annual award of Free Shares up to the limits prescribed under UK tax legislation.

Management Share Awards (MSA)

The MSA are designed to help the Group attract the best staff in an increasingly competitive labour market, and to retain key individuals as we deliver our long-term strategy. MSA are conditional awards that are not subject to a performance condition. They vest at the end of three years subject to continued employment, to act as a retention tool. Shares to satisfy the awards are bought in the market, and no new shares are issued. Executives are not eligible for the MSA after appointment.

When remuneration is delivered

The following chart provides a timeline of when total remuneration is delivered, using 2019 as an example.



Dilution

Awards under the Share Option Plan, the 2013 Performance Share Plan, the 2018 EIP and all employee plans may be satisfied by, in the case of Rio Tinto plc, treasury shares or the issue of new shares or the purchase of shares in the market. In the case of Rio Tinto Limited, the plans are satisfied by the purchase of shares in the market and can be satisfied by the issue of new shares.

In the UK, the Investment Association has issued corporate governance guidelines in relation to the amount of new shares that may be issued having regard to the total issued share capital. Under the guidelines, the rules of a scheme must provide that commitments to issue new shares or reissue treasury shares, when aggregated with awards under all of a company's other schemes, must not exceed 10% of the issued ordinary share capital (adjusted for share issuance and cancellation) in any rolling ten-year period.

Furthermore, commitments to issue new shares or reissue treasury shares under executive (discretionary) schemes should not exceed 5% of the issued ordinary share capital of a company (adjusted for share issuance and cancellation) in any rolling ten-year period. This may be exceeded where vesting is dependent on the achievement of significantly more stretching performance criteria. Rio Tinto plc is in compliance with these guidelines. As at 31 December 2019 these limits had not been exceeded.

In Australia, as a condition of relief from prospectus requirements, the Australian Securities and Investments Commission has imposed a cap on the issue of shares to employees of 5% of issued capital during a three-year period. As Rio Tinto Limited satisfies awards by market purchase, Rio Tinto Limited is in compliance with this requirement.

All other share awards are satisfied by shares that are purchased in the market. Further information in respect of the share plan arrangements and outstanding balances under each plan can be found in note 43 to the financial statements.

Shareholder voting

In the table below, we set out the results of the remuneration-related resolutions approved at the Group's 2019 AGMs. Our meetings with shareholders in 2019 were well attended and provided an opportunity for the Committee chairman to discuss remuneration-related topics with shareholders.

Resolution	Total votes cast	Votes for	Votes against	Votes withheld[a]
Approval of the Directors' remuneration report: Implementation report	1,143,455,162	1,070,321,199	73,133,963	24,817,450
		93.6%	6.4%	
Approval of the Directors' remuneration report	1,151,989,943	1,069,822,503	82,167,440	16,285,082
		92.9%	7.1%	

(a) A vote "withheld" is not a vote in law, and is not counted in the calculation of the proportion of votes for and against the resolution.

Relative spend on remuneration

To show our relative spend on remuneration, the directors have shown other significant disbursements of the company's funds for comparison.

Stated in US$m	2019	2018	Difference in spend
Remuneration paid[a]	4,522	4,765	(243)
Distributions to shareholders[b]	11,886	6,333	5,553
Purchase of property, plant and equipment and intangible assets[c]	5,488	4,482	1,006
Corporate income tax paid[c]	4,549	2,307	2,242

(a) Total employment costs for the financial year as per note 5 to the financial statements.
(b) Distributions to shareholders include equity dividends paid to owners of Rio Tinto and own shares purchased from owners of Rio Tinto as per the Group cash flow statement.
(c) Purchase of property, plant and equipment and intangible assets, and corporate income tax paid during the financial year are as per the Group cash flow statement and are calculated as per note 1 to the financial statements.

Gender pay

Rio Tinto is committed to ensuring that employees with similar skills, knowledge, qualifications, experience and performance are paid equally for the same or comparable work.

The company's statement on pay equity, and our approach to inclusion and diversity, are set out on pages 69 to 70, and on the company's website.

An additional voluntary disclosure on UK gender pay reporting is set out on the company's website.

Implementation report continued

Table 1a – Executives' remuneration

Stated in US$'000[a]		Base salary	Cash bonus[b]	Short-term benefits: Other cash-based benefits[c]	Short-term benefits: Non-monetary benefits[d][e]	Total short-term benefits
Executive Directors						
Jean-Sébastien Jacques	2019	1,447	1,118	350	64	2,979
	2018	1,476	989	350	62	2,877
Jakob Stausholm	2019	989	573	223	57	1,842
	2018	345	160	518	138	1,161
Other Executives						
Bold Baatar	2019	683	398	148	56	1,285
	2018	697	275	152	33	1,157
Alfredo Barrios[f]	2019	769	383	247	123	1,522
	2018	773	361	249	146	1,529
Joanne Farrell[g]	2019	450	486	19	43	998
	2018	630	276	27	38	971
Vera Kirikova	2019	536	312	129	19	996
	2018	547	242	132	19	940
Stephen McIntosh	2019	717	414	150	81	1,362
	2018	752	415	95	79	1,341
Simone Niven	2019	536	345	124	17	1,022
	2018	547	305	112	5	969
Philip Richards	2019	603	664	143	40	1,450
	2018	615	290	146	28	1,079
Chris Salisbury	2019	717	387	179	53	1,336
	2018	752	335	181	48	1,316
Arnaud Soirat	2019	683	465	148	61	1,357
	2018	697	472	152	109	1,430
Simon Trott	2019	691	416	26	23	1,156
	2018	686	334	734	75	1,829

Notes to table 1a – Executives' remuneration

(a) "Table 1a – Executives' remuneration" is reported in US$ using A$1 = US$0.69531; £1 = US$1.27661; C$1 = US$0.75370; S$1 = US$0.73307 (2019 average rates), except for cash bonuses which use A$1 = US$0.70033; £1 = US$1.31397; C$1 = US$0.76578; S$1 = US$0.74167 (2019 year-end rates).

(b) "Cash bonus" relates to the cash portion of the 2019 STIP award to be paid in March 2020.

(c) "Other cash-based benefits" typically include cash in lieu of a car and fuel and, where applicable, cash in lieu of company pension or superannuation contributions.

(d) "Non-monetary benefits" for executives include healthcare coverage, provision of a car, professional tax compliance services/advice and flexible perquisites.

(e) "Non-monetary benefits" for executives living outside their home country include international assignment benefits comprising, where applicable, housing, education, relocation expenses, tax equalisation and related compliance services, assignee and family home leave trips and international assignment payments made to and on their behalf.

(f) Other cash-based benefits for Alf Barrios for 2018 have been restated as pension cash supplement of C$15,000 (US$12,000) was omitted. The previous figure disclosed for 2018 was US$237,000.

(g) The details for 2019 reflect remuneration for the period 1 January to 30 September 2019.

Table 1a – Executives' remuneration continued

		Long-term benefits: Value of shared-based awards[h]				Post-employment benefits[k]				
Stated in US$'000[a]		BDA[i]	PSA	MSA	Others[j]	Pension and superannuation	Other post-employment benefits	Termination benefits	Total renumeration[l]	Currency of actual payment
Executive Directors										
Jean-Sébastien Jacques	2019	1,047	3,028	–	8	27	–	–	7,089	£
	2018	947	2,270	–	9	36	–	–	6,139	£
Jakob Stausholm	2019	174	491	–	1	15	–	–	2,523	£
	2018	39	50	–	–	8	–	–	1,258	£
Other Executives										
Bold Baatar	2019	327	1,071	6	8	13	–	–	2,710	£
	2018	258	732	51	7	13	–	–	2,218	£
Alfredo Barrios	2019	472	1,675	–	4	21	–	–	3,694	C$
	2018	507	1,195	–	4	20	–	–	3,255	C$
Joanne Farrell	2019	179	656	5	3	128	–	–	1,969	A$
	2018	270	610	64	4	164	–	–	2,083	A$
Vera Kirikova	2019	242	713	3	8	13	–	–	1,975	£
	2018	176	483	20	7	13	–	–	1,639	£
Stephen McIntosh	2019	398	1,070	7	4	47	–	–	2,888	A$
	2018	338	739	64	4	112	–	–	2,598	A$
Simone Niven	2019	270	794	3	5	18	–	–	2,112	£
	2018	204	534	25	5	36	–	–	1,773	£
Philip Richards	2019	148	772	–	5	–	–	310	2,685	£
	2018	146	504	–	4	–	–	–	1,733	£
Chris Salisbury	2019	389	1,149	8	–	17	–	–	2,899	A$
	2018	341	775	68	–	19	–	–	2,519	A$
Arnaud Soirat	2019	402	1,117	8	5	13	–	–	2,902	£
	2018	323	797	75	5	13	–	–	2,643	£
Simon Trott	2019	211	694	48	4	165	–	–	2,278	S$
	2018	132	335	76	4	141	–	–	2,517	S$

(h) The value of share-based awards has been determined in accordance with the recognition and measurement requirements of IFRS2 "Share-based Payment". The fair value of awards granted under the Management Share Awards (MSA), the Bonus Deferral Awards (BDA) and the Performance Share Awards (PSA) have been calculated at their dates of grant using valuation models provided by external consultants, Lane Clark and Peacock LLP, including an independent lattice-based option valuation model and a Monte Carlo valuation model which take into account the constraints on vesting and exercise attached to these awards. Further details of the valuation methods and assumptions used for these awards are included in note 43 (Share-based Payments) in the financial statements. The fair value of other share-based awards is measured at the purchase cost of the shares from the market. The non-executive directors do not participate in the long term incentive share plans.

(i) "BDA" represents the portion of the 2016 – 2019 STIP awards deferred into Rio Tinto shares.

(j) "Others" includes the Global Employee Share Plan (myShare) and the Share Ownership Plan.

(k) The costs shown for defined benefit pension plans and post-retirement medical benefits are the service costs attributable to the individual, calculated in accordance with IAS 19. The cost for defined contribution plans is the amount contributed in the year by the company.

(l) "Total remuneration" represents the disclosure of total emoluments and compensation required under the Australian Corporations Act 2001 and applicable accounting standards.

Further details in relation to aggregate compensation for executives, including directors, are included in note 38 (Directors' and key management remuneration).

Implementation report continued

Table 1b – Non-executive directors' remuneration

Stated in US$'000[a]		Fees and allowances[b]	Non-monetary benefits[c]	Single total figure of remuneration[d]	Currency of actual payment
Chairman					
Simon Thompson[e]	2019	932	2	934	£
	2018	844	8	852	£
Non-executive directors					
Megan Clark	2019	263	21	284	A$
	2018	303	29	332	A$
David Constable	2019	252	23	275	£
	2018	289	34	323	£
Ann Godbehere[f]	2019	108	9	117	£
	2018	304	12	316	£
Moya Greene[g]	2019	107	3	110	£
	2018	70	–	70	£
Simon Henry	2019	241	4	245	£
	2018	215	9	224	£
Sam Laidlaw	2019	270	3	273	£
	2018	229	8	237	£
Michael L'Estrange	2019	188	13	201	A$
	2018	256	19	275	A$
Simon McKeon	2019	250	14	264	A$

Notes to table 1b – Non-executive directors' remuneration

(a) The remuneration is reported in US$. The amounts have been converted using the relevant 2019 average exchange rates of £1 = US$1.27661 and A$1 = US$0.69531 (1 January to 31 December 2019 average).

(b) "Fees and allowances" comprises the total fees for the Chairman and all non-executive directors, and travel allowances for the non-executive directors (other than the Chairman). The payment of statutory minimum superannuation contributions for Australian non-executive directors is required by Australian superannuation law. These contributions are included in the "Fees and allowances" amount disclosed for Australian non-executive directors.

(c) "Non-monetary benefits" include, as in previous years, amounts which are deemed by the UK tax authorities to be benefits in kind relating largely to the costs of non-executive directors' expenses in attending board meetings held at the company's UK registered office (including associated hotel and subsistence expenses) and professional tax compliance services/advice. Given these expenses are incurred by directors in the fulfilment of their duties, the company pays the tax on them.

(d) Represents disclosure of the single total figure of remuneration under Schedule 8 of the Large and Medium-sized Companies and Groups (Accounts and Reports) Regulations 2008 (as amended) and total remuneration under the Australian Corporations Act 2001 and applicable accounting standards.

(e) The amounts reported for Simon Thompson in 2018 reflect the period when he was a non-executive director from 1 January to 4 March 2018 and then Chairman of the Board from 5 March to 31 December 2018.

(f) The amounts reported for Ann Godbehere reflect the period when she was an active member of the Board from 1 January to 9 May 2019.

(g) The amounts reported for Moya Greene reflect the periods when she was an active member of the Board from 1 January to 26 June in 2019 and 17 September to 31 December in 2018.

Further details in relation to aggregate compensation for executives, including directors, are included in note 38 (Directors' and key management remuneration).

Table 2 – Directors' and executives' beneficial interests in Rio Tinto shares

	Rio Tinto plc[a]			Rio Tinto Limited					Movements
	1 Jan 2019[b]	31 Dec 2019[c]	**14 Feb 2020[c]**	1 Jan 2019[b]	31 Dec 2019[c]	**14 Feb 2020[c]**	Exercise of options[e]	Compensation[f]	Other[g]
Directors									
Megan Clark	–	–	–	5,245	5,770	**5,770**	–	–	525
David Constable	2,547	2,547	**2,547**	–	–	–	–	–	–
Ann Godbehere [h]	3,100	3,100	–	–	–	–	–	–	–
Moya Greene [h]	2,618	2,618	–	–	–	–	–	–	–
Simon Henry	500	500	**500**	–	–	–	–	–	–
Jean-Sébastien Jacques	64,740	97,578	**97,603**	–	–	–	–	62,082	(29,219)
Sam Laidlaw	7,500	7,500	**7,500**	–	–	–	–	–	–
Michael L'Estrange	–	–	–	3,103	3,103	**3,103**	–	–	–
Simon McKeon	–	–	–	10,000	10,000	**10,000**	–	–	–
Jakob Stausholm	15,000	15,078	**15,102**	–	–	–	–	93	9
Simon Thompson	7,458	7,458	**7,458**	–	–	–	–	–	–
Executives									
Bold Baatar	17,231	28,920	**28,952**	–	–	–	–	15,725	(4,004)
Alfredo Barrios	17,906	38,812	**38,843**	–	–	–	–	38,977	(18,040)
Joanne Farrell [h]	3,175	3,528	–	41,001	50,234	–	–	16,382	(6,796)
Vera Kirikova	3,768	6,788	**6,825**	–	–	–	–	4,564	(1,507)
Barbara Levi [h]	–	–	–	–	–	–		–	–
Stephen McIntosh	8,478	2,673	**2,673**	17,784	28,748	**28,775**	–	17,331	(12,145)
Simone Niven	5,895	10,077	**10,077**	–	–	–	–	6,459	(2,277)
Philip Richards [h]	68	200	–	–	–	–	–	121	11
Christopher Salisbury	–	–	–	27,837	38,188	**38,188**	–	17,873	(7,522)
Arnaud Soirat	155	2,380	**2,404**	20,626	27,393	**27,393**	–	23,225	(14,209)
Simon Trott	74	169	**169**	11,536	18,391	**18,417**	–	6,853	123

Notes to table 2 – Directors' and executives' beneficial interests in Rio Tinto shares

(a) Rio Tinto plc ordinary shares or American Depositary Shares.
(b) Or date of appointment, if later.
(c) Or date of retirement / date stepped down from the Executive Committee, if earlier.
(d) Latest practicable date prior to the publication of the 2019 Annual report.
(e) Shares obtained through the exercise of options under the Rio Tinto Share Savings Plan or the Share Option Plan. The number of shares retained may differ from the number of options exercised.
(f) Shares obtained through awards under the Rio Tinto Share Ownership Plan, the Global Employee Share Plan and/or vesting of the Performance Share Awards (PSA), Management Share Awards (MSA) and Bonus Deferral Awards (BDA) granted under the Group's Long Term Incentive Plan (LTIP) arrangements.
(g) Share movements due to the sale or purchase of shares, or shares received under dividend reinvestment plans.
(h) Ann Godbehere and Moya Greene retired as directors on 9 May 2019 and 26 June 2019 respectively. Joanne Farrell and Philip Richards retired from the Executive Committee on 30 September 2019 and 31 December 2019 respectively. Barbara Levi joined the Executive Committee on 1 January 2020.

Interests in outstanding awards under LTIPs and option plans are set out in table 3.

Implementation report continued

Table 3 – Plan interests (awards of shares under long term incentive plans)

Name	Award/ grant date	Market price at award[a][b]	1 January 2019	Awarded	Lapsed/ cancelled	Dividend units	Vested	31 December 2019	14 February 2020	Vesting period concludes	Date of release	Market price at release	Market value of award at release US$[a]
Bonus Deferral Awards													
Bold Baatar	9 Mar 2017	£32.03	5,703	–	–	1,079	6,782	–	–	-	2 Dec 2019	£42.26	365,886
	15 May 2018	£42.30	7,389	–	–	–	–	7,389	7,389	1 Dec 2020	–	–	–
	18 Mar 2019	£42.67	–	5,205	–	–	–	5,205	5,205	1 Dec 2021	–	–	–
Alfredo Barrios	9 Mar 2017	£32.03	14,230	–	–	2,692	16,922	–	–	-	2 Dec 2019	£42.26	912,934
	15 May 2018	£42.30	10,097	–	–	–	–	10,097	10,097	1 Dec 2020	–	–	–
	18 Mar 2019	£42.67	–	6,715	–	–	–	6,715	6,715	1 Dec 2021	–	–	–
Joanne Farrell	9 Mar 2017	A$60.14	6,511	–	–	966	7,477	–	–	-	2 Dec 2019	A$97.92	509,070
	15 May 2018	A$83.61	6,478	–	–	–	–	6,478	6,478	1 Dec 2020	–	–	–
	18 Mar 2019	A$93.17	–	4,307	–	–	–	4,307	4,307	1 Dec 2021	–	–	–
Jean-Sébastien Jacques	9 Mar 2017	£32.03	22,163	–	–	4,194	26,357	–	–	-	2 Dec 2019	£42.26	1,421,948
	15 May 2018	£42.30	21,401	–	–	–	–	21,401	21,401	1 Dec 2020	–	–	–
	18 Mar 2019	£42.67	–	18,681	–	–	–	18,681	18,681	1 Dec 2021	–	–	–
Vera Kirikova	9 Mar 2017	£32.03	1,811	–	–	342	2,153	–	–	-	2 Dec 2019	£42.26	116,153
	15 May 2018	£42.30	6,308	–	–	–	–	6,308	6,308	1 Dec 2020	–	–	–
	18 Mar 2019	£42.67	–	4,581	–	–	–	4,581	4,581	1 Dec 2021	–	–	–
Stephen McIntosh	9 Mar 2017	A$60.14	7,526	–	–	1,116	8,642	–	–		2 Dec 2019	A$97.92	588,388
	15 May 2018	A$83.61	7,569	–	–	–	–	7,569	7,569	1 Dec 2020	–	–	–
	18 Mar 2019	A$93.17	–	6,467	–	–	–	6,467	6,467	1 Dec 2021	–	–	–
Simone Niven	9 Mar 2017	£32.03	1,704	–	–	322	2,026	–	–	-	2 Dec 2019	£42.26	109,302
	15 May 2018	£42.30	6,713	–	–	–	–	6,713	6,713	1 Dec 2020	–	–	–
	18 Mar 2019	£42.67	–	5,766	–	–	–	5,766	5,766	1 Dec 2021	–	–	–
Philip Richards	15 May 2018	£42.30	5,327	–	–	–	–	5,327	5,327	1 Dec 2020	–	–	–
	18 Mar 2019	£42.67	–	5,487	–	–	–	5,487	5,487	1 Dec 2021	–	–	–
Chris Salisbury	9 Mar 2017	A$60.14	7,772	–	–	1,153	8,925	–	–	-	2 Dec 2019	A$97.92	607,656
	15 May 2018	A$83.61	8,525	–	–	–	–	8,525	8,525	1 Dec 2020	–	–	–
	18 Mar 2019	A$93.17	–	5,214	–	–	–	5,214	5,214	1 Dec 2021	–	–	–
Arnaud Soirat	9 Mar 2017	£32.03	8,051	–	–	1,523	9,574	–	–	-	2 Dec 2019	£42.26	516,513
	15 May 2018	£42.30	6,328	–	–	–	–	6,328	6,328	1 Dec 2020	–	–	–
	18 Mar 2019	£42.67	–	8,913	–	–	–	8,913	8,913	1 Dec 2021	–	–	–
Jakob Stausholm	18 Mar 2019	£42.67	–	3,022	–	–	–	3,022	3,022	1 Dec 2021	–	–	–
Simon Trott	9 Mar 2017	A$60.14	1,335	–	–	198	1,533	–	–	-	2 Dec 2019	A$97.92	104,374
	15 May 2018	£42.30	1,313	–	–	–	–	1,313	1,313	1 Dec 2020	–	–	–
	18 Mar 2019	£42.67	–	6,140	–	–	–	6,140	6,140	1 Dec 2021	–	–	–

Table 3 – Plan interests (awards of shares under long term incentive plans) continued

Name	Award/ grant date	Market price at award[a][b]	1 January 2019	Awarded	Lapsed/ cancelled	Dividend units	Vested	31 December 2019	14 February 2020	Performance / vesting (MSA) period concludes[c]	Date of release	Market price at release	Market value of award at release US$[a]
Management Share Awards													
Bold Baatar	11 Mar 2016	£20.00	4,317	–	–	433	4,750	–	–	–	28 Feb 2019	£43.27	262,385
Joanne Farrell	11 Mar 2016	A$44.57	4,318	–	–	345	4,663	–	–	–	28 Feb 2019	A$96.68	313,459
Vera Kirikova	11 Mar 2016	£20.00	1,878	–	–	188	2,066	–	–	–	28 Feb 2019	£43.27	114,124
Stephen McIntosh	11 Mar 2016	A$44.57	4,364	–	–	349	4,713	–	–	–	28 Feb 2019	A$96.68	316,820
Simone Niven	11 Mar 2016	£20.00	2,277	–	–	228	2,505	–	–	–	28 Feb 2019	£43.27	138,373
Chris Salisbury	11 Mar 2016	A$44.57	4,632	–	–	371	5,003	–	–	–	28 Feb 2019	A$96.68	336,315
Arnaud Soirat	11 Mar 2016	A$44.57	5,057	–	–	405	5,462	–	–	–	28 Feb 2019	A$96.68	367,170
Simon Trott	11 Mar 2016	A$44.57	2,353	–	–	188	2,541	–	–	–	28 Feb 2019	A$96.68	170,813
	9 Mar 2017	A$60.14	2,695	–	–	–	–	2,695	2,695	27 Feb 2020	–	–	–
Performance Share Awards													
Bold Baatar	17 Mar 2014	£31.80	7,765	–	(4,429)	589	3,925	–	–	31 Dec 2018	28 Feb 2019/ 3 Jun 2019	£43.27/ £45.38	166,269/ 53,002
	23 Mar 2015	£29.43	14,954	–	–	–	–	14,954	14,954	31 Dec 2019	–	–	–
	11 Mar 2016	£20.00	17,270	–	–	–	–	17,270	17,270	31 Dec 2020	–	–	–
	9 Mar 2017	£32.03	85,174	–	–	–	–	85,174	85,174	31 Dec 2021	–	–	–
	15 May 2018	£42.30	63,039	–	–	–	–	63,039	63,039	31 Dec 2022	–	–	–
	18 Mar 2019	£42.67	–	51,752	–	–	–	51,752	51,752	31 Dec 2023	–	–	–
Alfredo Barrios	15 Sep 2014	£32.35	43,568	–	(24,844)	3,072	21,796	–	–	31 Dec 2018	28 Feb 2019/ 31 May 2019	£43.27/ £45.10	922,932/ 292,964
	23 Mar 2015	£29.43	66,390	–	–	–	–	66,390	66,390	31 Dec 2019	–	–	–
	11 Mar 2016	£20.00	73,140	–	–	–	–	73,140	73,140	31 Dec 2020	–	–	–
	9 Mar 2017	£32.03	91,721	–	–	–	–	91,721	91,721	31 Dec 2021	–	–	–
	15 May 2018	£42.30	66,050	–	–	–	–	66,050	66,050	31 Dec 2022	–	–	–
	18 Mar 2019	£42.67	–	57,011	–	–	–	57,011	57,011	31 Dec 2023	–	–	–
Joanne Farrell	17 Mar 2014	A$61.28	7,448	–	(4,247)	475	3,676	–	–	31 Dec 2018	28 Feb 2019/ 31 May 2019	A$96.68/ A$100.43	189,971/ 59,355
	23 Mar 2015	A$58.21	7,539	–	–	–	–	7,539	7,539	31 Dec 2019	–	–	–
	11 Mar 2016	A$44.57	8,637	–	–	–	–	8,637	8,637	31 Dec 2020	–	–	–
	9 Mar 2017	A$60.14	66,295	–	–	–	–	66,295	66,295	31 Dec 2021	–	–	–
	15 May 2018	A$83.61	48,612	–	–	–	–	48,612	48,612	31 Dec 2022	–	–	–
	18 Mar 2019	A$93.17	–	41,620	–	–	–	41,620	41,620	31 Dec 2023	–	–	–
Jean-Sébastien Jacques	17 Mar 2014	£31.80	70,057	–	(39,950)	5,323	35,430	–	–	31 Dec 2018	28 Feb 2019/ 31 May 2019	£43.27/ £45.10	1,500,620/ 475,836
	23 Mar 2015	£29.43	72,768	–	–	–	–	72,768	72,768	31 Dec 2019	–	–	–
	11 Mar 2016	£20.00	84,005	–	–	–	–	84,005	84,005	31 Dec 2020	–	–	–
	12 Sep 2016	£22.95	79,966	–	–	–	–	79,966	79,966	31 Dec 2020	–	–	–
	9 Mar 2017	£32.03	184,994	–	–	–	–	184,994	184,994	31 Dec 2021	–	–	–
	15 May 2018	£42.30	139,995	–	–	–	–	139,995	139,995	31 Dec 2022	–	–	–
	18 Mar 2019	£42.67	–	125,665	–	–	–	125,665	125,665	31 Dec 2023	–	–	–
Vera Kirikova	14 Sep 2015	£23.98	1,758	–	–	–	–	1,758	1,758	31 Dec 2019	–	–	–
	11 Mar 2016	£20.00	5,636	–	–	–	–	5,636	5,636	31 Dec 2020	–	–	–
	9 Mar 2017	£32.03	66,803	–	–	–	–	66,803	66,803	31 Dec 2021	–	–	–
	15 May 2018	£42.30	45,219	–	–	–	–	45,219	45,219	31 Dec 2022	–	–	–
	18 Mar 2019	£42.67	–	40,591	–	–	–	40,591	40,591	31 Dec 2023	–	–	–

Implementation report continued

Table 3 – Plan interests (awards of shares and options under long term incentive plans) continued

Name	Award/ grant date	Market price at award[a][b]	1 January 2019	Awarded	Lapsed/ cancelled	Dividend units	Vested	31 December 2019	14 February 2020	Performance period concludes[c]	Date of release	Market price at release	Market value of award at release US$[a]
Stephen McIntosh	17 Mar 2014	A$61.28	7,578	–	(4,322)	483	3,739	–	–	31 Dec 2018	28 Feb 2019/ 31 May 2019	A$96.68/ A$100.43	193,265/ 60,333
	23 Mar 2015	A$58.21	11,429	–	–	–	–	11,429	11,429	31 Dec 2019	–	–	–
	11 Mar 2016	A$44.57	13,093	–	–	–	–	13,093	13,093	31 Dec 2020	–	–	–
	9 Mar 2017	A$60.14	79,152	–	–	–	–	79,152	79,152	31 Dec 2021	–	–	–
	15 May 2018	A$83.61	58,040	–	–	–	–	58,040	58,040	31 Dec 2022	–	–	–
	18 Mar 2019	A$93.17	–	49,689	–	–	–	49,689	49,689	31 Dec 2023	–	–	–
Simone Niven	17 Mar 2014	£31.80	3,660	–	(2,088)	277	1,849	–	–	31 Dec 2018	28 Feb 2019/ 31 May 2019	£43.27/ £45.10	78,384/ 24,759
	23 Mar 2015	£29.43	5,041	–	–	–	–	5,041	5,041	31 Dec 2019	–	–	–
	11 Mar 2016	£20.00	9,109	–	–	–	–	9,109	9,109	31 Dec 2020	–	–	–
	9 Mar 2017	£32.03	66,803	–	–	–	–	66,803	66,803	31 Dec 2021	–	–	–
	15 May 2018	£42.30	49,440	–	–	–	–	49,440	49,440	31 Dec 2022	–	–	–
	18 Mar 2019	£42.67	–	44,379	–	–	–	44,379	44,379	31 Dec 2023	–	–	–
Philip Richards	11 Sep 2017	£36.78	57,810	–	–	–	–	57,810	57,810	31 Dec 2021	–	–	–
	15 May 2018	£42.30	50,872	–	–	–	–	50,872	50,872	31 Dec 2022	–	–	–
	18 Mar 2019	£42.67	–	45,666	–	–	–	45,666	45,666	31 Dec 2023	–	–	–
Chris Salisbury	17 Mar 2014	A$61.28	7,994	–	(4,559)	510	3,945	–	–	31 Dec 2018	28 Feb 2019/ 31 May 2019	A$96.68/ A$100.43	203,886/ 63,685
	23 Mar 2015	A$58.21	16,175	–	–	–	–	16,175	16,175	31 Dec 2019	–	–	–
	11 Mar 2016	A$44.57	13,898	–	–	–	–	13,898	13,898	31 Dec 2020	–	–	–
	9 Mar 2017	A$60.14	79,152	–	–	–	–	79,152	79,152	31 Dec 2021	–	–	–
	15 May 2018	A$83.61	63,457	–	–	–	–	63,457	63,457	31 Dec 2022	–	–	–
	18 Mar 2019	A$93.17	–	49,689	–	–	–	49,689	49,689	31 Dec 2023	–	–	–
Arnaud Soirat	17 Mar 2014	A$61.28	16,326	–	(9,310)	1,043	8,059	–	–	31 Dec 2018	28 Feb 2019/ 3 Jun 2019	A$96.68/ A$98.70	416,444/ 127,921
	23 Mar 2015	A$58.21	17,658	–	–	–	–	17,658	17,658	31 Dec 2019	–	–	–
	11 Mar 2016	A$44.57	20,230	–	–	–	–	20,230	20,230	31 Dec 2020	–	–	–
	9 Mar 2017	£32.03	85,174	–	–	–	–	85,174	85,174	31 Dec 2021	–	–	–
	15 May 2018	£42.30	57,657	–	–	–	–	57,657	57,657	31 Dec 2022	–	–	–
	18 Mar 2019	£42.67	–	56,582	–	–	–	56,582	56,582	31 Dec 2023	–	–	–
Jakob Stausholm	10 Sep 2018	£35.16	29,886	–	–	–	–	29,886	29,886	31 Dec 2022	–	–	–
	18 Mar 2019	£42.67	–	79,609	–	–	–	79,609	79,609	31 Dec 2023	–	–	–
Simon Trott	17 Mar 2014	A$61.28	5,135	–	(2,929)	327	2,533	–	–	31 Dec 2018	28 Feb 2019/ 31 May 2019	A$96.68/ A$100.43	130,950/ 40,851
	23 Mar 2015	A$58.21	8,216	–	–	–	–	8,216	8,216	31 Dec 2019	–	–	–
	11 Mar 2016	A$44.57	9,412	–	–	–	–	9,412	9,412	31 Dec 2020	–	–	–
	9 Mar 2017	A$60.14	8,085	–	–	–	–	8,085	8,085	31 Dec 2021	–	–	–
	15 May 2018	£42.30	57,188	–	–	–	–	57,188	57,188	31 Dec 2022	–	–	–
	18 Mar 2019	£42.67	–	50,598	–	–	–	50,598	50,598	31 Dec 2023	–	–	–

(a) Awards denominated in pound sterling were for Rio Tinto plc ordinary shares of 10 pence each and awards denominated in Australian dollars were for Rio Tinto Limited shares. All awards are granted over ordinary shares.

(b) The weighted fair value per share of Bonus Deferral Awards granted in 2019 was £41.51 for Rio Tinto plc and A$91.65 for Rio Tinto Limited and for Performance Share Awards was £24.68 for Rio Tinto plc and A$54.55 for Rio Tinto Limited. Conditional awards are awarded at no cost to the recipient and no amount remains unpaid on any shares awarded.

(c) Details of performance conditions for the PSA are provided below.

For awards granted from 2013, for the TSR component (constituting two-thirds of the award for awards granted until 2017 and constituting 100% for awards granted from 2018), where TSR performance is measured against both the EMIX Global Mining Index and the MSCI World Index, the award will vest as follows:

- Out-performance of the index by 6% per annum – 100% award vests
- Performance between equal to the index and 6% per annum out-performance – Proportionate vesting between 22.5% and 100% vesting
- Performance equal to the index – 22.5% award vests
- Performance less than index – Nil vesting

For awards granted from 2013 to 2017, one-third of the award is subject to an EBIT margin condition measuring the change in the EBIT margin of Rio Tinto and each of the comparator companies (measured on a "point-to-point" basis using the last financial year in the performance period and the financial year prior to the start of the performance period). This will be calculated using independent third-party data. Vesting will be subject to Rio Tinto's interpolated ranking position using the following schedule.

- Equal to or greater than 2nd ranked company – 100% award vests
- Between the 5th and 2nd ranked companies – Proportionate vesting between 22.5% and 100% vesting
- Above the 6th ranked company – 22.5% award vests
- Equal to the 6th ranked company or below – Nil vesting

The TSR performance condition (two thirds of the award) vests in February with the EBIT performance condition (one third of the award) vesting in May. Due to the phased vesting nature of the award, details of each vest are displayed separately side by side within the table.
For awards granted from 2018 the EBIT performance condition will not apply. Instead the award is subject to the TSR measures described above, with each applied to 50% of the award

If vesting is achieved, participants will be entitled to receive a number of additional shares whose market value reflects the aggregate cash amount of dividends that would have been received had the number of shares which have vested at the end of the performance period been held throughout the period.

(d) The amount in US dollars has been converted at the rate of US$1.27661 = £1 and US$0.69531 = A$1, being the average exchange rates for 2019.
(e) For the Performance Share Awards granted on 23 March 2015 with a performance period that concluded on 31 December 2019, 45.56% of the award vested in relation to the TSR portion of the award. The remaining performance condition of relative EBIT margin will be assessed later in 2020.
(f) The closing price at 31 December 2019 was £45.03 for Rio Tinto plc ordinary shares and was A$100.40 for Rio Tinto Limited ordinary shares. The high and low prices during 2019 of Rio Tinto plc and Rio Tinto Limited shares were £49.765 and £36.43 and A$107.05 and A$76.65 respectively.

As of 14 February 2020, executives held 2,671,784 shares awarded and not vested under long term incentive plans. No executive held any options.

Table 3a – Plan interests (award of shares under all-employee share arrangements)

		myShare		Share Ownership Plan				**Total activity in 2019**		
	Plan interests at 1 January 2019[a]	Value of Matching shares awarded in year[b] ('000)	Value of Matching shares vested in year[c] ('000)	Value of Matching shares awarded in year[b] ('000)	Value of Matching shares vested in year[c] ('000)	Value of Free shares awarded in year[d] ('000)	Value of Free shares vested in year[d] ('000)	**Grants in year ('000)**	**Vesting in year ('000)**	Plan interests at 31 December 2019[a]
Bold Baatar	311.31	4	5	0	0	5	0	**9**	**5**	392.86
Alfredo Barrios	291.28	4	8	0	0	0	0	**4**	**8**	235.95
Joanne Farrell	278.66	4	9	0	0	0	0	**4**	**9**	219.03
Jean-Sébastien Jacques	664.70	2	4	2	4	5	9	**9**	**17**	520.29
Vera Kirikova	547.15	2	6	2	0	5	5	**9**	**11**	508.24
Stephen McIntosh	278.66	4	9	0	0	0	0	**4**	**9**	219.03
Simone Niven	363.00	0	0	0	0	5	9	**5**	**9**	286.00
Philip Richards	67.00	1	0	1	0	5	0	**7**	**0**	174.52
Chris Salisbury	0.00	0	0	0	0	0	0	**0**	**0**	0.00
Arnaud Soirat	148.00	1	0	1	0	5	0	**7**	**0**	250.96
Jakob Stausholm	0.00	1	0	1	0	1	0	**3**	**0**	60.09
Simon Trott	298.11	5	9	0	0	0	0	**5**	**9**	260.09

(a) All shares shown are Rio Tinto plc shares except in the cases of Joanne Farrell and Stephen McIntosh which are Rio Tinto Limited shares and Simon Trott who holds a combination of Rio Tinto plc and Rio Tinto Limited shares.
(b) myShare and Share Ownership Plan Matching share awards are granted on a quarterly basis (January, April, July and October) throughout the year.
(c) The vesting of a Matching share is dependent on continued employment with Rio Tinto and the retention of the associated Investment share purchased by the participant for 3 years.
(d) Share Ownership Plan Free Shares vest after 3 years.
(e) Share Ownership Plan awards shown above and the vested Matching shares under myShare are included, where relevant, in the Executive's share interests in Table 2.
(f) All currency figures are shown in USD and rounded.

Implementation report continued

Audited information
Under Schedule 8 of the Large and Medium-sized Companies and Groups (Accounts and Reports) Regulations 2008 (as amended), the following information is auditable:
- the 2019 performance for the purposes of the STIP on page 115;
- the single total figure of remuneration for each director, as set out on page 118 and table 1b on page 132;
- details of the directors' total pension entitlements, as set out on page 118;
- details of taxable benefits on page 118;
- details of scheme interests awarded to the directors during the financial year, as set out on pages 123 and table 3 and 3a on pages 134 to 137;
- details of payments to past directors as set out on page 125;
- details of shareholding ownership policy and directors' share ownership on pages 123 and 125;
- statement of the directors' shareholdings and share interests, as set out in tables 2, 3 and 3a on pages 133 to 137 of the Implementation report;
- STIP objectives and outcomes for 2019 as set out on pages 119 to 121 and LTIP outcome and award granted for 2019 as set out on pages 122 to 123.

The Australian Securities and Investments Commission issued an order dated 14 December 2015, under which the Remuneration report must be prepared and audited in accordance with the requirements of the Australian Corporations Act 2001 applied on the basis of certain modifications set out in the order (as detailed on page 255). The information provided in the Remuneration report has been audited as required by section 308 (3C) of the Australian Corporations Act 2001.

Directors' approval statement
This Directors' Remuneration report is delivered in accordance with a resolution of the Board, and has been signed on behalf of the Board by:

Sam Laidlaw
Chairman of the Remuneration Committee
26 February 2020

Additional statutory disclosure

The directors present their report and audited consolidated financial statements for the year ended 31 December 2019.

Scope of this report

For the purposes of UK company law and the Australian Corporations Act 2001:

- the additional disclosures under the heading "Shareholder information" on pages 292 to 298 are hereby incorporated by reference to, and form part of, this Directors' report;
- the Strategic report on pages 4 to 81 provides a comprehensive review of Rio Tinto's operations, its financial position and its business strategies and prospects, and is incorporated by reference into, and forms part of this Directors' report; certain items that would ordinarily need to be included in this Directors' report (including an indication of likely future developments in the business of the company and the Group) have, as permitted, instead been discussed in the Strategic report, while details of the Group's policy on addressing financial risks and details about financial instruments are shown in note 30 to the Group financial statements; and
- taken together, the Strategic report and this Directors' report are intended to provide a fair, balanced and understandable assessment of: the development and performance of the Group's business during the year and its position at the end of the year; its strategy; likely developments; and any principal or emerging risks and uncertainties associated with the Group's business.
- The Directors' declaration on page 256 is also incorporated into this Directors' report.

For the purposes of compliance with DTR 4.1.5R(2) and DTR 4.1.8R, the required content of the "Management report" can be found in the Strategic report or this Directors' report, including the material incorporated by reference.

A full report on director and executive remuneration and shareholdings can be found in the Remuneration report on pages 110 to 138 which for the purposes of the Australian Corporations Act 2001, forms part of this Directors' report.

Dual listed structure and constitutional documents

The dual listed companies (DLC) structure of Rio Tinto plc and Rio Tinto Limited, their constitutional provisions and voting arrangements – including restrictions that may apply to the shares of either company under specified circumstances – are described on pages 292 and 293.

Operating and financial review

Rio Tinto's principal activities during 2019 were minerals and metals exploration, development, production and processing and marketing.

Subsidiary and associated undertakings principally affecting the profits or net assets of the Group in the year are listed in notes 33 to 36 to the financial statements.

The following significant changes and events affected the Group during 2019 and up to the date of this report:

- In February 2019 Rio Tinto announced that it had discovered copper-gold mineralisation at the Winu Project in the Yeneena Basin of the Paterson Province in Western Australia.
- In March 2019 Rio Tinto announced it had completed the commisioning of the $1.9 billion Amrun bauxite mine on the Cape York Peninsula in Queensland, Australia.
- In April 2019 Rio Tinto announced the next stage in the development of Richards Bay Minerals in South Africa through the construction of the Zulti South project. The $463 million (Rio Tinto share $343 million) investment will sustain RBM's current capacity and extend its mine life. Construction is on hold after a number of security incidents.
- In April 2019 Rio Tinto committed $302 million of additional capital to advance its Resolution Copper project in the US state of Arizona. The investment funded additional drilling, ore-body studies, infrastructure improvements and permitting activities.
- On 19 June 2019 Rio Tinto announced that Rio Tinto Iron Ore was experiencing operational challenges, particularly in the Greater Brockman hub in the Pilbara. In light of these challenges Pilbara shipments for 2019 were revised to between 320 million tonnes and 330 million tonnes (previously between 333 million tonnes and 343 million tonnes).
- On 26 June 2019, Dame Moya Greene retired from the board as a non-executive director.
- In July 2019 Rio Tinto completed the sale of its entire interest in the Rössing uranium mine in Namibia to China National Uranium Corporation Limited (CNUC) for an initial cash payment of $6.5 million plus a contingent payment of up to $100 million.
- In July 2019 Rio Tinto provided an update on the schedule and cost of the Oyu Tolgoi underground project in Mongolia. Preliminary estimates for the development capital spend were revised to $6.5 billion to $7.2 billion, an increase of $1.2 billion to $1.9 billion from the $5.3 billion previously disclosed. Achievement of first sustainable production was revised to between May 2022 and June 2023, a delay of 16 to 30 months compared to the original feasibility study guidance in 2016.
- On 25 September 2019 Rio Tinto signed a Memorandum of Understanding with China's largest steel producer, China Baowu Steel Group and Tsinghua University, one of China's most prestigious and influential universities, to develop and implement new methods to reduce carbon emissions and improve environmental performance across the steel value chain.
- In October 2019 Rio Tinto announced it would conduct a strategic review of its interest in New Zealand's Aluminium Smelter (NZAS) at Tiwai Point, to determine the operation's ongoing viability and competitive position.
- On 4 November 2019 Rio Tinto announced it achieved a significant milestone at the Oyu Tolgoi mine in Mongolia with the completion of Shaft 2, which enabled the acceleration of work on the underground development.
- In November 2019 Rio Tinto announced that it would support Energy Resources of Australia Limited's (ERA) plans for a renounceable entitlement offer to raise $324 million (A$476 million) for the rehabilitation of the Ranger Project Area in Australia's Northern Territory.
- In November 2019 Rio Tinto approved a $749 million (A$1 billion) investment in its existing Greater Tom Price operations (100% owned) to help sustain the production capacity of its world-class iron ore business in the Pilbara of Western Australia.
- In December 2019 Rio Tinto approved a $1.5 billion investment (100 per cent basis) to continue production at its Kennecott copper operations in the United States. The investment extended operations at Kennecott to 2032.
- In February 2020 Rio Tinto announced it would conduct a strategic review of the ISAL smelter in Iceland, to determine the operation's ongoing viability and explore options to improve its competitive position.
- In February 2020, Rio Tinto's subsidiary Energy Resources of Australia Ltd (ERA) announced the completion of an entitlement offer, which was underwritten by the Group. As a result of the issue of new shares to the Group, our interest in ERA has increased from 68.39% to 86.33%.
- In February 2020, Rio Tinto announced the appointment of three new independent non-executive directors to the board. They were Hinda Gharbi, Jennifer Nason and Ngaire Woods.
- In February 2020, Rio Tinto announced that it expected Pilbara iron ore shipments in 2020 to be between 324 million tonnes and 334 million tonnes (100% basis) versus previous guidance of between 330 million tonnes and 343 million tonnes.

Details of events that took place after the balance sheet date are further described in note 42 to the financial statements.

Risk identification, assessment and management

The Group's principal risks and uncertainties are listed on pages 74 to 80. The Group's approach to risk management is discussed on pages 71 to 73.

Share capital

Details of the Group's share capital as at 31 December 2019 are described in notes 27 and 28 to the financial statements. Details of the rights and obligations attached to each class of shares are covered on pages 292 to 293, under the heading "Voting arrangements".

Additional statutory disclosure continued

In situations where an employee share plan operated by the company and plan participants are the beneficial owners of shares but not the registered owners, voting rights are normally exercised by the registered owner at the direction of the participant.

Details of certain restrictions on holding shares in Rio Tinto and certain consequences triggered by a change of control are described on page 293 under the heading "Limitations on ownership of shares and merger obligations". There are no other restrictions on the transfer of ordinary Rio Tinto shares save for:
- restrictions that may from time to time be imposed by laws, regulations or Rio Tinto policy (for example relating to market abuse, insider dealing, share trading or an Australian foreign investment);
- restrictions on the transfer of shares that may be imposed following a failure to supply information required to be disclosed, or where registration of the transfer may breach a court order or a law, or in relation to unmarketable parcels of shares;
- restrictions on the transfer of shares held under certain employee share plans while they remain subject to the plan.

At the AGMs held in 2019, shareholders authorised:
- the on-market purchase by Rio Tinto plc or Rio Tinto Limited or its subsidiaries, of up to 126,772,263 Rio Tinto plc shares (representing approximately 10% of Rio Tinto plc's issued share capital, excluding Rio Tinto plc shares held in Treasury at that time);
- the off-market purchase by Rio Tinto plc of up to 126,772,263 Rio Tinto plc shares acquired by Rio Tinto Limited or its subsidiaries under the above authority; and
- the off-market and/or on-market buy-back by Rio Tinto Limited of up to 55.6 million Rio Tinto Limited shares (representing approximately 15% of Rio Tinto Limited's issued share capital at that time).

Substantial shareholders
Details of substantial shareholders are included on page 294.

Dividends
Details of dividends paid and declared for payment, together with the company's shareholder returns policy are explained on page 36.

Directors
The names of directors who served during or since the end of the year and their period of appointment are listed on pages 84 and 85, together with details of each directors qualifications, experience and special responsibilities, and current directorships.

A table of directors' attendance at board and committee meetings during 2019 is on page 97.

At the 2020 AGMs, Hinda Gharbi and Jennifer Nason will stand for election, Ngaire Woods will stand for election with effect from 1 September, 2020, and all other directors will stand for re-election.

Previous listed directorships
Details of each director's previous directorships of other listed companies (where relevant) held in the past three years are set out below:

David Constable
- Anadarko Petroleum Company (July 2016 to August 2019)

Sam Laidlaw
- HSBC Holdings plc (January 2008 to April 2017)

Jakob Stausholm
- A P Moller-Maersk A/s (December 2016 to March 2018)

Simon Thompson
- Tullow Oil plc (May 2011 to April 2017)

Directors' and executives' beneficial interests
A table of directors' and executives' beneficial interests in Rio Tinto shares is on page 133.

Secretaries
Steve Allen is company secretary of Rio Tinto plc and joint company secretary, together with Tim Paine, of Rio Tinto Limited. Steve's and Tim's qualifications and experience are described on page 85.

Indemnities and insurance
The Articles of Association of Rio Tinto plc and the Constitution of Rio Tinto Limited provide for them to indemnify, to the extent permitted by law, directors and officers of the companies, including officers of certain subsidiaries, against liabilities arising from the conduct of the Group's business. The directors, Group company secretary and joint company secretary of Rio Tinto Limited, together with employees serving as directors of eligible subsidiaries at the Group's request, have also received similar direct indemnities. Former directors also received indemnities for the period in which they were directors.These are qualifying third-party indemnity provisions for the purposes of the UK Companies Act 2006, in force during the financial year ended 31 December 2019 and up to the date of this report. No amount has been paid under any of these indemnities during the year.

Qualifying pension scheme indemnity provisions (as defined by section 235 of the UK Companies Act 2006) were in force during the course of the financial year ended 31 December 2019 and up to the date of this Directors' report, for the benefit of trustees of the Rio Tinto Group pension and superannuation funds across various jurisdictions. No amount has been paid under any of these indemnities during the year.

The Group purchased directors' and officers' insurance during the year. In broad terms, this cover indemnifies individual directors and officers against certain personal legal liability and legal defence costs for claims arising out of actions connected with Group business.

Employment of disabled persons
Our statement on the employment of disabled persons is on page 69.

Engagement with UK employees
Our statement on engagement with UK employees is on page 92.

Engagement with suppliers, customers and others in a business relationship with the company
Our statement on engagement with suppliers, customers and others in a business relationship with the company is on page 93.

Statutory Audit Services Order
The Group has fully complied with the Statutory Audit Services Order.

Purchases

Rio Tinto plc shares[a] and Rio Tinto plc American Depositary Receipts (ADRs)

	Total number of shares purchased[b]	Average price per share US$[c]	Total number of shares purchased to satisfy company dividend reinvestment plans	Total number of shares purchased to satisfy employee share plans	Total number of shares purchased as part of publicly announced plans or programmes[d][k]	Maximum number of shares that may be purchased under plans or programmes
2019						
1 to 31 Jan	6,253,189	49.71	–	–	6,253,189	76,033,612[f]
1 to 28 Feb	5,401,268	56.38	–	–	5,401,268	70,632,344[f]
1 to 31 Mar	1,866,278	56.46	–	–	1,866,278	68,766,066[f]
1 to 30 Apr	2,816,717	59.88	1,023,851	319,702	1,473,164	125,299,099[g]
1 to 31 May	1,596,086	58.14	–	–	1,596,086	123,703,013[g]
1 to 30 Jun	1,514,392	59.18	–	149,435	1,364,957	122,338,056[g]
1 to 31 Jul	1,953,181	59.53	–	–	1,953,181	120,384,875[g]
1 to 31 Aug	2,803,415	51.33	–	–	2,803,415	117,581,460[g]
1 to 30 Sep	1,738,314	52.71	528,356	168,712	1,041,246	116,540,214[g]
1 to 31 Oct	1,682,872	51.00	–	–	1,682,872	114,857,342[g]
1 to 30 Nov	1,677,420	53.62	–	–	1,677,420	113,179,922[g]
1 to 31 Dec	1,827,773	57.34	–	584,815	1,242,958	111,936,964[g]
	31,130,905[e]	**54.74**	**1,552,207**	**1,222,664**	**28,356,034**	–
2020						
1 to 31 Jan	1,962,815	58.41	–	–	1,962,815	109,974,149[g]
1 to 14 Feb	840,082	54.22	–	–	840,082	109,134,067[g]

Rio Tinto Limited shares

	Total number of shares purchased[b]	Average price per share US$[c]	Total number of shares purchased to satisfy company dividend reinvestment plans	Total number of shares purchased to satisfy employee share plans[h]	Total number of shares purchased as part of publicly announced plans or programmes[d][k]	Maximum number of shares that may be purchased under plans or programmes
2019						
1 to 31 Jan	–	–	–	–	–	1,866[i]
1 to 28 Feb	–	–	–	–	–	1,866[i]
1 to 31 Mar	–	–	–	–	–	1,866[i]
1 to 30 Apr	1,623,567	69.49	1,397,150	226,417	–	1,866[i]
1 to 31 May	–	–	–	–	–	55,600,000[j]
1 to 30 Jun	–	–	–	–	–	55,600,000[j]
1 to 31 Jul	–	–	–	–	–	55,600,000[j]
1 to 31 Aug	–	–	–	–	–	55,600,000[j]
1 to 30 Sep	910,307	63.17	788,265	122,042	–	55,600,000[j]
1 to 31 Oct	–	–	–	–	–	55,600,000[j]
1 to 30 Nov	–	–	–	–	–	55,600,000[j]
1 to 31 Dec	791,445	71.49	–	791,445	–	55,600,000[j]
	3,325,319	**68.24**	**2,185,415**	**1,139,904**	–	–
2020						
1 to 31 Jan	21,555	70.02	–	21,555	–	55,600,000[j]
1 to 14 Feb	–	–	–	–	–	55,600,000[j]

(a) Rio Tinto plc shares have a nominal value of 10 pence each.
(b) Monthly totals of purchases are based on the settlement date.
(c) The shares were purchased in the currency of the stock exchange on which the purchases took place and the sale price has been converted into US dollars at the exchange rate on the date of settlement.
(d) Shares purchased in connection with the dividend reinvestment plans and employee share plans are not deemed to form any part of any publicly announced plan or programme.
(e) This figure represents 2.5% of Rio Tinto plc issued share capital at 31 December 2019.
(f) At the Rio Tinto plc AGM held in 2018, shareholders authorised the on-market purchase by Rio Tinto plc, Rio Tinto Limited and its subsidiaries of up to 133,746,522 Rio Tinto plc shares. This authorisation expired on 11 July 2019.
(g) At the Rio Tinto plc AGM held in 2019, shareholders authorised the on-market purchase by Rio Tinto plc, Rio Tinto Limited and its subsidiaries of up to 126,772,263 Rio Tinto plc shares. This authorisation will expire on the later of 10 July 2020 or the date of the 2020 AGM.
(h) The average price of shares purchased on-market by the trustee of Rio Tinto Limited's employee share trust during 2019 was $70.18.
(i) At the Rio Tinto Limited AGM held in 2018 shareholders authorised the off-market and/or on-market buy-back of up to 41.2 million Rio Tinto Limited shares.
(j) At the Rio Tinto Limited AGM held in 2019 shareholders authorised the off-market and/or on-market buy-back of up to 55.6 million Rio Tinto Limited shares.
(k) Rio Tinto purchased US$1.6 billion of shares through an on-market purchase of Rio Tinto plc shares during 2019 which comprised a return of US$0.7 billion of the US$1.0 billion programme announced on 1 August 2018 and US$0.9 billion of the US$3.2 billion programme announced on 20 September 2018, returning the post-tax proceeds of the coal assets to shareholders. The US$3.2 billion programme comprised the A$2.9 billion off-market share buy-back of Rio Tinto Limited shares which was completed on 12 November 2018 and US$1.1 billion on market buy-back of Rio Tinto plc shares of which the remaining US$0.2 billion will be completed no later than 28 February 2020.

Additional statutory disclosure continued

Political donations
The Group made no political donations (as defined by the UK Companies Act 2006) in the EU, Australia or elsewhere during 2019.

Government regulations
Our operations around the world are subject to extensive laws and regulations imposed by local, state, provincial and federal governments. These regulations govern many aspects of our work – from how we explore, mine and process ore, to conditions of land tenure and health, safety and environmental requirements. They also govern how we operate as a company in relation to securities, taxation, intellectual property, competition and foreign investment, provisions to protect data privacy, conditions of trade and export and infrastructure access. In addition to these laws, several of our operations are governed by specific agreements made with governments, some of which are enshrined in legislation. The geographic and product diversity of our operations reduces the likelihood of any single law or government regulation having a material effect on the Group's business as a whole.

Environmental regulations
Rio Tinto is subject to various environmental laws and regulations in the countries where it has operations. Rio Tinto measures its performance against environmental regulation by tracking and rating incidents according to their actual environmental and compliance impacts using five severity categories (minor, medium, serious, major or catastrophic). Incidents with a consequence rating of major or catastrophic are of a severity that require notification to the relevant product group Chief Executive and the Rio Tinto Chief Executive immediately after the incident occurring. In 2019, there were no environmental incidents at managed operations with a major or catastrophic impact.

During 2019, three managed operations incurred fines amounting to US$ 18,964 (2018: US$284,684). Details of these fines are reported in the performance section of the sustainability report at: **https://www.riotinto.com/sustainability/sustainability-reporting.**

Australian corporations that exceed specific greenhouse gas emissions or energy use thresholds have obligations under the Australian National Greenhouse and Energy Reporting Act 2007 (NGER). All Rio Tinto entities covered under this Act have submitted their annual NGER reports by the required 31 October 2019 deadline.

Further information on the Group's environmental performance is included in the Sustainability section of this Annual report, on pages 60 to 70, and on the website.

Greenhouse gas emissions
(in million tCO_2-e)[a][b]

	2019	2018[g]
Scope 1[c]	**17.1**	17.8
Scope 2[d]	**9.7**	10.9
Total greenhouse gas emissions[e]	**26.4**	28.2
Ratios		
Greenhouse gas emissions intensity index[f]	**70.6**	71.6
Greenhouse gas emissions intensity (tCO_2-e/t of product)	**0.062**	0.065

(a) Rio Tinto's greenhouse gas emission for managed operations are reported in accordance with the requirements under Part 7 of the UK Companies Act 2006 (Strategic report and Directors' report) Regulations 2013. Our approach and methodology used forthe determination of these emissions are available at: **https://www.riotinto.com/sustainability/sustainability-reporting.**
(b) Rio Tinto's greenhouse gas emissions inventory is based on definitions provided by The World Resource Institute/World Business Council for Sustainable Development Greenhouse Gas Protocol: A Carbon Reporting and Accounting Standard, March 2004.
(c) Scope 1 emissions include "emissions from combustion of fuel and operation of manage facilities. These include emissions from land management and livestock management at those facilities.
(d) Scope 2 emissions include "emissions from the purchase of electricity, heat, steam or cooling.
(e) Total emissions is the sum of scope 1 and scope 2 emissions, minus emissions that are associated with the generation of electricity, heat, steam or cooling supplied to others. These emissions exclude indirect emissions associated with transportation and use of our products reported at https://www.riotinto.com/sustainability/sustainability-reporting.
(f) Rio Tinto greenhouse gas intensity index is the weighted emissions intensity for each of Rio Tinto's main commodities relative to the commodity intensities in the 2008 base year (set to 100). This index includes approximately 97 (97.18%)% of Rio Tinto's emissions from managed operations.
(g) All numbers are restated to ensure comparability over time. Amendments are due to changes in measurement and calculation methodologies including the adoption of updated global warming potentials from the IPCC fourth assessment report or immaterial updates to data.

Exploration, research and development
The Group carries out exploration, research and development, described in the Growth and Innovation section on pages 56 to 57. Exploration and evaluation costs, net of any gains and losses on disposal, generated a net loss before tax of $614 million (2018: $210 million). Research and development costs were $45 million (2018: $45 million).

Financial instruments
Details of the Group's financial risk management objectives and policies, and exposure to risk, are described in note 30 to the financial statements.

Dealing in Rio Tinto securities
Rio Tinto operates rules which restrict the dealing in Rio Tinto securities by directors and employees who may be in possession of "inside information". These individuals must seek clearance before any proposed dealing takes place.

Our rules also prohibit such persons from engaging in hedging or other arrangements which limit the economic risk in connection to Rio Tinto securities issued, or otherwise allocated, as remuneration that are either unvested, or that have vested, but remain subject to a holding period. We also impose restrictions on a broader group of employees, requiring them to seek clearance before engaging in similar arrangements over any Rio Tinto securities.

Financial reporting
Financial statements
The directors are required to prepare financial statements for each financial period that give a true and fair view of the state of the Group at the end of the financial period, together with profit or loss and cash flows for that period. This includes preparing financial statements in accordance with UK company law that give a true and fair view of the state of the company's affairs, and preparing a Remuneration report that includes the information required by Regulation 11, Schedule 8 of the Large- and Medium-sized Companies and Groups (Accounts and Reports) Regulations 2008 (as amended) and the Australian Corporations Act 2001.

In addition, the UK Corporate Governance Code recommends that the board provides a fair, balanced and understandable assessment of the company's position and prospects in its external reporting.

Rio Tinto's management conducts extensive review and challenge in support of the board's obligations, aiming to strike a balance between positive and negative statements and provide good linkages throughout the Annual report.

The directors were responsible for the preparation and approval of the Annual report for the year ended 31 December 2019. They consider the Annual report, taken as a whole, to be fair, balanced and understandable, and that it provides the information necessary for shareholders to assess the Group's position, performance, business model and strategy.

The directors are responsible for maintaining proper accounting records, in accordance with UK and Australian legislation. They have a general responsibility to safeguard the assets of the Group, and to prevent and detect fraud and other irregularities. The directors are also responsible for ensuring that appropriate systems are in place to maintain and preserve the integrity of the Group's website.

Legislation in the UK governing the preparation and dissemination of financial statements may differ from current and future legislation in other jurisdictions. The work carried out by the Group's external auditors does not take into account such legislation and, accordingly, the external auditors accept no responsibility for any changes to the financial statements after they are made available on the Group's website.

The directors, senior executives, senior financial managers and other members of staff who are required to exercise judgment while preparing the Group's financial statements, are required to conduct themselves with integrity and honesty and in accordance with the highest ethical standards, as are all Group employees.

The directors consider that the 2019 Annual report presents a true and fair view and has been prepared in accordance with applicable accounting standards, using the most appropriate accounting policies for Rio Tinto's business, and supported by reasonable judgments and estimates. The accounting policies have been consistently applied as described on pages 152 to 166, and directors have received a written statement from the Chief Executive and the Chief Financial Officer to this effect. In accordance with the internal control requirements of the Code and the ASX Principles, this written statement confirms that the declarations in the statement are founded on a sound system of risk management and internal controls, and that the system is operating effectively in all material respects in relation to financial reporting risks. Further information on directors' responsibilities in the light of UK Disclosure and Transparency Rules is included on page 256.

Disclosure controls and procedures
The Group maintains disclosure controls and procedures, as defined in US Exchange Act Rule 13a-15(e). Management, with the participation of the Chief Executive and Chief Financial Officer, has evaluated the effectiveness of the Group's disclosure controls and procedures in relation to US Exchange Act Rule 13a-15(b), as of the end of the period covered by this report, and has concluded that the Group's disclosure controls and procedures were effective at a reasonable assurance level.

Management's report on internal control over financial reporting
Management is responsible for establishing and maintaining adequate internal controls over financial reporting. These controls, designed under the supervision of the Chief Executive and Chief Financial Officer, provide reasonable assurance regarding the reliability of the Group's financial reporting and the preparation and presentation of financial statements for external reporting purposes, in accordance with International Financial Reporting Standards (IFRS) as defined on page 152.

The Group's internal controls over financial reporting include policies and procedures designed to ensure the maintenance of records that:
- accurately and fairly reflect transactions and dispositions of assets;
- provide reasonable assurances that transactions are recorded as necessary, enabling the preparation of financial statements in accordance with IFRS, and that receipts and expenditures are made with the authorisation of management and directors of each of the companies; and
- provide reasonable assurance regarding the prevention or timely detection of unauthorised acquisition, use or disposition of the Group's assets that could have a material effect on its financial statements.

Due to inherent limitations, internal controls over financial reporting cannot provide absolute assurance. Similarly, these controls may not prevent or detect all misstatements, whether caused by error or fraud within each of Rio Tinto plc and Rio Tinto Limited.

There were no changes to internal controls over financial reporting during the relevant period that have materially affected, or are reasonably likely to materially affect, the financial reporting of Rio Tinto plc and Rio Tinto Limited.

Management's evaluation of the effectiveness of the company's internal controls over financial reporting was based on criteria established in Internal Control-Integrated Framework (2013), issued by the Committee of Sponsoring Organisations of the Treadway Commission. Following this evaluation, management concluded that our internal controls over financial reporting were effective as at 31 December 2019.

Directors' declaration
The directors' statement of responsibilities in relation to the Group's financial statements is set out on page 256.

Non-audit services and auditor independence
Details of the non-audit services and a statement of independence regarding the provision of non-audit services undertaken by our external auditor, including the amounts paid for non-audit services, are set out on page 102 of the Directors' report.

Going concern
The directors, having made appropriate enquiries, have satisfied themselves that it is appropriate to adopt the going concern basis of accounting in preparing the financial statements. Additionally, the directors have considered longer-term viability, as described in their statement on page 72.

2020 AGMs
The 2020 AGMs will be held on 8 April in London and 7 May in Brisbane. Separate notices of the 2020 AGMs will be produced for the shareholders of each company.

Directors' approval statement
The Directors' report is delivered in accordance with a resolution of the board.

S.R. Thompson

Simon Thompson
Chairman
26 February 2020

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consistency

Group income statement
Years ended 31 December

	Note	2019 US$m	2018 US$m	2017 US$m
Consolidated operations				
Consolidated sales revenue	2,3	**43,165**	40,522	40,030
Net operating costs (excluding items shown separately)	4	**(27,307)**	(27,115)	(26,983)
Impairment charges	6	**(3,487)**	(132)	(796)
Net (losses)/gains on consolidation and disposal of interests in businesses	2,37	**(291)**	4,622	2,344
Exploration and evaluation costs	13	**(624)**	(488)	(445)
Profit/(loss) relating to interests in undeveloped projects	13	**10**	278	(15)
Operating profit		**11,466**	17,687	14,135
Share of profit after tax of equity accounted units	7	**301**	513	339
Profit before finance items and taxation		**11,767**	18,200	14,474
Finance items				
Net exchange gains/(losses) on net external and intragroup debt balances		**58**	704	(601)
Net (losses)/gains on derivatives not qualifying for hedge accounting		**(68)**	(57)	33
Finance income	8	**300**	249	141
Finance costs	8	**(554)**	(552)	(848)
Amortisation of discount		**(384)**	(377)	(383)
		(648)	(33)	(1,658)
Profit before taxation		**11,119**	18,167	12,816
Taxation	9	**(4,147)**	(4,242)	(3,965)
Profit after tax for the year		**6,972**	13,925	8,851
– attributable to owners of Rio Tinto (net earnings)		**8,010**	13,638	8,762
– attributable to non-controlling interests		**(1,038)**	287	89
Basic earnings per share	10	**491.4c**	793.2c	490.4c
Diluted earnings per share	10	**487.8c**	787.6c	486.9c

The notes on pages 152 to 246 are an integral part of these consolidated financial statements.

Group statement of comprehensive income
Years ended 31 December

	Note	2019 US$m	2018 US$m	2017 US$m
Profit after tax for the year		**6,972**	13,925	8,851
Other comprehensive (loss)/income				
Items that will not be reclassified to profit or loss:				
Actuarial (losses)/gains on post-retirement benefit plans	44	**(262)**	907	6
Changes in the fair value of equity investments held at fair value through other comprehensive income (FVOCI)		**(5)**	(13)	—
Tax relating to these components of other comprehensive income	9	**83**	(271)	(12)
Share of other comprehensive losses of equity accounted units, net of tax		**(6)**	(1)	—
Adjustments to deferred tax on post-retirement benefit plans due to changes in corporate tax rates in the US and France	9	**—**	—	(140)
		(190)	622	(146)
Items that have been/may be subsequently reclassified to profit or loss:				
Currency translation adjustment[a]		**343**	(3,830)	3,096
Currency translation on companies disposed of, transferred to the income statement		**215**	14	78
Fair value movements:				
– Cash flow hedge gains		**12**	156	62
– Cash flow hedge (gains)/losses transferred to the income statement		**(41)**	40	(62)
– Gains on revaluation of available for sale securities		**—**	—	19
– Losses on revaluation of available for sale securities transferred to the income statement		**—**	—	8
Net change in costs of hedging[b]		**3**	(39)	—
Tax relating to these components of other comprehensive income	9	**(6)**	(54)	(1)
Share of other comprehensive income/(loss) of equity accounted units, net of tax		**10**	(48)	34
Other comprehensive income/(loss) for the year, net of tax		**346**	(3,139)	3,088
Total comprehensive income for the year		**7,318**	10,786	11,939
– attributable to owners of Rio Tinto		**8,351**	10,663	11,691
– attributable to non-controlling interests		**(1,033)**	123	248

(a) Excludes a currency translation charge of US$29 million (2018: charge of US$382 million; 2017: gain of US$310 million) arising on Rio Tinto Limited's share capital for the year ended 31 December 2019, which is recognised in the Group statement of changes in equity. Refer to Group statement of changes in equity on page 150.

(b) As part of the 2018 bond buy-back programme, cross currency interest rate swaps hedging the bonds repurchased were closed out. This resulted in the reclassification of US$3 million from the cost of hedging reserve to finance costs in the income statement in 2018. There was no bond buy-back programme in 2019.

The notes on pages 152 to 246 are an integral part of these consolidated financial statements.

Group cash flow statement
Years ended 31 December

	Note	2019 US$m	2018 US$m	2017 US$m
Cash flows from consolidated operations[a]		**19,705**	15,655	16,670
Dividends from equity accounted units		**669**	800	817
Cash flows from operations		**20,374**	16,455	17,487
Net interest paid[b]		**(537)**	(612)	(897)
Dividends paid to holders of non-controlling interests in subsidiaries		**(376)**	(420)	(399)
Tax paid		**(4,549)**	(3,602)	(2,307)
Net cash generated from operating activities		**14,912**	11,821	13,884
Cash flows from investing activities				
Purchases of property, plant and equipment and intangible assets	2	**(5,488)**	(5,430)	(4,482)
Disposals of subsidiaries, joint ventures, unincorporated joint operations and associates	37	**(80)**	7,733	2,675
Purchases of financial assets[c]		**(43)**	(1,572)	(723)
Sales of financial assets		**83**	19	40
Sales of property, plant and equipment and intangible assets		**49**	586	138
Net funding of equity accounted units		**(33)**	(9)	(3)
Acquisitions of subsidiaries, joint ventures and associates	37	**—**	(5)	—
Other investing cash flows		**11**	(1)	(18)
Net cash (used)/generated in investing activities		**(5,501)**	1,321	(2,373)
Cash flows before financing activities		**9,411**	13,142	11,511
Cash flows from financing activities				
Equity dividends paid to owners of Rio Tinto	11	**(10,334)**	(5,356)	(4,250)
Proceeds from additional borrowings		**80**	54	18
Repayment of borrowings[b]		**(203)**	(2,300)	(2,795)
Lease principal payments	23,45	**(315)**	—	—
Proceeds from issue of equity to non-controlling interests		**101**	85	170
Own shares purchased from owners of Rio Tinto		**(1,552)**	(5,386)	(2,083)
Purchase of non-controlling interests	37	**—**	—	(194)
Other financing cash flows		**4**	(48)	(7)
Net cash flows used in financing activities		**(12,219)**	(12,951)	(9,141)
Effects of exchange rates on cash and cash equivalents		**(54)**	151	(12)
Net (decrease)/increase in cash and cash equivalents		**(2,862)**	342	2,358
Opening cash and cash equivalents less overdrafts		**10,889**	10,547	8,189
Closing cash and cash equivalents less overdrafts	21	**8,027**	10,889	10,547
(a) Cash flows from consolidated operations				
Profit after tax for the year		**6,972**	13,925	8,851
Adjustments for:				
– Taxation		**4,147**	4,242	3,965
– Finance items		**648**	33	1,658
– Share of profit after tax of equity accounted units		**(301)**	(513)	(339)
– Net losses/(gains) on consolidation and disposal of interests in businesses	37	**291**	(4,622)	(2,344)
– Impairment charges	6	**3,487**	132	796
– Depreciation and amortisation		**4,384**	4,015	4,375
– Provisions (including exchange differences on provisions)		**753**	1,011	535
Utilisation of provisions		**(539)**	(620)	(714)
Utilisation of provision for post-retirement benefits	26	**(205)**	(219)	(339)
Change in inventories		**28**	(587)	(482)
Change in trade and other receivables		**163**	(421)	(138)
Change in trade and other payables		**(191)**	476	421
Other items[d]		**68**	(1,197)	425
		19,705	15,655	16,670

(b) In 2018 and 2017 we completed bond buy-back programmes of US$1.9 billion (nominal value) and US$2.5 billion (nominal value) respectively. Net interest paid included the payment of the premiums and the accelerated interest associated with the bond redemptions (2018: US$80 million, 2017: US$259 million). There was no bond buy-back programme in 2019.

(c) In 2019, we invested a further US$28 million in a separately managed portfolio of fixed income instruments (refer to note 20) (2018: US$1.6 billion, 2017: US$0.7 billion). As there is significant turnover in this portfolio, we have elected to report the purchases and sales of these securities on a net cash flow basis within "Purchases of financial assets".

(d) In 2019, other items includes the settlement of currency forward contracts relating to tax and dividend payments offset by other non-cash items. In 2018 other items included adjustments to add back mark-to-market gains of US$288 million relating to derivative contracts transacted for operational purposes and not designated in a hedge relationship, a gain of US$549 million on the sale of surplus land at Kitimat and a gain of US$167 million on the revaluation of a financial asset arising from the disposal of the Mount Pleasant coal project in 2016. In 2017, other items included adjustments to add back losses of US$501 million relating to derivative contracts transacted for operational purposes and not designated in a hedge relationship.

The notes on pages 152 to 246 are an integral part of these consolidated financial statements.

Group balance sheet
At 31 December

	Note	2019 US$m	2018 US$m
Non-current assets			
Goodwill	12	**922**	912
Intangible assets	13	**2,637**	2,779
Property, plant and equipment	14	**57,372**	56,361
Investments in equity accounted units	15	**3,971**	4,299
Inventories	16	**139**	152
Deferred tax assets	17	**3,102**	3,137
Trade and other receivables	18	**1,716**	1,585
Tax recoverable		**5**	8
Other financial assets	20	**635**	814
		70,499	70,047
Current assets			
Inventories	16	**3,463**	3,447
Trade and other receivables	18	**3,027**	3,179
Tax recoverable		**116**	77
Other financial assets	20	**2,670**	2,692
Cash and cash equivalents	21	**8,027**	10,773
		17,303	20,168
Assets of disposal groups held for sale	19	**—**	734
Total assets		**87,802**	90,949
Current liabilities			
Borrowings and other financial liabilities	22	**(1,372)**	(1,073)
Trade and other payables	25	**(6,480)**	(6,600)
Tax payable		**(1,874)**	(1,842)
Provisions including post-retirement benefits	26	**(1,399)**	(1,056)
		(11,125)	(10,571)
Non-current liabilities			
Borrowings and other financial liabilities	22	**(13,341)**	(12,847)
Trade and other payables	25	**(794)**	(841)
Tax payable		**(376)**	(348)
Deferred tax liabilities	17	**(3,220)**	(3,673)
Provisions including post-retirement benefits	26	**(13,704)**	(12,552)
		(31,435)	(30,261)
Liabilities of disposal groups held for sale	19	**—**	(294)
Total liabilities		**(42,560)**	(41,126)
Net assets		**45,242**	49,823
Capital and reserves			
Share capital			
– Rio Tinto plc	27	**207**	211
– Rio Tinto Limited	28	**3,448**	3,477
Share premium account		**4,313**	4,312
Other reserves	29	**9,177**	8,661
Retained earnings	29	**23,387**	27,025
Equity attributable to owners of Rio Tinto		**40,532**	43,686
Attributable to non-controlling interests		**4,710**	6,137
Total equity		**45,242**	49,823

The notes on pages 152 to 246 are an integral part of these consolidated financial statements.

The financial statements on pages 144 to 246 were approved by the directors on 26 February 2020 and signed on their behalf by

Simon Thompson
Chairman

Jean-Sébastien Jacques
Chief executive

Jakob Stausholm
Chief financial officer

Group statement of changes in equity

Year ended 31 December 2019	Attributable to owners of Rio Tinto						
	Share capital (notes 27 and 28) US$m	Share premium account US$m	Other reserves (note 29) US$m	Retained earnings (note 29) US$m	Total US$m	Non-controlling interests US$m	Total equity US$m
Opening balance	**3,688**	**4,312**	**8,661**	**27,025**	**43,686**	**6,137**	**49,823**
Adjustment for transition to new accounting pronouncements[a]	—	—	—	(113)	(113)	(2)	(115)
Restated opening balance	**3,688**	**4,312**	**8,661**	**26,912**	**43,573**	**6,135**	**49,708**
Total comprehensive income for the year[b]	—	—	**519**	**7,832**	**8,351**	**(1,033)**	**7,318**
Currency translation arising on Rio Tinto Limited's share capital[c]	**(29)**	—	—	—	**(29)**	—	**(29)**
Dividends (note 11)	—	—	—	**(10,334)**	**(10,334)**	**(376)**	**(10,710)**
Share buy-back[d]	**(4)**	—	**4**	**(1,135)**	**(1,135)**	—	**(1,135)**
Companies no longer consolidated	—	—	—	—	—	**(32)**	**(32)**
Own shares purchased from Rio Tinto shareholders to satisfy share options[e]	—	—	**(63)**	**(43)**	**(106)**	—	**(106)**
Change in equity interest held by Rio Tinto	—	—	—	**85**	**85**	**(85)**	—
Treasury shares reissued and other movements	—	**1**	—	—	**1**	—	**1**
Equity issued to holders of non-controlling interests	—	—	—	—	—	**101**	**101**
Employee share options and other IFRS 2 charges to the income statement	—	—	**56**	**70**	**126**	—	**126**
Closing balance	**3,655**	**4,313**	**9,177**	**23,387**	**40,532**	**4,710**	**45,242**

Year ended 31 December 2018	Attributable to owners of Rio Tinto						
	Share capital (notes 27 and 28) US$m	Share premium account US$m	Other reserves (note 29) US$m	Retained earnings (note 29) US$m	Total US$m	Non-controlling interests US$m	Total equity US$m
Opening balance	4,360	4,306	12,284	23,761	44,711	6,404	51,115
Adjustment for transition to new accounting pronouncements	—	—	10	(179)	(169)	—	(169)
Restated opening balance	4,360	4,306	12,294	23,582	44,542	6,404	50,946
Total comprehensive income for the year[b]	—	—	(3,600)	14,263	10,663	123	10,786
Currency translation arising on Rio Tinto Limited's share capital[c]	(382)	—	—	—	(382)	—	(382)
Dividends (note 11)	—	—	—	(5,356)	(5,356)	(415)	(5,771)
Share buy-back[d]	(290)	—	9	(5,423)	(5,704)	—	(5,704)
Own shares purchased from Rio Tinto shareholders to satisfy share options[e]	—	—	(114)	(140)	(254)	—	(254)
Change in equity interest held by Rio Tinto	—	—	—	60	60	(60)	—
Treasury shares reissued and other movements	—	6	—	—	6	—	6
Equity issued to holders of non-controlling interests	—	—	—	—	—	85	85
Employee share options and other IFRS 2 charges to the income statement	—	—	50	61	111	—	111
Transfers and other movements	—	—	22	(22)	—	—	—
Closing balance	3,688	4,312	8,661	27,025	43,686	6,137	49,823

Year ended 31 December 2017	Attributable to owners of Rio Tinto						
	Share capital (notes 27 and 28) US$m	Share premium account US$m	Other reserves (note 29) US$m	Retained earnings (note 29) US$m	Total US$m	Non-controlling interests US$m	Total equity US$m
Opening balance	4,139	4,304	9,216	21,631	39,290	6,440	45,730
Total comprehensive income for the year[b]	—	—	3,078	8,613	11,691	248	11,939
Currency translation arising on Rio Tinto Limited's share capital[c]	310	—	—	—	310	—	310
Dividends (note 11)	—	—	—	(4,250)	(4,250)	(403)	(4,653)
Share buy-back[d]	(89)	—	4	(2,312)	(2,397)	—	(2,397)
Companies no longer consolidated	—	—	(124)	130	6	(8)	(2)
Own shares purchased from Rio Tinto shareholders to satisfy share options[e]	—	—	(64)	(18)	(82)	—	(82)
Change in equity interest held by Rio Tinto	—	—	—	43	43	(43)	—
Treasury shares reissued and other movements	—	2	—	—	2	—	2
Equity issued to holders of non-controlling interests	—	—	—	—	—	170	170
Employee share options and other IFRS 2 charges to the income statement	—	—	41	57	98	—	98
Transfers and other movements	—	—	133	(133)	—	—	—
Closing balance	4,360	4,306	12,284	23,761	44,711	6,404	51,115

(a) The impact of the transition to new accounting pronouncements; IFRS 16 "Leases" and IFRIC 23 "Uncertainty over income tax treatments" on 1 January 2019 is discussed in note 45.
(b) Refer to Group statement of comprehensive income for further details. Adjustments to other reserves include currency translation attributable to owners of Rio Tinto, other than that arising on Rio Tinto Limited's share capital.
(c) Refer to note 1(d).
(d) In 2019, the total amount of US$1,135 million (2018: US$5,704 million, 2017: US$2,397 million) includes own shares purchased from the owners of Rio Tinto as per the cash flow statement of US $1,552 million (2018: US$5,386 million, 2017: US$2,083 million) and a financial liability recognised in respect of an irrevocable contract in place as at the reporting date to cover the share buy-back programme, less amounts paid during the year in respect of a similar irrevocable contract in place at the beginning of the year.
(e) Net of contributions received from employees for share options.

Reconciliation with Australian Accounting Standards
The Group's financial statements have been prepared in accordance with IFRS, as defined in note 1, which differs in certain respects from the version of International Financial Reporting Standards that is applicable in Australia, referred to as Australian Accounting Standards (AAS).

Prior to 1 January 2004, the Group's financial statements were prepared in accordance with UK GAAP. Under IFRS, as defined in note 1, goodwill on acquisitions prior to 1998, which was eliminated directly against equity in the Group's UK GAAP financial statements, has not been reinstated. This was permitted under the rules governing the transition to IFRS set out in IFRS 1. The equivalent Australian Standard, AASB 1, does not provide for the netting of goodwill against equity. As a consequence, shareholders' funds under AAS include the residue of such goodwill, which amounted to US$379 million at 31 December 2019 (2018: US$379 million).

Save for the exception described above, the Group's financial statements drawn up in accordance with IFRS are consistent with the requirements of AAS.

Outline of dual listed companies structure and basis of financial statements
The Rio Tinto Group
These are the financial statements of the Group formed through the merger of economic interests of Rio Tinto plc and Rio Tinto Limited ("Merger"), and presented by both Rio Tinto plc and Rio Tinto Limited as their consolidated financial statements in accordance with both UK and Australian legislation and regulations.

Merger terms
On 21 December 1995, Rio Tinto plc and Rio Tinto Limited entered into a dual listed companies (DLC) merger. Rio Tinto plc is incorporated in the UK and listed on the London and New York Stock Exchanges and Rio Tinto Limited is incorporated in Australia and listed on the Australian Securities Exchange. The Merger was effected by contractual arrangements between the companies and amendments to Rio Tinto plc's Memorandum and Articles of Association and Rio Tinto Limited's Constitution.

As a result, Rio Tinto plc and Rio Tinto Limited and their respective groups operate together as a single economic enterprise, with neither assuming a dominant role. In particular, the arrangements:

- confer upon the shareholders of Rio Tinto plc and Rio Tinto Limited a common economic interest in both groups;
- provide for common boards of directors and a unified management structure;
- provide for equalised dividends and capital distributions; and
- provide for the shareholders of Rio Tinto plc and Rio Tinto Limited to take key decisions, including the election of directors, through an electoral procedure in which the public shareholders of the two companies in effect vote on a joint basis.

The Merger involved no change in the legal ownership of any assets of Rio Tinto plc or Rio Tinto Limited, nor any change in the ownership of any existing shares or securities of Rio Tinto plc or Rio Tinto Limited, nor the issue of any shares, securities or payment by way of consideration, save for the issue by each company of one special voting share to a trustee company which facilitates the joint electoral procedure for public shareholders. During 2002, each of the parent companies issued a DLC Dividend Share to facilitate the efficient management of funds within the DLC structure.

Accounting standards
The financial statements have been drawn up in accordance with IFRS as defined in note 1. The Merger was accounted for as a merger under UK GAAP. As permitted under the rules governing the transition to IFRS, which are set out in IFRS 1, the Group did not restate business combinations that occurred before the transition date of 1 January 2004. As a result, the DLC Merger of economic interests described above continues to be accounted for as a merger under IFRS as defined in note 1.

The main consequence of adopting merger rather than acquisition accounting is that the balance sheet of the merged Group includes the assets and liabilities of Rio Tinto plc and Rio Tinto Limited at their carrying values prior to the Merger, subject to adjustments to achieve uniformity of accounting policies, rather than at their fair values at the date of the Merger. For accounting purposes Rio Tinto plc and Rio Tinto Limited are viewed as a single public parent company (with their respective public shareholders being the shareholders in that single company). As a result, the amounts attributable to both Rio Tinto plc and Rio Tinto Limited public shareholders are included in the amounts attributed to owners of Rio Tinto on the balance sheet, income statement and statement of comprehensive income.

Australian Corporations Act
The financial statements are drawn up in accordance with an order, under section 340 of the Australian Corporations Act 2001, issued by the Australian Securities and Investments Commission (ASIC) on 14 December 2015. The main effect of the order is that the financial statements are prepared on the basis that Rio Tinto Limited, Rio Tinto plc and their respective controlled entities are treated as a single economic entity, and in accordance with the principles and requirements of International Financial Reporting Standards as adopted by the European Union (EU IFRS) and include a reconciliation from EU IFRS to the Australian equivalent of IFRS (see above).

For further details of the ASIC Class Order relief see page 255.

Notes to the 2019 financial statements

1 Principal accounting policies

Corporate information

Rio Tinto's business is finding, mining and processing mineral resources. Major products are aluminium, copper, diamonds, gold, industrial minerals (borates, titanium dioxide and salt), iron ore and uranium. Activities span the world and are strongly represented in Australia and North America, with significant businesses also in Asia, Europe, Africa and South America.

Rio Tinto plc is incorporated in the UK and listed on the London and New York Stock Exchanges and Rio Tinto Limited is incorporated in Australia and listed on the Australian Stock Exchange. Rio Tinto plc's registered office is at 6 St James's Square, London SW1Y 4AD, UK. Rio Tinto Limited's registered office is at Level 7, 360 Collins Street, Melbourne, Victoria 3000, Australia.

As described in the "Outline of dual listed companies structure and basis of financial statements" on page 151, for the purposes of preparing the IFRS compliant consolidated financial statements of the Rio Tinto Group; both the DLC companies, Rio Tinto plc and Rio Tinto Limited, are viewed as a single economic entity, and the interests of shareholders of both companies are presented as the equity interests of shareholders in the Rio Tinto Group.

These financial statements consolidate the accounts of Rio Tinto plc and Rio Tinto Limited (together "the Companies") and their respective subsidiaries (together "the Group") and include the Group's share of joint arrangements and associates as explained in note 1(b) below. The Group's financial statements for the year ended 31 December 2019 were authorised for issue in accordance with a directors' resolution on 26 February 2020.

Notes 33 to 36 provide more information on the Group's subsidiaries, joint arrangements and associates and note 40 provides information on the Group's transactions with other related parties.

The 2019 Annual report satisfies the obligations of Rio Tinto Limited to prepare consolidated accounts under Australian company law, as amended by an order issued by the Australian Securities and Investments Commission on 14 December 2015. The 2019 financial statements disclose on page 151 the effect of the adjustments to the Group's consolidated profit/(loss), consolidated total comprehensive income/(loss) and consolidated shareholders' funds as prepared under IFRS as defined below that would be required under the version of IFRS that is applicable in Australia, referred to as Australian Accounting Standards (AAS).

The US dollar is the presentation currency used in these financial statements, as it most reliably reflects the Group's global business performance.

Basis of preparation of the financial statements

The basis of preparation and the accounting policies used in preparing the Group's 2019 financial statements are set out below.

The financial statements have been prepared on a going concern basis in accordance with the Companies Act 2006 applicable to companies reporting under IFRS and in accordance with applicable UK law, applicable Australian law as amended by the Australian Securities and Investments Commission Order dated 14 December 2015, Article 4 of the European Union IAS regulation and also with:

- International Financial Reporting Standards as issued by the International Accounting Standards Board (IASB) and interpretations issued from time to time by the IFRS Interpretations Committee (IFRS IC) both as adopted by the European Union (EU) and which are mandatory for EU reporting as at 31 December 2019; and
- International Financial Reporting Standards as issued by the IASB and interpretations issued from time to time by the IFRS IC which are mandatory as at 31 December 2019.

The above accounting standards and interpretations are collectively referred to as "IFRS" in this report. With the exception of "Amendments to IFRS 9, IAS 39 and IFRS 7 - Interest rate benchmark reform" (see below), the Group has not early adopted any amendments, standards or interpretations that have been issued but are not yet mandatory.

Further detail on the going concern basis of accounting is included on page 143.

The Group's financial statements have been prepared on the basis of accounting policies consistent with those applied in the financial statements for the year ended 31 December 2018, except for the change in accounting requirements set out below, all of which were effective as at 1 January 2019 without restatement of prior years.

The Group adopted IFRS 16 "Leases", IFRIC 23 "Uncertainty over income tax treatments", "Amendments to IAS 19 - Plan Amendment, Curtailment or Settlement" and a number of other minor amendments to IFRS on 1 January 2019. All of these pronouncements have been endorsed by the EU.

The Group has also early adopted "Amendments to IFRS 9, IAS 39 and IFRS 7 - Interest rate benchmark reform", which was endorsed by the EU in January 2020, for the year ended 31 December 2019. This pronouncement allows temporary relief from applying specific hedge accounting requirements to hedging arrangements directly impacted by reform of the London Interbank Offered Rate (LIBOR) and other benchmark interest rates.

Information on the transition impact of these new pronouncements is included in note 45.

Mandatory in 2020

Accounting pronouncements that are mandatory in 2020 are listed below. The impact on the Group of transition to these pronouncements is currently expected to be immaterial.

Conceptual Framework for Financial Reporting (Endorsed by the EU and mandatory in 2020)

The IASB revised its Conceptual Framework in April 2018. Where specific accounting policies are not covered by IFRS they must be in accordance with the principles in the Framework by 2020. The 2018 Conceptual Framework for Financial Reporting is effective in 2020 for preparers that develop an accounting policy based on the Framework.

The 2018 Conceptual Framework describes the objective of, and the concepts for, general purpose financial reporting. The purpose of the Conceptual Framework is to:

(a) Assist the International Accounting Standards Board ("Board") to develop IFRS Standards ("Standards") that are based on consistent concepts;

(b) Assist preparers to develop consistent accounting policies when no Standard applies to a particular transaction or other event, or when a Standard allows a choice of accounting policy; and

(c) Assist all parties to understand and interpret the Standards.

The Conceptual Framework is not a Standard. Nothing in the Conceptual Framework overrides any Standard or any requirement in a Standard.

"Definition of a business - amendments to IFRS 3" (Mandatory in 2020 and not yet endorsed by the EU)
IFRS 3 "Business Combinations" has been amended to update the definition of a business. In essence, to be considered a business, an acquired arrangement has to have an input and substantive process which together significantly contribute to the ability to create outputs.

These changes to the definition of a business may result in future investment in new operations being accounted for as asset acquisitions rather than as business combinations. The Group will evaluate such transactions from 1 January 2020 onwards in accordance with this pronouncement.

"Amendments to IAS 1 and IAS 8 on the definition of materiality" (Endorsed by the EU and mandatory in 2020)
Amendments to IAS 1 "Presentation of financial statements" and IAS 8 "Accounting policies, changes in accounting estimates and errors" and consequent amendments to other IFRSs require entities to apply and disclose a consistent definition of materiality in the financial statements. The amendments also provide guidance on the identification of immaterial information.

The Group is currently evaluating the impact of this pronouncement on presentation and disclosure in the financial statements for the year ended 31 December 2020 and the condensed consolidated interim financial statements for the six months to 30 June 2020.

Mandatory in 2021
IFRS 17 "Insurance Contracts" (Mandatory in 2021 and not yet endorsed by the EU)
The Standard provides consistent principles for all aspects of accounting for insurance contracts. The Group is currently evaluating the impact of this pronouncement.

Judgments in applying accounting policies and key sources of estimation uncertainty
The preparation of the financial statements requires management to use judgment in applying accounting policies and in making critical accounting estimates.

These judgments and estimates are based on management's best knowledge of the relevant facts and circumstances, having regard to previous experience, but actual results may differ materially from the amounts included in the financial statements. Areas of judgment in the application of accounting policies that have the most significant effect on the amounts recognised in the financial statements and key sources of estimation uncertainty that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year are noted below and further information is contained in the accounting policies and/or the notes to the financial statements.

These areas of judgment and estimation are discussed further in critical accounting policies and estimates on pages 163 to 166. The quantum of ore reserves and mineral resources impacts many of these areas and the basis of calculation is explained below. Information on less material judgments and sources of estimation uncertainty has been incorporated into the relevant accounting policy notes.

Areas of judgment in the application of accounting policies that have the most significant effect on the amounts recognised in the financial statements are:
- Impairment of non-current assets – determination of Cash Generating Units (CGUs) and assessment of indicators of impairment – note 1(e) and (i), note 6, note 12 and note 13.
- Estimation of asset lives – whether certain assets are indefinite lived – note 1(e) and (i).
- Provision for onerous contracts – determination of assets dedicated to a contract – note 1(i).
- Close-down, restoration and environmental obligations – determining when an estimate is sufficiently reliable to update – note 1(l).
- Deferral of stripping costs – judgment on components/strip ratios and separate or integrated multiple pit mines – note 1(h).
- Uncertain tax positions – technical interpretation of tax law and evaluation of outcomes in the determination of whether multiple or binary scenarios are the appropriate basis for provision measurement – note 1(n), note 9 and note 31.
- Recoverability of potential deferred tax assets – recognition of deferred tax assets for loss making operations – note 17(c), (e) and (f).
- Identification of functional currencies – different companies may make different judgments based on similar facts – note 1(d).
- Basis of consolidation – judgment as to when the Group has control, joint control or significant influence – notes 33-36.
- *Contingencies – assessing the probability of any loss and whether it is* possible to quantify any loss – note 31.
- Exclusions from underlying earnings – judgment on items to be excluded on grounds of nature or size – note 2.
- Accounting for the Pilbara Iron Arrangements – treatment of payments made over a contractually specified period for network infrastructure capacity – critical policies note (xiii).

Key sources of estimation uncertainty that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year are:
- Impairment of non-current assets – review of asset carrying values, impairment charges and reversals and the recoverability of goodwill – determination of discounted cash flows – note1(e) and (i), note 6, note 12 and note 13.
- Close-down, restoration and environmental cost obligations – estimation of costs and the timing of expenditure – note 1(l) and note 26.
- Uncertain tax positions – estimating the potential exposures for each possible scenario – note 1(n), note 9 and note 31.
- Recoverability of potential deferred tax assets – determination of cash flows – note 1(n), note 17(c), (e) and (f).
- Estimation of obligations for post-employment costs – note 1(o) and note 44.
- Contingencies – estimate of possible liability – note 31.

Ore reserves and mineral resources
Estimates of ore reserves and, in some cases, mineral resources can impact: depreciation and amortisation rates; the carrying values of intangible assets and property, plant and equipment; deferred stripping costs; provisions for close-down and restoration costs; and the recovery of deferred tax assets.

The Group estimates its ore reserves and mineral resources based on information compiled by Competent Persons as defined in accordance with the Joint Ore Reserves Committee (JORC) code (see note 1(j)).

The estimation of ore reserves and mineral resources requires judgment to interpret available geological data and subsequently to select an *appropriate mining method and then to establish an extraction schedule.* Estimation requires assumptions about future commodity prices and demand, exchange rates, production costs, transport costs, close-down and restoration costs, recovery rates and discount rates and, in some instances, the renewal of mining licences.

There are many uncertainties in the estimation process and assumptions that are valid at the time of estimation may change significantly when new information becomes available. New geological or economic data, or unforeseen operational issues, may change estimates of ore reserves and mineral resources.

The Group uses judgment as to when to include mineral resources in accounting estimates, for example, the use of mineral resources in the Group's depreciation policy is described in note 1(i) below and in the determination of the date of closure as described in note 1(l). The unaudited statement of ore reserves is included on page 273 and of mineral resources on page 277.

Notes to the 2019 financial statements continued

1 Principal accounting policies continued

(a) Accounting convention

The financial information included in the financial statements for the year ended 31 December 2019, and for the related comparative periods, has been prepared under the historical cost convention, as modified by the revaluation of certain derivative contracts and financial assets, the impact of fair value hedge accounting on the hedged item and the accounting for post-employment assets and obligations. The Group's policy in respect of these items is set out in the notes below.

All financial statement values are rounded to the nearest million (US$m) unless otherwise stated.

Where applicable, comparatives have been adjusted to measure or present them on the same basis as current period figures.

(b) Basis of consolidation (notes 33-36)

All intragroup transactions and balances have been eliminated on consolidation.

Where necessary, adjustments are made to the locally reported assets, liabilities, and results of subsidiaries, joint arrangements and associates to bring their accounting policies in line with those used by the Group.

Subsidiaries

Subsidiaries are entities controlled by either of the Companies. Control exists where either of the Companies has: power over the entities, that is, existing rights that give it the current ability to direct the relevant activities of the entities (those that significantly affect the Companies' returns); exposure, or rights, to variable returns from its involvement with the entities; and the ability to use its power to affect those returns. Subsidiaries are fully consolidated from the date on which the Group obtains control. They are deconsolidated from the date that control ceases.

Joint arrangements

A joint arrangement is an arrangement in which two or more parties have joint control. Joint control is the contractually agreed sharing of control such that decisions about the relevant activities of the arrangement (those that significantly affect the Companies' returns) require the unanimous consent of the parties sharing control. The Group has two types of joint arrangements:

Joint operations (JO)

A JO is a joint arrangement in which the parties that share joint control have rights to the assets, and obligations for the liabilities, relating to the arrangement. This includes situations where the parties benefit from the joint activity through a share of the output, rather than by receiving a share of the results of trading. In relation to its interest in a JO, the Group recognises: its share of assets and liabilities; revenue from the sale of its share of the output and its share of any revenue generated from the sale of the output by the JO; and its share of expenses. All such amounts are measured in accordance with the terms of the arrangement, which is usually in proportion to the Group's interest in the JO. These amounts are recorded in the Group's financial statements on the appropriate lines.

Joint ventures (JV)

A JV is a joint arrangement in which the parties that share joint control have rights to the net assets of the arrangement. JVs are accounted for using the equity accounting method.

Other unincorporated arrangements

In some cases, the Group participates in unincorporated arrangements and has rights to its share of the assets and obligations for its share of the liabilities of the arrangement rather than a right to a net return, but does not share joint control. In such cases, the Group recognises: its share of assets and liabilities; revenue from the sale of its share of the output and its share of any revenue generated from the sale of the output by the unincorporated arrangement; and its share of expenses. All such amounts are measured in accordance with the terms of the arrangement, which is usually in proportion to the Group's interest in the arrangement. These amounts are recorded in the Group's financial statements on the appropriate lines.

Associates

An associate is an entity that is neither a subsidiary nor a joint arrangement, over which the Group has significant influence. Significant influence is presumed to exist where there is neither control nor joint control and the Group has over 20% of the voting rights, unless it can be clearly demonstrated that this is not the case. Significant influence can arise where the Group holds less than 20% of the voting rights if it has the power to participate in the financial and operating policy decisions affecting the entity. Investments in associates are accounted for using the equity accounting method.

The Group uses the term "equity accounted units" (EAUs) to refer to associates and JVs collectively. Under the equity accounting method the investment is recorded initially at cost to the Group, including any goodwill on acquisition. In subsequent periods the carrying amount of the investment is adjusted to reflect the Group's share of the EAUs' retained post-acquisition profit or loss and other comprehensive income. Long-term loans to EAUs that in substance form part of the Group's net investment (quasi equity loans) are financial assets but are included in the line "Investments in equity accounted units" on the face of the balance sheet. When the Group's share of losses in an EAU equals or exceeds its interest in the EAU, including such long-term loans and any other unsecured receivables, the Group does not recognise further losses, unless it has incurred legal or constructive obligations to continue to make payments on behalf of the EAU.

Acquisitions (note 37)

Under the "acquisition" method of accounting for business combinations, the purchase consideration is allocated to the identifiable assets acquired and liabilities and contingent liabilities assumed (the identifiable net assets) on the basis of their fair value at the date of acquisition, which is the date on which control is obtained.

The consideration transferred for the acquisition of a subsidiary comprises the fair values of the assets transferred, the liabilities incurred to the former owners of the acquiree, the fair value of any asset or liability resulting from a contingent consideration arrangement and any equity interests issued by the Group. Costs related to the acquisition of a subsidiary are expensed as incurred.

The excess of the consideration transferred, the amount of any non-controlling interest in the acquiree and the acquisition-date fair value of any previous equity interest in the acquiree over the fair value of the identifiable net assets acquired is recorded as goodwill. Any shortfall is immediately recognised in the income statement.

Non-controlling interests in the acquiree, that are present ownership interests and entitle their holders to a proportionate share of the entity's net assets in the event of liquidation, are recognised by the Group in one of two ways with the choice being available on an acquisition-by-acquisition basis. They can be measured at either the non-controlling interest's proportionate share of the acquiree's identifiable net assets or at fair value. In some cases, non-controlling interests may be treated as equity options and valued on that basis. Goodwill (see note 1(e)) and amounts attributable to non-controlling interests will differ depending on the basis used.

Where the Group previously held a non-controlling interest in the acquiree, this is remeasured to fair value at the date control is obtained with any gain or loss recognised in the income statement. The cash cost of the share purchase that gives rise to control is included within "investing activities" in the cash flow statement.

Where the Group increases its ownership interest in a subsidiary, the difference between the purchase price and the carrying value of the share of net assets acquired is recorded in equity. The cash cost of such purchases is included within "financing activities" in the cash flow statement.

Provisional fair values allocated at a reporting date are finalised within 12 months of the acquisition date.

The results of businesses acquired during the year are included in the consolidated financial statements from the date on which control, joint control or significant influence is obtained.

Disposals (note 37)
Individual non-current assets or "disposal groups" (that is, groups of assets and liabilities) to be disposed of by sale or otherwise in a single transaction are classified as "held for sale" if the following criteria are met at the period end:

- The carrying amount will be recovered principally through a sale transaction rather than through continuing use; and
- The disposal group is available for immediate sale in its present condition subject only to terms that are usual and customary for such sales; and
- The sale is highly probable.

Disposal groups held for sale are carried at the lower of their carrying amount and fair value less costs to sell. The comparative balance sheet is not restated. Disposal groups acquired with a view to resale are held at the fair value determined at the acquisition date. For these assets acquired for resale no profits or losses are recognised between the acquisition date and the disposal date, unless there is a subsequent impairment.

On classification as held for sale, the assets are no longer depreciated and, if applicable, equity accounting ceases.

If control is lost, any interest in the entity retained by the Group is remeasured to its fair value and the change in carrying amount is recognised in the income statement. The retained interest may be subsequently accounted for as a joint venture, joint operation, associate or financial asset depending on the facts. Certain amounts previously recognised in other comprehensive income in respect of the entity disposed of, or for which control, joint control or significant influence has ceased, may be recycled to the income statement. The cash proceeds of disposals are included within "Investing activities" in the cash flow statement.

Changes in the Group's interest in a subsidiary that do not result in a loss of control are accounted for in equity. The cash proceeds of such disposals are included within "Financing activities" in the cash flow statement.

(c) Sales revenue
Recognition and measurement
The Group recognises sales revenue related to the transfer of promised goods or services when control of the goods or services passes to the customer. The amount of revenue recognised reflects the consideration to which the Group is or expects to be entitled in exchange for those goods or services.

Sales revenue is recognised on individual sales when control transfers to the customer. In most instances, control passes and sales revenue is recognised when the product is delivered to the vessel or vehicle on which it will be transported once loaded, the destination port or the customer's premises. There may be circumstances when judgment is required based on the five indicators of control below.

- The customer has the significant risks and rewards of ownership and has the ability to direct the use of, and obtain substantially all of the remaining benefits from, the good or service.
- The customer has a present obligation to pay in accordance with the terms of the sales contract. For shipments under the Incoterms Cost, Insurance and Freight (CIF)/Carriage Paid to (CPT)/Cost and Freight (CFR) this is generally when the ship is loaded, at which time the obligation for payment is for both product and freight.
- The customer has accepted the asset. Sales revenue may be subject to adjustment if the product specification does not conform to the terms specified in the sales contract but this does not impact the passing of control. Assay and specification adjustments have been immaterial historically.
- The customer has legal title to the asset. The Group usually retains legal title until payment is received for credit risk purposes only.
- The customer has physical possession of the asset. This indicator may be less important as the customer may obtain control of an asset prior to obtaining physical possession, which may be the case for goods in transit.

The Group sells a significant proportion of its products on CFR or CIF Incoterms. This means that the Group is responsible (acts as principal) for providing shipping services and, in some instances, insurance after the date at which control of goods passes to the customer at the loading port.

The Group therefore has separate performance obligations for freight and insurance services that are provided solely to facilitate sale of the commodities it produces. Other Incoterms commonly used by the Group are Free on Board (FOB), where the Group has no responsibility for freight or insurance once control of the goods has passed at the loading port, and Delivered at Place (DAP) where control of the goods passes when the product is delivered to the agreed destination. For these Incoterms there is only one performance obligation, being for provision of product at the point where control passes.

The Group's products are sold to customers under contracts which vary in tenure and pricing mechanisms, including some volumes sold in the spot market. Pricing for iron ore is on a range of terms, the majority being either monthly or quarterly average pricing mechanisms, with a smaller proportion of iron ore volumes being sold on the spot market.

Within each sales contract, each unit of product shipped is a separate performance obligation. Revenue is generally recognised at the contracted price as this reflects the stand-alone selling price. Sales revenue excludes any applicable sales taxes. Mining royalties payable are presented as an operating cost or, where they are in substance a profit-based tax, within taxation.

Sales of copper concentrate are stated net of the treatment and refining charges which will be required to convert it to an end product.

Certain of the Group's products may be provisionally priced at the date revenue is recognised; however, substantially all iron ore and aluminium sales are reflected at final prices in the results for the period. The final selling price for all provisionally priced products is based on the price for the quotational period stipulated in the contract. Final prices for copper concentrate are normally determined between 30-180 days after delivery to the customer. The change in value of the provisionally priced receivable is based on relevant forward market prices and is included in sales revenue.

Notes to the 2019 financial statements continued

1 Principal accounting policies continued

Rio Tinto has a number of long-term contracts to supply product to customers in future periods. Generally, revenues are recognised on an as invoiced basis; hence, the right to consideration from a customer corresponds directly with the entity's performance completed to date.

A number of the Group's businesses provide volume discounts in certain circumstances. The impact of constraining such variable consideration under IFRS 15 was immaterial at both 31 December 2019 and 31 December 2018.

The Group applies the practical expedient in paragraph 121 of IFRS 15 and does not disclose information on the transaction price allocated to performance obligations that are unsatisfied.

Presentation and disclosures

Consolidated sales revenue as reported in the income statement comprises sales to third parties. Certain of the Group's products may be provisionally priced at the date revenue is recognised. Sales revenue includes revenue from contracts with customers, which is accounted for under IFRS 15 "Revenue from Contracts with Customers" and subsequent movements in provisionally priced receivables which are accounted for under IFRS 9 "Financial Instruments". A breakdown of sales revenue between these two amounts is disclosed in the product analysis in note 3 and further detail on provisional pricing in note 3. Sales revenue includes revenue from movements in provisionally priced receivables, consistent with the treatment in prior periods.

The Group considers that the impact of economic factors on its sales revenue, particularly pricing and volumes, is best understood by reference to the disclosure of sales revenue by product group and sales destination in note 3. The analysis of provisional pricing adjustments by commodity in the product analysis in note 3 shows which products are subject to price volatility post the transfer of control. With the exception of Oyu Tolgoi, which sells copper concentrate to China, this price uncertainty is largely resolved at the period end.

Typically, the Group has a right to payment before or at the point that control of the goods passes including a right, where applicable, to payment for provisionally priced products and unperformed freight and insurance services. Cash received before control passes is recognised as a contract liability. The amount of consideration does not contain a significant financing component as payment terms are less than one year.

Revenues from the sale of significant by-products, such as gold, are included in sales revenue. Sundry revenue (eg sales of surplus power) incidental to the main revenue-generating activities of the operations, is treated as a credit to operating costs.

The Group does not disclose sales revenue from freight and insurance services separately as it does not consider that this is necessary in order to understand the impact of economic factors on the Group; the Group's chief executive, the chief operating decision maker, as defined under IFRS 8, "Operating Segments", does not review information specifically relating to these sources of revenue in order to evaluate the performance of business segments and Group information on these sources of revenue is not provided externally.

The Group does provide information on freight revenue for the iron ore and bauxite businesses on pages 43 and 47 to help stakeholders understand FOB operating margins for those products.

Third-party commodity swap arrangements principally for delivery and receipt of smelter-grade alumina are offset within operating costs.

Presentation of comparative consolidated sales revenue for the year ended 31 December 2017 is in accordance with the previous standard IAS 18 "Revenue". No material measurement or recognition differences on comparative information were identified between IAS 18 and the current standard IFRS 15 "Revenue from contracts with customers".

(d) Currency translation

The functional currency for each entity in the Group, and for joint arrangements and associates, is the currency of the primary economic environment in which that entity operates. For many of these entities, this is the currency of the country in which they are located. Transactions denominated in other currencies are converted to the functional currency at the exchange rate ruling at the date of the transaction. Monetary assets and liabilities denominated in foreign currencies are retranslated at period-end exchange rates.

The Group's financial statements are presented in US dollars, as that presentation currency most reliably reflects the global business performance of the Group as a whole. On consolidation, income statement items for each entity are translated from the functional currency into US dollars at average rates of exchange, except for material one-off transactions, which are translated at the rate prevailing on the transaction date. Balance sheet items are translated into US dollars at period-end exchange rates.

Exchange differences arising on the translation of the net assets of entities with functional currencies other than the US dollar are recognised directly in the currency translation reserve. These translation differences are shown in the statement of comprehensive income, with the exception of translation adjustments relating to Rio Tinto Limited's share capital which are shown in the statement of changes in equity.

Where an intragroup balance is, in substance, part of the Group's net investment in an entity, exchange gains and losses on that balance are taken to the currency translation reserve.

Except as noted above, or in note 1(q) relating to derivative contracts, all other exchange differences are charged or credited to the income statement in the year in which they arise.

(e) Goodwill and intangible assets (excluding exploration and evaluation expenditure) (notes 12 and 13)

Goodwill is not amortised; it is tested annually for impairment or more frequently if events or changes in circumstances indicate a potential impairment. Investments in EAUs, including any goodwill, are tested for impairment as a single asset when a trigger for impairment has been identified. The Group's impairment policy is explained in note 1(i).

Purchased intangible assets are initially recorded at cost. Finite-life intangible assets are amortised over their useful economic lives on a straight line or units of production basis, as appropriate. Intangible assets that are deemed to have indefinite lives and intangible assets that are not yet ready for use are not amortised; they are reviewed annually for impairment or more frequently if events or changes in circumstances indicate a potential impairment in accordance with accounting policy note 1(i).

The Group considers that intangible assets have indefinite lives when, based on an analysis of all of the relevant factors, there is no foreseeable limit to the period over which the asset is expected to generate cash flows for the Group. The factors considered in making this judgment include the existence of contractual rights for unlimited terms or evidence that renewal of the contractual rights without significant incremental cost can be expected for indefinite future periods in view of the Group's investment intentions. The life cycles of the products and processes that depend on the asset are also considered.

(f) Exploration and evaluation (note 13)
Exploration and evaluation expenditure comprises costs that are directly attributable to:

- Researching and analysing existing exploration data;
- Conducting geological studies, exploratory drilling and sampling;
- Examining and testing extraction and treatment methods; and/or
- Compiling various studies (order of magnitude, pre-feasibility and feasibility).

Exploration expenditure relates to the initial search for deposits with economic potential. Expenditure on exploration activity undertaken by the Group is not capitalised.

Evaluation expenditure relates to a detailed assessment of deposits or other projects (including smelter and refinery projects) that have been identified as having economic potential. Capitalisation of evaluation expenditure commences when there is a high degree of confidence that the Group will determine that a project is commercially viable, that is the project will provide a satisfactory return relative to its perceived risks, and therefore it is considered probable that future economic benefits will flow to the Group. The Group's view is that a high degree of confidence is greater than "more likely than not" (that is, greater than 50% certainty) and less than "virtually certain" (that is, less than 90% certainty).

Assessing whether there is a high degree of confidence that the Group will ultimately determine that an evaluation project is commercially viable requires judgment and consideration of all relevant factors such as the nature and objective of the project; the project's current stage; project timeline; current estimates of the project's net present value, including sensitivity analyses for the key assumptions; and the main risks of the project. Development expenditure incurred prior to the decision to proceed is subject to the same criteria for capitalisation, being a high degree of confidence that the Group will ultimately determine that a project is commercially viable.

In some cases, undeveloped projects are regarded as successors to orebodies, smelters or refineries currently in production. Where this is the case, it is intended that these will be developed and go into production when the current source of ore is exhausted or when existing smelters or refineries are closed.

Ore reserves may be declared for an undeveloped mining project before its commercial viability has been fully determined. Evaluation costs may continue to be capitalised during the period between declaration of ore reserves and approval to mine as further work is undertaken in order to refine the development case to maximise the project's returns.

In accordance with IFRS 6 "Exploration for and Evaluation of Mineral Resources", the criteria for the capitalisation of evaluation costs are applied consistently from period to period.

In the case of undeveloped mining projects which have arisen through acquisition, the allocation of the purchase price consideration may result in undeveloped properties being recognised at an earlier stage of project evaluation compared with projects arising from the Group's exploration and evaluation programme. Subsequent expenditure on acquired undeveloped projects is only capitalised if it meets the high degree of confidence threshold discussed above.

The carrying values of capitalised evaluation expenditure for undeveloped mining projects (projects for which the decision to mine has not yet been approved at the appropriate authorisation level within the Group) are reviewed at each reporting date for indicators of impairment in accordance with IFRS 6, and when indicators are identified are tested in accordance with IAS 36. Evaluation expenditure for non-mining projects is reviewed and tested under IAS 36.

The impairment review is based on a status report summarising the Group's intentions to recover value through development, sale or other partnering arrangements. If a project does not prove viable and is cancelled, all irrecoverable costs associated with the project net of any previously recorded impairment provisions are charged to the income statement.

(g) Property, plant and equipment (note 14)
Once an undeveloped mining project has been determined as commercially viable and approval to mine has been given, expenditure other than that on land, buildings, plant, equipment and capital work in progress is capitalised under "Mining properties and leases" together with any amount transferred from "Exploration and evaluation".

Costs which are necessarily incurred whilst commissioning new assets, in the period before they are capable of operating in the manner intended by management, are capitalised. Development costs incurred after the commencement of production are capitalised to the extent they are expected to give rise to a future economic benefit. Interest on borrowings related to construction or development projects is capitalised, at the rate payable on project-specific debt if applicable or at the Group or subsidiary's cost of borrowing if not, until the point when substantially all the activities that are necessary to make the asset ready for its intended use are complete. It may be appropriate to use a subsidiary's cost of borrowing when the debt was negotiated based on the financing requirements of that subsidiary.

Property, plant and equipment is stated at cost, as defined in IAS 16, less accumulated depreciation and accumulated impairment losses. The cost of property, plant and equipment includes, where applicable, the estimated close-down and restoration costs associated with the asset.

Property, plant and equipment includes Right of Use assets (note 14) arising from leasing arrangements, shown separately from owned and leasehold assets.

(h) Deferred stripping (note 14)
In open pit mining operations, overburden and other waste materials must be removed to access ore from which minerals can be extracted economically. The process of removing overburden and waste materials is referred to as stripping. During the development of a mine (or, in some instances, pit; see below), before production commences, stripping costs related to a component of an orebody are capitalised as part of the cost of construction of the mine (or pit) and are subsequently amortised over the life of the mine (or pit) on a units of production basis.

Where a mine operates several open pits that are regarded as separate operations for the purpose of mine planning, initial stripping costs are accounted for separately by reference to the ore from each separate pit. If, however, the pits are highly integrated for the purpose of mine planning, the second and subsequent pits are regarded as extensions of the first pit in accounting for stripping costs. In such cases, the initial stripping (i.e. overburden and other waste removal) of the second and subsequent pits is considered to be production phase stripping (see page 158). The Group's judgment as to whether multiple pit mines are considered separate or integrated operations depends on each mine's specific circumstances.

Notes to the 2019 financial statements continued

1 Principal accounting policies continued

The following factors would point towards the initial stripping costs for the individual pits being accounted for separately:

- If mining of the second and subsequent pits is conducted consecutively following that of the first pit, rather than concurrently;
- If separate investment decisions are made to develop each pit, rather than a single investment decision being made at the outset;
- If the pits are operated as separate units in terms of mine planning and the sequencing of overburden removal and ore mining, rather than as an integrated unit;
- If expenditures for additional infrastructure to support the second and subsequent pits are relatively large; and
- If the pits extract ore from separate and distinct orebodies, rather than from a single orebody.

If the designs of the second and subsequent pits are significantly influenced by opportunities to optimise output from several pits combined, including the co-treatment or blending of the output from the pits, then this would point to treatment as an integrated operation for the purposes of accounting for initial stripping costs. The relative importance of each of the above factors is considered in each case.

In order for production phase stripping costs to qualify for capitalisation as a stripping activity asset, three criteria must be met:

- It must be probable that there will be an economic benefit in a future accounting period because the stripping activity has improved access to the orebody;
- It must be possible to identify the "component" of the orebody for which access has been improved; and
- It must be possible to reliably measure the costs that relate to the stripping activity.

A "component" is a specific section of the orebody that is made more accessible by the stripping activity. It will typically be a subset of the larger orebody that is distinguished by a separate useful economic life (for example, a pushback).

Production phase stripping can give rise to two benefits: the extraction of ore in the current period and improved access to ore which will be extracted in future periods. When the cost of stripping which has a future benefit is not distinguishable from the cost of producing current inventories, the stripping cost is allocated to each of these activities based on a relevant production measure using a life-of-component strip ratio. The ratio divides the tonnage of waste mined for the component for the period either by the quantity of ore mined for the component or by the quantity of minerals contained in the ore mined for the component. In some operations, the quantity of ore is a more appropriate basis for allocating costs, particularly where there are significant by-products. Stripping costs for the component are deferred to the extent that the current period ratio exceeds the life of component ratio. The stripping activity asset is depreciated on a "units of production" basis based on expected production of either ore or minerals contained in the ore over the life of the component unless another method is more appropriate.

The life-of-component ratios are based on the ore reserves of the mine (and for some mines, other mineral resources) and the annual mine plan; they are a function of the mine design and, therefore, changes to that design will generally result in changes to the ratios. Changes in other technical or economic parameters that impact the ore reserves (and for some mines, other mineral resources) may also have an impact on the life-of-component ratios even if they do not affect the mine design. Changes to the ratios are accounted for prospectively.

It may be the case that subsequent phases of stripping will access additional ore and that these subsequent phases are only possible after the first phase has taken place. Where applicable, the Group considers this on a mine-by-mine basis. Generally, the only ore attributed to the stripping activity asset for the purposes of calculating a life-of-component ratio, and for the purposes of amortisation, is the ore to be extracted from the originally identified component.

Deferred stripping costs are included in "Mining properties and leases" within "Property, plant and equipment" or within "Investments in equity accounted units", as appropriate. Amortisation of deferred stripping costs is included in "Depreciation of property, plant and equipment" within "Net operating costs" or in "Share of profit after tax of equity accounted units", as appropriate.

(i) Depreciation and impairment (notes 13 and 14)

Depreciation of non-current assets

Property, plant and equipment is depreciated over its useful life, or over the remaining life of the mine or smelter or refinery if that is shorter and there is no reasonable alternative use for the asset by the Group.

The useful lives of the major assets of a cash-generating unit are often dependent on the life of the orebody to which they relate. Where this is the case, the lives of mining properties, and their associated refineries, concentrators and other long-lived processing equipment are generally limited to the expected life of the orebody. The life of the orebody, in turn, is estimated on the basis of the life-of-mine plan. Where the major assets of a cash-generating unit are not dependent on the life of a related orebody, management applies judgment in estimating the remaining service potential of long-lived assets. Factors affecting the remaining service potential of smelters include, for example, smelter technology and electricity purchase contracts when power is not sourced from the company's, or in some cases a local government's, renewably sourced electricity generating capacity.

The useful lives and residual values for material assets and categories of assets are reviewed annually and changes are reflected prospectively.

Depreciation commences when an asset is available for use. The major categories of property, plant and equipment are depreciated on a units of production and/or straight-line basis as follows:

Units of production basis

For mining properties and leases and certain mining equipment, consumption of the economic benefits of the asset is linked to production. Except as noted below, these assets are depreciated on the units of production basis.

In applying the units of production method, depreciation is normally calculated based on production in the period as a percentage of total expected production in current and future periods based on ore reserves and, for some mines, other mineral resources. Other mineral resources may be included in the calculations of total expected production in limited circumstances where there are very large areas of contiguous mineralisation, for which the economic viability is not sensitive to likely variations in grade, as may be the case for certain iron ore, bauxite and industrial minerals deposits and where there is a high degree of confidence that the other mineral resources can be extracted economically. This would be the case when the other mineral resources do not yet have the status of ore reserves merely because the necessary detailed evaluation work has not yet been performed and the responsible technical personnel agree that inclusion of a proportion of measured and indicated resources in the calculation of total expected production is appropriate based on historical reserve conversion rates.

The required level of confidence is unlikely to exist for minerals that are typically found in low-grade ore (as compared with the above), such as copper or gold. In these cases, specific areas of mineralisation have to be evaluated in detail before their economic status can be predicted with confidence.

Where measured and indicated resources are used in the calculation of depreciation for infrastructure, primarily rail and port, which will benefit current and future mines, then the measured and indicated resources may relate to mines which are currently in production or to mines where there is a high degree of confidence that they will be brought into production in the future. The quantum of mineral resources is determined taking into account future capital costs as required by the JORC code. The depreciation calculation, however, applies to current mines only and does not take into account future development costs for mines which are not yet in production. Measured and indicated resources are currently incorporated into depreciation calculations in the Group's Australian iron ore business.

Straight line basis
Assets within operations for which production is not expected to fluctuate significantly from one year to another or which have a physical life shorter than the related mine are depreciated on a straight line basis.

Impairment charges/reversals of non-current assets
Impairment charges and reversals are assessed at the level of cash-generating units which, in accordance with IAS 36 "Impairment of Assets", are identified as the smallest identifiable asset or group of assets that generate cash inflows which are largely independent of the cash inflows from other assets. Separate cash-generating units are identified where an active market exists for intermediate products, even if the majority of those products are further processed internally. Impairment of financial assets is evaluated in accordance with IFRS 9.

In some cases, individual business units consist of several operations with independent cash-generating streams which constitute separate cash-generating units.

Goodwill acquired through business combinations is allocated to the cash-generating unit or groups of cash-generating units that are expected to benefit from the related business combination, and tested for impairment at the lowest level within the Group at which goodwill is monitored for internal management purposes. All goodwill, intangible assets that have an indefinite life and intangible assets that are not ready for use are tested annually for impairment as at 30 September, regardless of whether there has been an impairment trigger, or more frequently if events or changes in circumstances indicate a potential impairment.

Property, plant and equipment and intangible assets with finite lives are reviewed for impairment if there is an indication that the carrying amount may not be recoverable. Right of use assets recognised under IFRS 16 "Leases" are included in the review. The Group conducts an internal review of the asset values annually as at 30 September which is used as a source of information to assess for indications of impairment or reversal of previously recognised impairment losses. External factors, such as changes in forecasted commodity prices, costs and other market factors as well as internal factors such as cancellation of a project or reduced project scope, are also monitored to assess for indications of impairment or reversal of previously recognised impairment losses. If any such indication exists then an impairment review is undertaken; the recoverable amount is assessed by reference to the higher of value in use (being the net present value of expected future cash flows of the relevant cash-generating unit in its current condition) and fair value less costs of disposal (FVLCD).

When the recoverable amount of the cash-generating unit is measured by reference to FVLCD, this amount is further classified in accordance with the fair value hierarchy for observable market data that is consistent with the unit of account for the cash-generating unit being tested. The Group considers that the best evidence of FVLCD is the value obtained from an active market or binding sale agreement and, in this case, the recoverable amount is classified in the fair value hierarchy as level 1. When FVLCD is based on quoted prices for equity instruments but adjusted to reflect factors such as a lack of liquidity in the market, the recoverable amount is classified as level 2 in the fair value hierarchy. No cash-generating units are currently assessed for impairment by reference to a recoverable amount based on FVLCD classified as level 1 or level 2.

Where unobservable inputs are material to the measurement of the recoverable amount, FVLCD is based on the best information available to reflect the amount the Group could receive for the cash-generating unit in an orderly transaction between market participants at the measurement date. This is often estimated using discounted cash flow techniques and is classified as level 3 in the fair value hierarchy.

Where the recoverable amount is assessed using FVLCD based on discounted cash flow techniques, the resulting estimates are based on detailed life-of-mine and/or long-term production plans. These may include anticipated expansions which are at the evaluation stage of study.

The cash flow forecasts for FVLCD purposes are based on management's best estimates of expected future revenues and costs, including the future cash costs of production, capital expenditure, and closure, restoration and environmental costs. For the purposes of determining FVLCD from a market participant's perspective, the cash flows incorporate management's price and cost assumptions in the short and medium term. In the longer term, operating margins are assumed to remain constant where appropriate, as it is considered unlikely that a market participant would prepare detailed forecasts over a longer term. The cash flow forecasts may include net cash flows expected to be realised from the extraction, processing and sale of material that does not currently qualify for inclusion in ore reserves. Such non-reserve material is only included when there is a high degree of confidence in its economic extraction. This expectation is usually based on preliminary drilling and sampling of areas of mineralisation that are contiguous with existing ore reserves. Typically, the additional evaluation required to achieve reserves status for such material has not yet been done because this would involve incurring evaluation costs earlier than is required for the efficient planning and operation of the mine.

As noted above, cost levels incorporated in the cash flow forecasts for FVLCD purposes are based on the current life-of-mine plan or long-term production plan for the cash-generating unit. This differs from value in use which requires future cash flows to be estimated for the asset in its current condition and therefore does not include future cash flows associated with improving or enhancing an asset's performance. Anticipated enhancements to assets may be included in FVLCD calculations and, therefore, generally result in a higher value.

Where the recoverable amount of a cash-generating unit is dependent on the life of its associated orebody, expected future cash flows reflect the current life of mine and/or long-term production plans, which are based on detailed research, analysis and iterative modelling to optimise the level of return from investment, output and sequence of extraction. The mine plan takes account of all relevant characteristics of the orebody, including waste-to-ore ratios, ore grades, haul distances, chemical and metallurgical properties of the ore impacting process recoveries and capacities of processing equipment that can be used. The life-of-mine plan and/or long-term production plans are, therefore, the basis for forecasting production output and production costs in each future year.

Forecast cash flows for ore reserve estimation for JORC purposes are generally based on Rio Tinto's commodity price forecasts, which assume short-term market prices will revert to the Group's assessment of the long-term price, generally over a period of three to five years. For most commodities, these forecast commodity prices are derived from a combination of analyses of the marginal costs of the producers and of the incentive price of these commodities. These assessments often differ from current price levels and are updated periodically. The Group does not believe that published medium- and long-term forward prices necessarily provide a good indication of future levels because they tend to be strongly influenced by spot prices. The price forecasts used for ore reserve estimation are generally consistent with those used for impairment testing unless management deems that in certain economic environments, a market participant would not assume Rio Tinto's view on prices, in which case in preparing FVLCD impairment calculations management estimates the assumptions that a market participant would be expected to use.

Notes to the 2019 financial statements continued

1 Principal accounting policies continued

Forecast future cash flows of a cash-generating unit take into account the sales prices under existing sales contracts.

The discount rates applied to the future cash flow forecasts represent an estimate of the rate the market would apply having regard to the time value of money and the risks specific to the asset for which the future cash flow estimates have not been adjusted. The Group's weighted average cost of capital is generally used as a starting point for determining the discount rates, with appropriate adjustments for the risk profile of the countries in which the individual cash-generating units operate. For final feasibility studies and ore reserve estimation, internal hurdle rates, which are generally higher than the Group's weighted average cost of capital, are used. For developments funded with project finance, the debt component of the weighted average cost of capital may be calculated by reference to the specific interest rate of the project finance and anticipated leverage of the project.

For operations with a functional currency other than the US dollar, the impairment review is undertaken in the relevant functional currency. In estimating FVLCD, internal forecasts of exchange rates take into account spot exchange rates, historical data and external forecasts, and are kept constant in real terms after five years. The great majority of the Group's sales are based on prices denominated in US dollars. To the extent that the currencies of countries in which the Group produces commodities strengthen against the US dollar without an increase in commodity prices, cash flows and, therefore, net present values are reduced. Management considers that over the long term, there is a tendency for movements in commodity prices to compensate to some extent for movements in the value of the US dollar, particularly against the Australian dollar and Canadian dollar, and vice versa. However, such compensating changes are not synchronised and do not fully offset each other. In estimating value in use, the present value of future cash flows in foreign currencies is translated at the spot exchange rate on the testing date.

Non-current assets (excluding goodwill) that have suffered impairment are reviewed using the same basis for valuation as explained above whenever events or changes in circumstances indicate that the impairment loss may no longer exist, or may have decreased. If appropriate, an impairment reversal will be recognised. The carrying amount of the cash-generating unit after reversal must be the lower of (a) the recoverable amount, as calculated above, and (b) the carrying amount that would have been determined (net of amortisation or depreciation) had no impairment loss been recognised for the cash-generating unit in prior periods.

An onerous contract is defined under IAS 37 "Provisions, Contingent Liabilities and Contingent Assets" as a contract under which the unavoidable costs of meeting the obligations under the contract exceed the economic benefits expected to be received under it. Provision is made when the assets dedicated to the contract are fully impaired or the contract becomes stranded as a result of a business decision.

(j) Determination of ore reserve and mineral resource estimates

The Group estimates its ore reserves and mineral resources based on information compiled by Competent Persons as defined in accordance with the JORC code.

Ore reserves and, for certain mines, other mineral resources, determined in this way are used in the calculation of depreciation, amortisation and impairment charges and for forecasting the timing of the payment of close-down and restoration costs and the recovery of deferred tax assets. The depreciation and impairment policy above notes instances in which mineral resources are taken into account for accounting purposes. In addition, value may be attributed to mineral resources in purchase price allocations undertaken for the purposes of business combination accounting.

(k) Leases (notes 14, 22, 23 and 45)

IFRS 16 "Leases" applies to the recognition, measurement, presentation and disclosure of leases. Certain leases are exempt from the standard, including leases to explore for or use minerals, oil, natural gas and similar non-regenerative resources. The Group does not apply IFRS 16 to arrangements which fall within the scope of IAS 38 "Intangible Assets".

A significant proportion by value of the Group's lease arrangements relate to dry bulk vessels and offices. Other leases include land and non-mining rights, warehouses, equipment and vehicles. The majority of lease terms are negotiated through the Group's procurement function, although agreements contain a wide range of different terms and conditions.

The Group recognises all lease liabilities and corresponding right of use assets, with the exception of short-term (12 months or fewer) and low value leases, on the balance sheet. Lease liabilities are recorded at the present value of: fixed payments; variable lease payments that depend on an index or rate; amounts payable under residual value guarantees; and extension options expected to be exercised. Where a lease contains an extension option which the Group can exercise without negotiation, lease payments for the extension period are included in the liability if the Group is reasonably certain that it will exercise the option. Variable lease payments not dependent on an index or rate are excluded from the calculation of lease liabilities. Payments are discounted at the incremental borrowing rate of the lessee, unless the interest rate implicit in the lease can be readily determined. For lease agreements relating to vessels and properties, non-lease components are excluded from the projection of future lease payments and recorded separately within operating costs on a straight line basis. The right of use asset arising from a lease arrangement at initial recognition reflects the lease liability, initial direct costs, lease payments made before the commencement date of the lease, and capitalised provision for dismantling and restoration, less any lease incentives.

The Group recognises depreciation of right of use assets and interest on lease liabilities in the income statement over the lease term. Repayments of lease liabilities are separated into a principal portion (presented within financing activities) and interest portion (which the Group presents in operating activities) in the cash flow statement. Payments made before the commencement date are included within financing activities unless they in substance represent investing cash flows, for example where pre-commencement cash flows are significant relative to aggregate cash flows of the leasing arrangement.

Presentation of comparative financial information relating to leases is in accordance with the previous standard IAS 17 "Leases". For further understanding of the impact of the transition to IFRS 16, refer to note 45.

(l) Close-down, restoration and environmental obligations (note 26)

The Group has provisions for close-down and restoration costs which include the dismantling and demolition of infrastructure, the removal of residual materials and the remediation of disturbed areas for mines and certain refineries and smelters. These provisions are based on all regulatory requirements and any other commitments made to stakeholders.

Closure provisions are not made for those operations that have no known restrictions on their lives as the closure dates cannot be reliably estimated. This applies primarily to certain Canadian smelters which have indefinite-lived water rights or power agreements for renewably sourced power with local governments.

Close-down and restoration costs are a normal consequence of mining or production, and the majority of close-down and restoration expenditure is incurred in the years following closure of the mine, refinery or smelter. Although the ultimate cost to be incurred is uncertain, the Group's businesses estimate their costs using current restoration standards and techniques.

Close-down and restoration costs are provided for in the accounting period when the obligation arising from the related disturbance occurs, based on the net present value of the estimated future costs of restoration to be incurred during the life of the operation and post closure. Where appropriate, the provision is estimated using probability weighting of the different remediation and closure scenarios. The obligation may occur during development or during the production phase of a facility.

Provisions for close-down and restoration costs do not include any additional obligations which are expected to arise from future disturbance.

The costs are estimated on the basis of a closure plan, and are reviewed at each reporting period during the life of the operation to reflect known developments. The estimates are also subject to formal review, with appropriate external support, at regular intervals.

The initial close-down and restoration provision is capitalised within "Property, plant and equipment". Subsequent movements in the close-down and restoration provisions for ongoing operations, including those resulting from new disturbance related to expansions or other activities qualifying for capitalisation, updated cost estimates, changes to the estimated lives of operations, changes to the timing of closure activities and revisions to discount rates are also capitalised within "Property, plant and equipment". These costs are then depreciated over the lives of the assets to which they relate. Changes in closure provisions relating to closed operations are charged/credited to "Net operating costs" in the income statement.

Where rehabilitation is conducted systematically over the life of the operation, rather than at the time of closure, provision is made for the estimated outstanding continuous rehabilitation work at each balance sheet date and the cost is charged to the income statement.

The amortisation or "unwinding" of the discount applied in establishing the provisions is charged to the income statement in each accounting period. The amortisation of the discount is shown within "Finance items" in the income statement.

Environmental costs result from environmental damage that was not a necessary consequence of operations, and may include remediation, compensation and penalties. Provision is made for the estimated present value of such costs at the balance sheet date. These costs are charged to "Net operating costs", except for the unwinding of the discount which is shown within "Finance items".

Remediation procedures may commence soon after the time the disturbance, remediation process and estimated remediation costs become known, but can continue for many years depending on the nature of the disturbance and the remediation techniques used.

(m) Inventories (note 16)

Inventories are valued at the lower of cost and net realisable value, primarily on a weighted average cost basis. Average costs are calculated by reference to the cost levels experienced in the relevant month together with those in opening inventory. The cost of raw materials and consumable stores is the purchase price. The cost of partly-processed and saleable products is generally the cost of production, including:

- Labour costs, materials and contractor expenses which are directly attributable to the extraction and processing of ore or the production of alumina and aluminium;
- The depreciation of mining properties and leases and of property, plant and equipment used in the extraction and processing of ore or the production of alumina and aluminium; and
- Production overheads.

Work in progress includes ore stockpiles and other partly processed material. Stockpiles represent ore that has been extracted and is available for further processing. If there is significant uncertainty as to if and/or when the stockpiled ore will be processed, the ore is expensed as mined. If the ore will not be processed within 12 months after the balance sheet date, it is included within non-current assets and net realisable value is calculated on a discounted cash flow basis: Quantities of stockpiled ore are assessed primarily through surveys and assays. Certain estimates, including expected metal recoveries, are calculated using available industry, engineering and scientific data, and are periodically reassessed taking into account technical analysis and historical performance.

(n) Taxation (note 9 and note 17)

Current tax is the tax expected to be payable on the taxable income for the year calculated using rates that have been enacted or substantively enacted at the balance sheet date. It includes adjustments for tax expected to be payable or recoverable in respect of previous periods. Where the amount of tax payable or recoverable is uncertain, Rio Tinto establishes provisions based on either: the Group's judgment of the most likely amount of the liability or recovery; or, when there is a wide range of possible outcomes, a probability weighted average approach.

Deferred tax is calculated in accordance with IAS 12. The Group provides for deferred tax in respect of fair value adjustments on acquisitions including mining rights that, in general, are not eligible for income tax allowances. Provision for deferred tax is based on the difference between the carrying value of the asset and its income tax base (which may be nil). Even when there is no income tax base, the existence of a tax base for capital gains tax purposes is not usually taken into account in determining the deferred tax provision for the assets, unless they are classified as held for sale or it is determined for other reasons that the carrying amount is expected to be recovered primarily through disposal and not through use of the assets.

(o) Post-employment benefits (note 44)

The Group operates a number of defined benefit plans which provide lump sums, pensions, medical benefits and life insurance to retirees. In accordance with IAS 19, for post-employment defined benefit plans, the difference between the fair value of any plan assets and the present value of the plan obligations is recognised as an asset or liability in the balance sheet.

Where appropriate, the recognition of assets may be restricted to the present value of any amounts the Group expects to recover by way of refunds from the plan or reductions in future contributions. In determining the extent to which a refund will be available the Group considers whether any third party, such as a trustee or pension committee, has the power to enhance benefits or to wind up a pension plan without the Group's consent.

The most significant assumptions used in accounting for pension plans are the discount rate, the inflation rate and mortality rates. The discount rate is used to determine the net present value of the obligations, the interest cost on the obligations and the interest income on plan assets. The discount rate used is the yield on high-quality corporate bonds with maturities and terms that match those of the post-employment obligations as closely as possible. Where there is no developed corporate bond market in a currency, the rate on government bonds is used. The inflation rate is used to project increases in future benefit payments for those plans that have benefits linked to inflation. The mortality rates are used to project the period over which benefits will be paid, which is then discounted to arrive at the net present value of the obligations.

The current service cost, any past service cost and the effect of any curtailment or settlements are recognised in the income statement. The interest cost less interest income on assets held in the plans is also charged to the income statement. All amounts charged to the income statement in respect of these plans are included within "Net operating costs" or in "Share of profit after tax of equity accounted units", as appropriate.

Notes to the 2019 financial statements continued

1 Principal accounting policies continued

The Group's contributions to defined contribution plans are charged to the income statement in the period to which the contributions relate. These are included within "Net operating costs" or in "Share of profit after tax of equity accounted units", as appropriate.

(p) Cash and cash equivalents (note 21)

For the purpose of the balance sheet, cash and cash equivalents comprise: cash on hand, deposits held with banks, and short-term, highly liquid investments (mainly money market funds) that are readily convertible into known amounts of cash and which are subject to insignificant risk of changes in value. Bank overdrafts are shown as current liabilities in the balance sheet.

Further detail on cash and cash equivalents, including restricted cash, is shown in note 21.

For the purposes of the cash flow statement, cash and cash equivalents are net of bank overdrafts that are repayable on demand.

(q) Financial instruments (note 30)

(i) Financial assets

Classification and measurement

The Group classifies its financial assets into the following categories: those to be measured subsequently at fair value (either through other comprehensive income (FVOCI) or through the income statement (FVPL)) and those to be held at amortised cost.

Classification depends on the business model for managing the financial assets and the contractual terms of the cash flows.

Management determines the classification of financial assets at initial recognition. The Group's policy with regard to financial risk management is set out in note 30. Generally, the Group does not acquire financial assets for the purpose of selling in the short term.

The Group's business model is primarily that of "hold to collect" (where assets are held in order to collect contractual cash flows). When the Group enters into derivative contracts, these transactions are designed to reduce exposures relating to assets and liabilities, firm commitments or anticipated transactions.

(a) Financial assets held at amortised cost

This classification applies to debt instruments which are held under a hold to collect business model and which have cash flows that meet the "solely payments of principal and interest" (SPPI) criteria.

At initial recognition, trade receivables that do not have a significant financing component are recognised at their transaction price. Other financial assets are initially recognised at fair value plus related transaction costs; they are subsequently measured at amortised cost using the effective interest method. Any gain or loss on de-recognition or modification of a financial asset held at amortised cost is recognised in the income statement.

(b) Financial assets held at fair value through other comprehensive income (FVOCI)

This classification applies to the following financial assets:

- Debt instruments that are held under a business model where they are held for the collection of contractual cash flows and also for sale ("collect and sell") and which have cash flows that meet the SPPI criteria. An example would be where trade receivable invoices for certain customers were factored from time to time.

  All movements in the fair value of these financial assets are taken through other comprehensive income, except for the recognition of impairment gains or losses, interest revenue (including transaction costs by applying the effective interest method), gains or losses arising on de-recognition and foreign exchange gains and losses which are recognised in the income statement. When the financial asset is derecognised, the cumulative fair value gain or loss previously recognised in other comprehensive income is reclassified to the income statement.
- Equity investments where the Group has irrevocably elected to present fair value gains and losses on revaluation in other comprehensive income. The election can be made for each individual investment; however it is not applicable to equity investments held for trading.

  Fair value gains or losses on revaluation of such equity investments, including any foreign exchange component, are recognised in other comprehensive income. When the equity investment is derecognised, there is no reclassification of fair value gains or losses previously recognised in other comprehensive income to the income statement. Dividends are recognised in the income statement when the right to receive payment is established.

(c) Financial assets held at fair value through profit or loss (FVPL)

This classification applies to the following financial assets. In all cases, transaction costs are immediately expensed to the income statement.

- Debt instruments that do not meet the criteria of amortised cost or fair value through other comprehensive income. The Group has a significant proportion of trade receivables with embedded derivatives for provisional pricing. These receivables are generally held to collect but do not meet the SPPI criteria and as a result must be held at FVPL. Subsequent fair value gains or losses are taken to the income statement.
- Equity investments which are held for trading or where the FVOCI election has not been applied. All fair value gains or losses and related dividend income are recognised in the income statement.
- Derivatives which are not designated as a hedging instrument. All subsequent fair value gains or losses are recognised in the income statement.

(ii) Financial liabilities

Borrowings and other financial liabilities (including trade payables but excluding derivative liabilities) are recognised initially at fair value, net of transaction costs incurred, and are subsequently measured at amortised cost.

The Group participates in supply chain finance arrangements whereby vendors may elect to receive early payment of their invoice from a third party bank by factoring their receivable from Rio Tinto. These arrangements do not modify the terms of the original liability with respect to either counterparty terms, settlement date or amount due. Utilisation of the early settlement facility is voluntary and at the vendors' discretion on an invoice-by-invoice basis. Financial liabilities subject to supply chain finance therefore continue to be classified as trade payables. At 31 December 2019, trade payables included US$573 million (2018:US$632 million) subject to early settlement election by vendors.

(iii) Impairment of financial assets
A forward looking expected credit loss (ECL) review is required for: debt instruments measured at amortised cost or held at fair value through other comprehensive income; loan commitments and financial guarantees not measured at fair value through profit or loss; lease receivables and trade receivables that give rise to an unconditional right to consideration.

As permitted by IFRS 9, the Group applies the "simplified approach" to trade receivable balances and receivables relating to net investment in finance leases and the "general approach" to all other financial assets. The general approach incorporates a review for any significant increase in counterparty credit risk since inception. The ECL reviews include assumptions about the risk of default and expected loss rates. For trade receivables and receivables relating to net investment in finance leases, the assessment takes into account the use of credit enhancements, for example, letters of credit. Impairments for undrawn loan commitments are reflected as a provision.

(iv) Derivatives and hedge accounting
The Group applies the hedge accounting requirements under IFRS 9 and its hedging activities are discussed in note 30 with movements on hedging reserves disclosed in note 29. Where applicable, the Group may defer the costs of hedging including currency basis spreads, forward points and the time value of options.

(r) Share-based payments (note 43)
The fair value of the Group's share plans is recognised as an expense over the expected vesting period with an offset to retained earnings for Rio Tinto plc plans and to other reserves for Rio Tinto Limited plans.

The Group uses fair values provided by independent actuaries calculated using either a lattice-based option valuation model or a Monte Carlo simulation model.

The terms of each plan are considered at the balance sheet date to determine whether the plan should be accounted for as equity-settled or cash-settled. The Group does not operate any plans as cash-settled. However, the Performance Share Plan can, at the discretion of the directors, offer employees an equivalent amount in cash. This is not standard practice. In some jurisdictions, employees are granted cash-settled awards where equity-settled awards are prohibited by local laws and regulations. The value of these awards is immaterial.

The Group's equity-settled share plans are settled either by: the issuance of shares by the relevant parent company; the purchase of shares on market; or the use of shares held in treasury which were previously acquired as part of a share buy-back. If the cost of shares acquired to satisfy the plans differs from the expense charged, the difference is taken to retained earnings or other reserves, as appropriate.

(s) Share capital (notes 27 and 28)
Ordinary shares are classified as equity. Incremental costs directly attributable to the issuance of new shares are shown in equity as a deduction, net of tax, from the proceeds.

Where any Group company purchases the Group's equity share capital (treasury shares), the consideration paid, including any directly attributable incremental costs (net of income taxes) is deducted from equity attributable to owners of Rio Tinto. Where such shares are subsequently reissued, any consideration received, net of any directly attributable incremental costs and the related income tax effects, is included in equity attributable to owners of Rio Tinto. If purchased Rio Tinto plc shares are cancelled, an amount equal to the nominal value of the cancelled share is credited to the capital redemption reserve.

(t) Segment reporting (notes 2 and 3)
Operating segments are reported in a manner consistent with the internal reporting provided to the chief operating decision maker (CODM). The Group considers that Rio Tinto's chief executive is the CODM, who is responsible for allocating resources and assessing performance of the operating segments.

Critical accounting policies and estimates
(i) Determination of CGUs, assessment of indicators of impairment, review of asset carrying values, impairment charges and reversals and the recoverability of goodwill (notes 6, 12 and 13)
Impairment is assessed at the cash-generating unit (CGU) level. A CGU is the smallest identifiable asset or group of assets that generates independent cash inflows. Judgment is applied to identify the Group's CGUs, particularly when assets belong to integrated operations, and changes in CGUs could impact impairment charges and reversals. The most significant examples of this judgment are: disaggregation, in 2019, of the Weipa bauxite mine and the downstream Gladstone alumina refineries (Yarwun and QAL) in Queensland, Australia into three separate CGUs on the basis of the ramp-up of the Amrun expansion at Weipa which increased bauxite exports such that the mine is now considered to generate largely independent cash inflows; and the continued grouping of Rio Tinto Fer et Titane in Quebec, Canada and QIT Madagascar Minerals (QMM) into a single CGU on the basis that they are vertically integrated operations with no active market for ilmenite. Prior to 2019, the Weipa mine and Gladstone refineries were grouped into a single CGU. Management reviews these judgments on an annual basis as part of the annual internal review of asset values as described in note (i) above.

External and internal factors are monitored for indicators of impairment and include an annual internal review of asset values as described in note (i) above. Judgment is required to determine whether the impact of adverse spot commodity price movements is significant and structural in nature. There were no material instances of this judgment resulting in an indicator of impairment as at 31 December 2019.

Generally, discounted cash flow models are used to determine the recoverable amount of CGUs. In this case, significant judgment is required to determine the appropriate estimates and assumptions used and there is significant estimation uncertainty. In particular, for fair value less costs of disposal valuations, judgment is required to determine the estimates a market participant would use. The discounted cash flow model is most sensitive to the following estimates: the timing of project expansions; the cost to complete assets under construction; long-term commodity prices; production timing and recovery rates; exchange rates; operating costs; reserve and resource estimates; closure costs; discount rates; allocation of long-term contract revenues between CGUs and, in some instances, the renewal of mining licences. Some of these variables are unique to an individual CGU. Future changes in these variables may differ from management's expectations and may materially alter the recoverable amounts of the CGUs.

Note (i) above also describes the Group's methodology for estimating long-term commodity prices, exchange rates and discount rates for impairment testing purposes. Note 6 outlines the significant judgments, assumptions and sensitivities made for both measuring the impairments recorded and for determining whether reversal of part or all of a previous impairment was appropriate. Judgments, assumptions and sensitivities in relation to the testing of CGUs containing goodwill and indefinite-lived intangible assets are outlined in notes 12 and 13 respectively.

Notes to the 2019 financial statements continued

1 Principal accounting policies continued

(ii) Estimation of asset lives

Intangible assets are considered to have indefinite lives (and therefore no related depreciation or amortisation charge) if, in the Group's judgment, there is no foreseeable limit to the period over which the asset is expected to generate cash flows. Factors that are considered in making this judgment include the existence of contractual rights for unlimited terms or evidence that renewal of the contractual rights without significant incremental costs can be expected for indefinite periods into the future in view of the Group's investment intentions. The most significant assessment of indefinite life applicable to Intangible assets relates to contract based water rights in Canada acquired with Alcan, described further in note 13.

The useful lives of the major assets of a CGU are often dependent on the life of the orebody to which they relate. The life of the orebody will be determined on the basis of the life-of-mine plan which is based on the estimates of ore reserves as described on page 273.

(iii) Provision for onerous contracts

Provision for an onerous contract is made only when the assets dedicated to that contract are fully impaired or the contract becomes stranded as a result of a business decision. Judgment is required in determining which assets are considered dedicated to a contract when there is optionality as to how the contract obligations can be settled. Key estimates are the cash flows associated with the contract and the discount rate assumption. The Group completed the disposal of its remaining coking coal assets in 2018 and has retained the onerous provisions made in past periods for rail infrastructure "take or pay" contracts which were considered stranded. Refer to note 37. As at 31 December 2019, the balance of the provision was US$284 million. In 2019, the Group's investment in the Escondida Joint Venture reduced by US$138 million relating to contractual payments under a power purchase agreement which became stranded and was judged to be onerous upon early cancellation in favour of renewable energy sources.

(iv) Close-down, restoration and environmental obligations (note 26)

Provision is made for close-down, restoration and environmental costs when the obligation occurs, based on the net present value of estimated future costs required to satisfy the obligation. Management uses its judgment and experience to determine the potential scope of closure rehabilitation work required to meet the Group's legal, statutory and constructive obligations, and any other commitments made to stakeholders, and the options and techniques available to meet those obligations and estimate the associated costs and the likely timing of those costs. Significant judgment is also required to determine both the costs associated with that work and the other assumptions used to calculate the provision. External experts support the cost estimation process where appropriate but there remains significant estimation uncertainty.

The key judgment in applying this accounting policy is determining when an estimate is sufficiently reliable to make or adjust a closure provision.

Closure provisions are not made for those operations that have no known restrictions on their lives as the closure dates cannot be reliably estimated. This applies primarily to certain Canadian smelters which have indefinite-lived water rights or power agreements for renewably sourced power with local governments.

Cost estimates are updated throughout the life of the operation; generally cost estimates must comply with the Group's Capital Project Framework once the operation is ten years from expected closure. This means, for example, that where an Order of Magnitude (OoM) study is required for closure it must be of the same standard as an OoM study for a new mine, smelter or refinery. As at 31 December 2019, there are 13 operations with remaining lives of under 10 years before taking into account unapproved extensions. The largest continuing closure study is at Rio Tinto Kennecott; information available from this study at 31 December 2019 resulted in an increase to closure and environmental liabilities of US$444 million. Adjustments are made to provisions when the range of possible outcomes becomes sufficiently narrow to permit reliable estimation. Depending on the materiality of the change, adjustments may require review and endorsement by the Group's Closure Steering Committee before the provision is updated.

In some cases, the closure study may indicate that monitoring and, potentially, remediation will be required indefinitely - for example ground water treatment. In these cases the underlying cash flows for the provision may be restricted to a period for which the costs can be reliably estimated, which on average is around 30 years. Where an alternative commercial arrangement to meet our obligations can be predicted with confidence, this period may be shorter.

The most significant assumptions and estimates used in calculating the provision are:

- Closure timeframes. The weighted average remaining lives of operations is shown in note 26 (c). Some expenditure may be incurred before closure whilst the operation as a whole is in production.
- The length of any post-closure monitoring period. This will depend on the specific site requirements and the availability of alternative commercial arrangements; some expenditure can continue into perpetuity. The Rio Tinto Kennecott closure and environmental remediation provision includes an allowance for ongoing monitoring and remediation costs, including ground water treatment, of approximately US$0.7 billion.
- The probability weighting of possible closure scenarios. The most significant impact of probability weighting is at the Pilbara operations (Iron Ore) relating to infrastructure and incorporates the possibility that some infrastructure may be retained by the relevant State authorities post closure. The assignment of probabilities to this scenario reduces the closure provision by US$0.8 billion.
- Appropriate sources on which to base the calculation of the risk-free discount rate. At 31 December 2019 the carrying value of the close-down, restoration and environmental provision was US$11.1 billion. The change in carrying value of the provision which would result if the real discount rate was 0.5% lower than that assumed by management is shown in note 26.

There is significant estimation uncertainty in the calculation of the provision and cost estimates can vary in response to many factors including:

- Changes to the relevant legal or local/national government requirements and any other commitments made to stakeholders;
- Review of remediation and relinquishment options;
- Additional remediation requirements identified during the rehabilitation;
- The emergence of new restoration techniques;
- Change in the expected closure date;
- Change in the discount rate; and
- The effects of inflation.

Experience gained at other mine or production sites may also change expected methods or costs of closure, although elements of the restoration and rehabilitation of each site are relatively unique to a site. Generally, there is relatively limited restoration and rehabilitation activity and historical precedent elsewhere in the Group, or in the industry as a whole, against which to benchmark cost estimates.

The expected timing of expenditure can also change for other reasons, for example because of changes to expectations around ore reserves and mineral resources, production rates, renewal of operating licences or economic conditions.

As noted in note (I) above, changes in closure and restoration provisions for ongoing operations (other than the impact relating to current year production) are capitalised and therefore will impact assets and liabilities but have no impact on equity at the time the change is made. However, these changes will impact depreciation and the unwind of discount in future years. Changes in closure estimates at the Group's ongoing operations could result in a material adjustment to assets and liabilities in the next 12 months.

Changes to closure cost estimates for closed operations, and changes to environmental cost estimates at any operation, would impact equity; however, the Group does not consider that there is significant risk of a change in estimates for these liabilities causing a material adjustment to equity in the next 12 months. Any new environmental incidents may require a material provision but cannot be predicted.

Cash flow estimates must be discounted at the risk-free interest rate if this has a material effect on the provision. The selection of appropriate sources on which to base the calculation of the risk-free discount rate requires judgment. The 2% real rate currently used by the Group is based on a number of inputs including observable historical yields on 30 year US Treasury Inflation Protected Securities (TIPS), and recommendations by independent valuation experts.

(v) Deferral of stripping costs (note 14)
Stripping of waste materials takes place throughout the production phase of a surface mine or pit. The identification of components within a mine and of the life of component strip ratios requires judgment and is dependent on an individual mine's design and the estimates inherent within that. Changes to that design may introduce new components and/or change the life of component strip ratios. Changes in other technical or economic parameters that impact ore reserves may also have an impact on the life of component strip ratios, even if they do not affect the mine's design. Changes to the life of component strip ratios are accounted for prospectively.

The Group's judgment as to whether multiple pit mines are considered separate or integrated operations determines whether initial stripping of a pit is deemed to be pre-production or production phase stripping and, therefore, the amortisation base for those costs. The analysis depends on each mine's specific circumstances and requires judgment: another mining company could make a different judgment even when the fact pattern appears to be similar.

(vi) Uncertain tax positions
The Group operates across a large number of jurisdictions and is subject to periodic challenges by local tax authorities on a range of tax matters during the normal course of business, including transfer pricing, indirect taxes and transaction related issues. Where the amount of tax payable or recoverable is uncertain, Rio Tinto establishes provisions based on either: the Group's judgment of the most likely amount of the liability or recovery; or, when there is a wide range of possible outcomes, a probability weighted average approach. The most significant of these judgments are in relation to transfer pricing matters, including issues under discussion with the Australian Tax Office (ATO) on certain transactions between Rio Tinto entities based in Australia and the Group's commercial centre in Singapore for the period since 2009.

(vii) Recoverability of potential deferred tax assets (note 17)
The Group has tax losses and other deductible temporary differences, *mainly in Australian, Canadian, French, US and Mongolian taxable entities*, that have the potential to reduce tax payments in future years. Deferred tax assets have been recognised to the extent that their recovery is probable, having regard to the availability of sufficient taxable temporary differences relating to the same taxation authority and the same taxable entity, the estimates of projected future taxable income of these taxable entities and after taking account of specific risk factors that are expected to affect the recovery of these assets including the risk of expiry of losses. Further information on deferred tax assets is given in note 17.

In addition to the risk of expiry of losses the projections on which recovery of tax losses are based are subject to the same estimation uncertainty as noted in (i) above in relation to impairment. The key judgment in the application of this accounting policy is the recognition of deferred tax assets for losses where the operation is not currently profitable for tax purposes.

(viii) Identification of functional currencies
The functional currency for each subsidiary, unincorporated arrangement, joint operation and equity accounted unit, is the currency of the primary economic environment in which it operates. Determination of functional currency involves significant judgment and other companies may make different judgments based on similar facts. For many of Rio Tinto's businesses, their functional currency is the currency of the country in which they operate. The Group reconsiders the functional currency of its businesses if there is a change in the underlying transactions, events or conditions which determine their primary economic environment.

The determination of functional currency is a key judgment which affects the measurement of non-current assets included in the balance sheet and, as a consequence, the depreciation and amortisation of those assets included in the income statement. It also impacts exchange gains and losses included in the income statement and in equity. The Group applies judgment in determining whether settlement of certain intragroup loans is neither planned nor likely in the foreseeable future and therefore whether the associated exchange gains and losses can be taken to equity. During 2019, A$14 billion of intragroup loans continued to meet these criteria; associated exchange gains and losses are taken to equity.

(ix) Estimation of obligations for post-employment costs (note 44)
The value of the Group's obligations for post-employment benefits is dependent on the amount of benefits that are expected to be paid out, discounted to the balance sheet date. The discount rate is a key assumption and is based upon the yields on high quality corporate bonds in the relevant currency which have durations consistent with the term of the obligations. The discount rate will vary from one period to another in line with movements in corporate bond yields, but at any given measurement date there is relatively little estimation uncertainty. This rate is also used to calculate the interest cost on obligations and interest income on plan assets.

The following key assumptions are used to calculate the estimated benefit: future pay increases to be received by members of final pay plans, the level of inflation (for those benefits that are subject to some form of inflation protection), current mortality rates and future improvements in mortality rates. The assumption regarding future inflation is based on market yields on inflation linked instruments, where possible, combined with consensus views. The Group reviews the actual mortality rates of retirees in its major pension plans on a regular basis and uses these rates to set its current mortality assumptions. It also uses its judgment with respect to allowances for future improvements in longevity having regard to standard improvement scales in each relevant country and after taking external actuarial advice.

Notes to the 2019 financial statements continued

1 Principal accounting policies continued

Most of the Group's defined benefit pension plans are closed to new entrants and the majority of the obligations relate to former employees. The carrying value of the Group's post-employment obligations is therefore less sensitive to assumptions about future salary increases than it is to assumptions regarding future inflation.

Details of the key assumptions, how they have moved since the previous balance sheet date and the sensitivity of the carrying value to changes in the assumptions are set out in note 44.

(x) Contingencies (note 31)

Disclosure is made of material contingent liabilities unless the possibility of any loss arising is considered remote based on the Group's judgment and legal advice. Contingent liabilities are quantified unless, in the Group's judgment, the amount cannot be reliably estimated.

(xi) Basis of consolidation (notes 33-36)

Judgment is sometimes required to determine whether after considering all relevant factors, the Group has control, joint control or significant influence over an entity or arrangement. Significant influence includes situations of collective control (see note 36 (a)). Other companies may make different judgments regarding the same entity or arrangement. The most significant instance of such a judgment by the Group is in the determination that Escondida is a joint venture, based on the nature of significant commercial decisions, including capital expenditure, which require approval by both Rio Tinto and its partner BHP.

(xii) Exclusions from underlying earnings (note 2)

As set out in note 2, certain items are excluded from net earnings/(loss) in arriving at underlying earnings in each period irrespective of materiality. In addition, there is a final judgmental category which includes, where applicable, other credits and charges that, individually or in aggregate if of a similar type, are of a nature or size to require exclusion in order to provide additional insight into underlying business performance.

The exclusion of provisions for obligations in respect of legacy operations and the reversal of an inventory provision at Oyu Tolgoi were the only judgments in this respect in 2019.

(xiii) Pilbara Iron Arrangements

The arrangements described in note 34 (c) to the accounts permit each of the partners to the joint operation to request the other to construct assets on their tenure to widen the capacity of the network. The requesting partner's (Asset User's) share of the capacity of the network will increase by the capacity of the newly constructed asset but, generally, that capacity may be provided from any of the network assets. The Asset User will pay an annual charge (Committed Use Charge – "CUC") over a contractually specified period irrespective of usage of the network. The constructing partner (Asset Owner) has an ongoing obligation to make available capacity from those assets and to maintain the assets in good working order as required under relevant State Agreements and associated tenure.

The Group considered whether the CUC arrangements give rise to a lease between the Asset Owner and the Asset User under the previous lease accounting standards IAS 17 "Leases" and IFRIC 4 "Determining whether an arrangement contains a lease". The conclusion that they do not is because there is no specified asset; rather the Asset User has a first priority right to the capacity in the CUC asset. This treatment has been grandfathered on adoption of IFRS 16. Management considers that these arrangements are unique and has used judgment to apply the principles of IFRS to the accounting for the arrangements as described above. The obligation of the Asset Owner to make capacity available is fulfilled over time and not at a point in time. The CUC arrangement is therefore an executory contract as defined under IAS 37 "Provisions, contingent liabilities and contingent assets" whereby neither party has performed any of its obligations, or both parties have partially performed their obligations to an equal extent, and so the CUC payments are expensed as incurred. An alternative treatment would have resulted in a gross presentation in the Group's balance sheet with an asset and a corresponding liability to reflect the present value of the CUC payments. The Asset User is a wholly owned subsidiary of Rio Tinto, whereas the Asset Owner is a joint operation. This impact would be some US$2 billion (calculated on the basis of grossing up the written down value of the CUC assets). Other methods of calculating the gross up might give rise to different numbers.

2 Operating segments

Rio Tinto's management structure is based on the principal product groups in the tables below together with the global functions that support the business, which include Growth & Innovation and Commercial. The chief executive of each product group reports to the chief executive of Rio Tinto. The chief executive of Rio Tinto monitors the performance of each product group based on a number of measures, including underlying earnings, underlying EBITDA, capital expenditure, net cash generated from operating activities and free cash flow. Finance costs and net debt are managed on a Group basis.

Effective from the first half of 2019, Dampier Salt has moved from the Energy & Minerals Product Group to the Iron Ore Product Group. The comparatives below have been adjusted to ensure comparability with the current year.

Generally, business units are allocated to product groups based on their primary product. The Energy & Minerals product group includes businesses with products such as uranium, borates, titanium dioxide feedstock together with Iron Ore Company of Canada and the Simandou iron ore project, which are the responsibility of the Energy & Minerals product group chief executive. The group's coal operations were also included in Energy & Minerals until the divestment of these assets, which was completed during 2018. The Copper & Diamonds product group also produces gold, silver, molybdenum and other by-products.

The financial information by business unit provided on pages 252 to 254 of these financial statements provides additional voluntary disclosure which the Group considers useful to the users of the financial statements.

Gross sales revenue	**2019 US$m**	2018 US$m	2017 US$m
Iron Ore - adjusted	**24,075**	18,731	18,466
Aluminium	**10,340**	12,191	11,005
Copper & Diamonds	**5,815**	6,468	4,842
Energy & Minerals - adjusted	**5,150**	5,451	7,549
Other Operations	**18**	9	10
Reportable segments total	**45,398**	42,850	41,872
Inter-segment transactions	**(31)**	(15)	(15)
Product group total	**45,367**	42,835	41,857
Items excluded from underlying earnings	**—**	—	10
Gross sales revenue	**45,367**	42,835	41,867
Share of equity accounted unit sales and adjustments for intra-subsidiary/equity accounted units sales	**(2,202)**	(2,313)	(1,837)
Consolidated sales revenue per income statement	**43,165**	40,522	40,030

Gross sales revenue includes the Group's proportionate share of sales revenue of equity accounted units (after adjusting for sales to subsidiaries) of US$2,234 million (2018: US$2,354 million; 2017: US$1,859 million) which are not included in consolidated sales revenue. Consolidated sales revenue includes subsidiary sales of US$32 million (2018: US$41 million; 2017: US$22 million) to equity accounted units which are not included in gross sales revenue.

Capital expenditure	**2019 US$m**	2018 US$m	2017 US$m
Iron Ore - adjusted	**1,741**	1,302	1,214
Aluminium	**1,456**	1,373	1,436
Copper & Diamonds	**2,087**	2,150	1,622
Energy & Minerals - adjusted	**551**	442	454
Other Operations	**(4)**	12	(35)
Reportable segments total	**5,831**	5,279	4,691
Other items	**64**	65	70
Less: capital expenditure of equity accounted units	**(456)**	(500)	(417)
Capital expenditure per financial information by business unit	**5,439**	4,844	4,344
Add back: proceeds from disposal of property, plant and equipment[a]	**49**	586	138
Capital expenditure per cash flow statement	**5,488**	5,430	4,482

(a) In 2018, proceeds from disposal of property, plant and equipment included US$508 million received on the sale of surplus land at Kitimat.

Capital expenditure for reportable segments comprises the net cash outflow on purchases less disposals of property, plant and equipment, capitalised evaluation costs and purchases less disposals of other intangible assets. The details provided include 100% of subsidiaries' capital expenditure and Rio Tinto's share of the capital expenditure of joint operations and equity accounted units.

Notes to the 2019 financial statements continued

2 Operating segments continued

Depreciation and amortisation	2019 US$m	2018 US$m	2017 US$m
Iron Ore - adjusted	**1,723**	1,702	1,667
Aluminium	**1,312**	1,122	1,199
Copper & Diamonds	**1,320**	1,317	1,452
Energy & Minerals - adjusted	**428**	455	630
Other Operations	**177**	26	32
Reportable segments total	**4,960**	4,622	4,980
Other items	**77**	43	42
Less: depreciation and amortisation of equity accounted units	**(653)**	(650)	(647)
Depreciation and amortisation per note 4	**4,384**	4,015	4,375

Product group depreciation and amortisation for reportable segments totals include 100% of subsidiaries' depreciation and amortisation and Rio Tinto's share of the depreciation and amortisation of equity accounted units. Rio Tinto's share of the depreciation and amortisation charge of equity accounted units is deducted to arrive at depreciation and amortisation, excluding equity accounted units, as shown in note 4. These figures exclude impairment charges and reversals, which are excluded from underlying earnings.

Tax charge/(credit)	2019 US$m	2018 US$m	2017 US$m
Iron Ore - adjusted	**4,198**	2,830	2,872
Aluminium	**211**	532	543
Copper & Diamonds	**65**	118	48
Energy & Minerals - adjusted	**411**	500	651
Other Operations	**(51)**	(51)	(84)
Reportable segments total	**4,834**	3,929	4,030
Inter-segment transactions	**(2)**	—	—
Product group total	**4,832**	3,929	4,030
Other items	**(67)**	(276)	(261)
Exploration and evaluation not attributed to product groups	**(83)**	(38)	(36)
Net finance costs	**(144)**	(174)	(364)
	4,538	3,441	3,369
Tax (credit)/charge excluded from underlying earnings	**(391)**	801	596
Tax charge per income statement	**4,147**	4,242	3,965

Tax charge/(credit) excludes amounts relating to equity accounted units. Further information on the tax charge/(credit) excluded from underlying earnings is provided in the section "Underlying earnings", below.

Underlying EBITDA	2019 US$m	2018 US$m	2017 US$m
Iron Ore - adjusted	**16,098**	11,378	11,547
Aluminium	**2,285**	3,095	3,423
Copper & Diamonds	**2,073**	2,776	1,904
Energy & Minerals - adjusted	**1,762**	2,140	2,776
Other Operations	**(77)**	(70)	(116)
Reportable segments total	**22,141**	19,319	19,534
Inter-segment transactions	**(9)**	—	—
Product group total	**22,132**	19,319	19,534
Central pension costs, share-based payments and insurance	**59**	(128)	(68)
Restructuring, project and one-off costs	**(183)**	(272)	(177)
Central costs	**(496)**	(552)	(491)
Exploration and evaluation not attributed to product groups	**(315)**	(231)	(218)
Underlying EBITDA	**21,197**	18,136	18,580
Items excluded from underlying EBITDA	**(722)**	5,127	1,912
EBITDA	**20,475**	23,263	20,492
Depreciation, amortisation and impairment charges in subsidiaries and equity accounted units	**(8,412)**	(4,691)	(5,746)
Taxation and finance items in equity accounted units	**(296)**	(372)	(272)
Profit on ordinary activities before finance items and tax	**11,767**	18,200	14,474

Underlying earnings	2019 US$m	2018 US$m	2017 US$m
Iron Ore - adjusted	**9,638**	6,531	6,695
Aluminium	**599**	1,347	1,583
Copper & Diamonds	**554**	1,054	263
Energy & Minerals - adjusted	**611**	995	1,239
Other Operations	**(89)**	(102)	(138)
Reportable segments total	**11,313**	9,825	9,642
Inter-segment transactions	**(3)**	—	—
Product group total	**11,310**	9,825	9,642
Central pension costs, share-based payments and insurance	**60**	(90)	(48)
Restructuring, project and one-off costs	**(94)**	(190)	(124)
Central costs	**(550)**	(410)	(311)
Exploration and evaluation not attributed to product groups	**(231)**	(193)	(178)
Net finance costs	**(122)**	(134)	(354)
Underlying earnings	**10,373**	8,808	8,627
Items excluded from underlying earnings	**(2,363)**	4,830	135
Net earnings attributable to owners of Rio Tinto per income statement	**8,010**	13,638	8,762

Underlying EBITDA and underlying earnings are reported by Rio Tinto to provide greater understanding of the underlying business performance of its operations and to enhance comparability of reporting periods.

The measures of underlying EBITDA and underlying earnings, in conjunction with net cash generated from operating activities and capital expenditure (net of proceeds on disposals), are used by the chief executive of Rio Tinto to assess the performance of the product groups. Underlying earnings and net earnings both represent amounts net of tax attributable to owners of Rio Tinto.

The following items are excluded from net earnings in arriving at underlying earnings in each period irrespective of materiality:
- Net gains/(losses) on disposal of interests in businesses.
- Impairment charges and reversals.
- Profit/(loss) after tax from discontinued operations.
- Exchange and derivative gains and losses. This exclusion includes exchange gains/(losses) on external net debt and intragroup balances, unrealised gains/(losses) on currency and interest rate derivatives not qualifying for hedge accounting, unrealised gains/(losses) on certain commodity derivatives not qualifying for hedge accounting, and unrealised gains/(losses) on embedded derivatives not qualifying for hedge accounting.

In addition, there is a final judgmental category which includes, where applicable, other credits and charges that, individually or in aggregate if of a similar type, are of a nature or size to require exclusion in order to provide additional insight into underlying business performance.

Underlying EBITDA excludes the EBITDA impact of the same items that are excluded from underlying earnings.

Product group earnings include the Group's share of the underlying earnings of subsidiaries and equity accounted units stated before finance items but after the amortisation of discount on provisions.

Rio Tinto's share of the underlying earnings of equity accounted units amounted to US$302 million in 2019 (2018: US$513 million; 2017: US$332 million). This amount is attributable as follows: US$292 million profit to the Copper & Diamonds product group and US$10 million profit to other product groups (2018: US$476 million profit to the Copper & Diamonds product group and US$37 million profit to other product groups; 2017: US$295 million profit to the Copper & Diamonds product group and US$37 million profit to other product groups). These amounts are included in underlying earnings and include the underlying earnings of the Group's tolling entities which process alumina. Tolling entities recharge the majority of their costs and generally have minimal earnings.

Notes to the 2019 financial statements continued

2 Operating segments continued

Reconciliation of net earnings/(losses) to underlying earnings

Exclusions from underlying earnings	Pre-tax[k] 2019 US$m	Taxation 2019 US$m	Non-controlling interests 2019 US$m	Net amount 2019 US$m	Net amount 2018 US$m	Net amount 2017 US$m
Impairment charges (note 6)	**(3,487)**	**323**	**1,506**	**(1,658)**	(104)	(481)
Net (losses)/gains on consolidation and disposal of interests in businesses[a]	**(291)**	**—**	**—**	**(291)**	3,996	2,022
Exchange and derivative gains/(losses):						
– Exchange gains/(losses) on external net debt, intragroup balances and derivatives[b]	**52**	**(6)**	**5**	**51**	550	(488)
– (Losses)/gains on currency and interest rate derivatives not qualifying for hedge accounting[c]	**(72)**	**15**	**(2)**	**(59)**	(48)	30
– (Losses)/gains on embedded commodity derivatives not qualifying for hedge accounting[d]	**(253)**	**65**	**(4)**	**(192)**	202	(352)
Losses from increases to closure estimates (non-operating and fully impaired sites)[e]	**—**	**—**	**—**	**—**	(335)	—
Gain relating to surplus land at Kitimat[f]	**—**	**—**	**—**	**—**	569	—
Changes in corporate tax rates in the US and France[g]	**—**	**—**	**—**	**—**	—	(439)
Rio Tinto Kennecott insurance settlement[h]	**—**	**—**	**—**	**—**	—	45
Tax charge relating to expected divestments[i]	**—**	**—**	**—**	**—**	—	(202)
Other exclusions[j]	**(171)**	**(6)**	**(37)**	**(214)**	—	—
Total excluded from underlying earnings	**(4,222)**	**391**	**1,468**	**(2,363)**	4,830	135
Net earnings	**11,119**	**(4,147)**	**1,038**	**8,010**	13,638	8,762
Underlying earnings	**15,341**	**(4,538)**	**(430)**	**10,373**	8,808	8,627

(a) In 2019, the net loss mainly relates to disposal of our entire 68.62% stake in Rössing Uranium on 16 July 2019 for which we recorded a pre-tax loss of US$289 million (US$289 million net of tax). In 2018, the net gain related mainly to the sales of the Hail Creek coal mine and the Kestrel underground coal mine, which both completed on 1 August 2018, the sale of the Dunkerque aluminium smelter on 14 December 2018 and the sale of Grasberg on 21 December 2018. The net gain in 2018 also includes a gain on consolidation recognised on the formation on 10 May 2018 of ELYSIS, a new joint venture to develop a carbon-free smelting process. In 2017, the net gain related mainly to the sale of Coal & Allied Industries Limited, which completed on 1 September 2017. Refer to note 37 for further details in respect of these transactions.

(b) Exchange gains/(losses) on external net debt and intragroup balances comprise post-tax foreign exchange gains on net debt of US$60 million and post-tax losses of US$9 million on intragroup balances, primarily as a result of the Canadian dollar strengthening against the US dollar. From 1 January 2019, all foreign exchange gains and losses relating to net debt are excluded from underlying earnings. In 2018 and previous years, foreign exchange gains and losses on non-US dollar cash held in US dollar functional currency entities was included within underlying earnings. The impact of this change on the reported comparatives is insignificant, and therefore the comparatives have not been restated. In 2018 the net exchange gains comprise post-tax foreign exchange losses of US$386 million on US dollar denominated net debt, and US$936 million gains on intragroup balances. Net exchange loss in 2017 comprise post-tax foreign exchange gains of US$420 million on US dollar denominated net debt, and US$908 million losses on intragroup balances.

(c) Valuation changes on currency and interest rate derivatives, which are ineligible for hedge accounting, other than those embedded in commercial contracts, and the currency revaluation of embedded US dollar derivatives contained in contracts held by entities whose functional currency is not the US dollar.

(d) Valuation changes on derivatives, embedded in commercial contracts, that are ineligible for hedge accounting, but for which there will be an offsetting change in future Group earnings. From 1 January 2018, all mark-to-market movements on commodity derivatives entered into with the commercial objective of achieving spot pricing for the underlying transaction at the date of settlement are included in underlying earnings. In 2017, valuation changes on this type of commodity derivative were excluded from underlying earnings. The impact of this change on the reported comparatives is insignificant, and therefore the comparatives have not been restated.

(e) In 2018, the pre-feasibility study for the Argyle mine closure was completed, resulting in an increase to the closure provision. As the assets at Argyle had previously been fully impaired, this increase was not capitalised and was instead recognised in the income statement. The impairment charge in respect of Argyle recognised in 2017 (see note 6) was based on preliminary findings from the pre-feasibility study and therefore the charge arising from the finalisation of this study has been excluded from underlying earnings. Also in 2018, the feasibility study for the closure of the Ranger Project Area at Energy Resources of Australia (ERA) was finalised, resulting in an increase to the closure provision. As the assets of ERA had been fully impaired, this increase was recognised in the income statement. The charge was excluded from underlying earnings.

(f) In November 2018, Rio Tinto completed the lease and sale of a wharf and land in Kitimat. The resulting gain on disposal of Property, plant and equipment and Other income were both excluded from underlying earnings on the grounds of materiality.

(g) In 2017, deferred tax assets were re-measured to reflect lower corporate income tax rates in the US and France as a result of tax legislation changes substantively enacted in December 2017.

(h) In 2017, Rio Tinto received the final settlement on the insurance claims related to the 2013 slide at Rio Tinto Kennecott's Bingham Canyon mine. The amounts excluded from underlying earnings were consistent with the previous excluded losses to which they related, in line with the treatment of the 2013 and 2015 settlement payments.

(i) In 2017, deferred tax assets were derecognised as a result of revised profit forecasts in France due to the expected divestments of Dunkerque and ISAL. The Dunkerque divestment completed in 2018.

(j) Other exclusions include provisions for obligations in respect of legacy operations of US$246 million (loss of US$233 million after tax), partially offset by the write-back of a net realisable value provision in respect of low value stockpile inventories at Oyu Tolgoi of US$75 million (gain of US$19 million after tax and non-controlling interests). As a result of increased uncertainty over timing of production from the Oyu Tolgoi underground project (refer to note 6), we now expect to utilise low value stockpiles sooner than previously expected. This was excluded from underlying earnings, consistent with the related impairment charge recognised in the period.

(k) Exclusions from underlying earnings relating to equity accounted units are stated after tax and are included in the column "Pre-tax".

3 Operating segments – additional information

Consolidated sales revenue by destination[a]

	2019 %	Adjusted[b] 2018 %	Adjusted[b] 2017 %	2019 US$m	Adjusted[b] 2018 US$m	Adjusted[b] 2017 US$m
China	**51.3**	44.6	44.2	**22,135**	18,061	17,706
Asia (excluding China and Japan)	**10.6**	11.5	12.8	**4,558**	4,665	5,108
United States of America	**14.2**	15.6	14.3	**6,125**	6,337	5,705
Japan	**8.9**	9.6	11.7	**3,855**	3,873	4,701
Europe (excluding UK)	**6.0**	9.3	7.8	**2,610**	3,788	3,140
Canada	**3.3**	3.3	2.8	**1,478**	1,330	1,114
Australia	**1.7**	1.8	1.8	**737**	720	710
UK	**0.6**	0.7	0.8	**248**	264	325
Other countries	**3.4**	3.6	3.8	**1,419**	1,484	1,521
Consolidated sales revenue	**100**	100	100	**43,165**	40,522	40,030

(a) Consolidated sales revenue by geographical destination is based on the ultimate country of destination of the product, if known. If the eventual destination of the product sold through traders is not known then revenue is allocated to the location of the product at the time when control is transferred. Rio Tinto is domiciled in both the UK and Australia.

(b) The 2018 and 2017 comparatives have been amended to correct the allocation of sales revenue by destination. This resulted in an increase in sales to the United States of America (2018: US$59 million, decrease in 2017: US$11 million); and to Europe (excluding UK) (2018: US$82 million; 2017: US$125 million) with a corresponding decrease in sales to the UK (2018: US$122 million, 2017: US$124 million), Canada (2018: US$10 million, increase in 2017: US$3 million) and Other countries (2018: US$9 million, increase in 2017: US$7 million).

Consolidated sales revenue by product

Consolidated sales revenues of the Group are derived from the following products sold to external customers:

	Revenue from contracts with customers 2019 US$m	Other revenue[a] 2019 US$m	Consolidated sales revenue 2019 US$m
Iron ore	**25,516**	**229**	**25,745**
Aluminium	**10,207**	**(32)**	**10,175**
Copper	**2,030**	**(7)**	**2,023**
Coal	**—**	**—**	**—**
Industrial minerals	**2,251**	**(12)**	**2,239**
Gold	**667**	**2**	**669**
Diamonds	**619**	**—**	**619**
Other	**1,697**	**(2)**	**1,695**
Consolidated sales revenue	**42,987**	**178**	**43,165**
Share of equity accounted unit sales and intra-subsidiary/equity accounted unit sales			**2,202**
Gross sales revenue			**45,367**

	Adjusted[b] revenue from contracts with customers 2018 US$m	Other revenue[a] 2018 US$m	Adjusted[b] Consolidated sales revenue 2018 US$m	Adjusted[b] Consolidated sales revenue 2017 US$m
Iron ore	19,888	(21)	19,867	20,010
Aluminium	12,041	(22)	12,019	10,864
Copper	2,420	(32)	2,388	1,760
Coal	986	3	989	2,822
Industrial minerals	2,168	—	2,168	2,085
Gold	869	—	869	378
Diamonds	695	—	695	706
Other	1,527	—	1,527	1,405
Consolidated sales revenue	40,594	(72)	40,522	40,030
Share of equity accounted unit sales and intra-subsidiary/equity accounted unit sales			2,313	1,837
Gross sales revenue			42,835	41,867

(a) Certain of the Group's products may be provisionally priced at the date revenue is recognised. The change in value of the provisionally priced receivables is based on relevant forward market prices and is included in "Other revenue" above. In 2017 there was no equivalent requirement under IAS 18 to separate out such provisional price movements and therefore this was not disclosed.

(b) The 2018 and 2017 comparatives have been amended to correct the allocation of sales revenue by product. The most significant impacts are a decrease in Other product revenues (2018: US$75 million, 2017: US$25 million) and an increase in Industrial minerals revenues (2018: US$75 million, 2017: US$25 million).

Notes to the 2019 financial statements continued

3 Operating segments – additional information continued

Non-current assets other than excluded items[a]

The total of non-current assets other than items excluded is shown by location below.

	2019 US$m	2018 US$m
Australia	**27,944**	28,592
Canada	**14,644**	13,775
Mongolia	**9,187**	9,912
United States of America	**5,459**	4,815
Africa	**3,583**	3,476
South America	**2,652**	3,047
Europe (excluding France and the UK)	**193**	50
UK	**158**	59
France	**64**	79
Other countries	**1,314**	850
Total non-current assets other than excluded items	**65,198**	64,655
Non-current assets excluded from analysis above:		
Deferred tax assets	**3,102**	3,137
Other financial assets[b]	**635**	814
Quasi equity loans to equity accounted units[b]	**113**	129
Tax recoverable	**5**	8
Trade and other receivables	**1,446**	1,304
Total non-current assets per balance sheet	**70,499**	70,047

(a) Allocation of non-current assets by country is based on the location of the business units holding the assets. It includes investments in equity accounted units totalling US$3,858 million (2018: US $4,170 million) which represents the Group's share of net assets excluding quasi equity loans shown separately above.

(b) Loans to equity accounted units comprise quasi equity loans of US$113 million (2018: US$129 million) included in "Investments in equity accounted units" on the face of the balance sheet and non-current non-quasi equity loans of US$39 million (2018: US$38 million) shown within "Other financial assets".

4 Net operating costs (excluding items shown separately)

	Note	2019 US$m	2018 US$m	2017 US$m
Raw materials, consumables, repairs and maintenance		**9,485**	10,613	9,286
Amortisation of intangible assets	13	**133**	133	177
Depreciation of property, plant and equipment	14	**4,251**	3,882	4,198
Employment costs	5	**4,522**	4,728	4,765
Shipping and other freight costs[a]		**2,257**	2,580	2,338
Decrease/(increase) in finished goods and work in progress		**42**	(186)	(82)
Royalties		**2,501**	2,117	2,228
Amounts charged by equity accounted units[b]		**1,136**	1,200	980
Net foreign exchange (gains)/losses		**(52)**	(56)	61
Other external costs[a][c]		**3,627**	3,184	3,967
Gain on sale of property, plant and equipment[d]		**31**	(506)	(32)
Provisions (including exchange differences on provisions)	26	**753**	1,011	527
Research and development		**45**	45	58
Costs included above qualifying for capitalisation		**(651)**	(589)	(486)
Other operating income		**(773)**	(1,041)	(1,002)
Net operating costs (excluding items shown separately)		**27,307**	27,115	26,983

(a) In 2019, other external costs include US$327 million of short term lease costs and US$15 million of variable lease costs recognised in the income statement in accordance with IFRS 16 "Leases". Refer to note 23. In 2018 and 2017, net operating costs included US$787 million and US$555 million respectively of operating lease expenses under IAS 17 "Leases". Costs for leases of dry bulk vessels (which included costs for crewing services) were included within "Shipping and other freight costs" and other lease costs were included within "Other external costs".

(b) Amounts charged by equity accounted units relate to toll processing and also include purchases from equity accounted units of bauxite and aluminium which are then processed by the product group or sold to third parties. Generally, purchases are in proportion to the Group's share of the equity accounted unit but in 2019, US$291 million (2018: US$332 million; 2017: US$229 million) related to purchases of the other investors' share of production.

(c) In 2017, other external costs include a financial penalty of £27.4 million (US$36.4 million) paid to the United Kingdom's Financial Conduct Authority (FCA) in relation to the timing of the impairment of the Group's former coal operations in Mozambique.

(d) In 2018, includes a US$549 million pre-tax gain on the sale of property, plant and equipment at Kitimat. Refer to note 2.

5 Employment costs

	Note	2019 US$m	2018 US$m	2017 US$m
Total employment costs				
– Wages and salaries		**3,923**	4,154	4,129
– Social security costs		**328**	336	337
– Net post-retirement charge	44	**384**	532	500
– Share-based payment charge	43	**123**	122	91
		4,758	5,144	5,057
Less: charged within provisions[a]	26	**(236)**	(416)	(292)
Total employment costs	4	**4,522**	4,728	4,765

(a) Amounts included above relate to provisions for pensions, post-retirement healthcare, long service leave and other employee entitlements. These are included in "Provisions (including exchange differences on provisions)" in note 4.

6 Impairment charges

	Note	Pre-tax amount 2019 US$m	Taxation 2019 US$m	Non-controlling interest 2019 US$m	Net amount 2019 US$m	Pre-tax amount 2018 US$m	Pre-tax amount 2017 US$m
Copper & Diamonds – Oyu Tolgoi		**(2,240)**	**(39)**	**1,506**	**(773)**	—	—
Aluminium – Yarwun alumina refinery		**(1,138)**	**339**	**—**	**(799)**	—	—
Aluminium – ISAL Smelter		**(109)**	**23**	**—**	**(86)**	(123)	—
Energy & Minerals – Rössing		**—**	**—**	**—**	**—**	(9)	(267)
Energy & Minerals – Roughrider		**—**	**—**	**—**	**—**	—	(357)
Copper & Diamonds – Argyle		**—**	**—**	**—**	**—**	—	(172)
Total impairment charge		**(3,487)**	**323**	**1,506**	**(1,658)**	(132)	(796)
Allocated as:							
Intangible assets	13	**(1)**				(2)	(357)
Property, plant and equipment	14	**(3,486)**				(130)	(435)
Other assets and liabilities		**—**				—	(4)
Total impairment charge		**(3,487)**				(132)	(796)
Comprising:							
Total impairment charges in the financial information by business unit (page 252)					**(3,487)**	(132)	(796)
Taxation (including related to EAUs)					**323**	25	141
Non-controlling interests					**1,506**	3	174
Total impairment in the income statement					**(1,658)**	(104)	(481)

Copper & Diamonds – Oyu Tolgoi, Mongolia

On 16 July 2019 we announced that the first sustainable production from the Oyu Tolgoi underground project could be delayed by 16 to 30 months compared with the original feasibility study guidance in 2016. We also announced that development capital spend for the project may increase by between US$1.2 billion and US$1.9 billion in excess of the US$5.3 billion previously disclosed.

We identified these matters as an impairment trigger and prepared an assessment of the recoverable amount for the cash-generating unit (CGU) at 30 June 2019 using a fair value less cost of disposal (FVLCD) model, as prescribed by IAS 36 "Impairment of assets".

In arriving at a recoverable amount, as at 30 June 2019, we estimated post-tax cash flows expressed in real terms over the current life of mine plus anticipated future expansions, utilising mineral resources. The mineral resources incorporate almost two billion tonnes of ore, which contributes approximately 20% to the total recoverable amount. We discounted the cash flows using a post-tax discount rate of 8.3% expressed in real terms. Due to the inputs used, the recoverable amount of the Oyu Tolgoi CGU was classified as level 3 under the fair value hierarchy.

At 30 June 2019 we determined the recoverable amount to be US$8.3 billion on a post-tax basis which resulted in a pre-tax impairment charge of US$2.2 billion (100% basis). This was allocated to mining properties and the underground development assets under construction. The net adjustment to tax represented an increase to deferred tax assets of US$320 million for the temporary difference corresponding to the impairment and a decrease in deferred tax assets of US$359 million for tax losses that are now expected to expire without utilisation.

The post-tax impairment charge of US$2.3 billion was allocated 66% to non-controlling interests with the remaining 34% to Rio Tinto shareholders (US $0.8 billion) in proportion to the equity ownership interest in the project.

We calculated the recoverable amount taking into account a number of mine design options. As studies progress, this will lead to the selection of a preferred development option with detailed cost scheduling and production assumptions, which may lead to a change in recoverable amount. The recoverable amount also includes high-level risk adjustments to net cash flows to reflect the inherent uncertainty of assumptions for development capital, schedule and mineral resources.

Notes to the 2019 financial statements continued

6 Impairment charges continued

Copper & Diamonds – Oyu Tolgoi, Mongolia continued

Together with development capital, scheduling and production assumptions, other critical assumptions in the determination of recoverable amount include discount rate and commodity prices. To illustrate the sensitivity of the recoverable amount to movements in these assumptions, an increase to the post-tax real terms discount rate of one percentage point with all other inputs remaining constant would reduce the recoverable amount by US$1.5 billion. A decrease in forecast copper prices by 10% throughout the life of the mine would reduce the recoverable amount by US$2.2 billion while an increase of 10% would increase the recoverable amount by US$2.1 billion.

We have continued to monitor developments in the project through the second half of the year. No further adjustment has been recorded to the impairment charge recognised at 30 June.

Aluminium – Yarwun alumina refinery, Australia

In previous years, the Yarwun alumina refinery has been part of a single cash-generating unit (CGU) with Queensland Alumina and the Weipa bauxite mine due to the integrated nature of these operations in Queensland, Australia. During 2019, the ramp-up of the Amrun expansion at Weipa resulted in increased bauxite export levels to the extent that Weipa is now considered to generate cash inflows largely independent from the downstream alumina operations. This change in circumstance has resulted in the previous CGU being split in 2019 into three CGUs: Weipa bauxite mine, Yarwun alumina refinery and Queensland Alumina.

In 2019, our annual impairment assessment of the Yarwun CGU resulted in a pre-tax impairment charge of US$1,138 million to property, plant and equipment as a result of this CGU being assessed on a stand-alone basis and a 30 per cent year-on-year reduction in the spot price of alumina.

The recoverable amount of US$911 million for the Yarwun CGU was determined by reference to a fair value less cost of disposal (FVLCD) model in line with the accounting policy set out in note 1(i). The recoverable amount of the Yarwun CGU is classified as level 3 under the fair value hierarchy. In arriving at FVLCD, post-tax cash flows expressed in real terms have been estimated over the expected useful economic life of the refinery and discounted using a post-tax discount rate of 6.6% expressed in real terms.

The individual assumptions subject to the most estimation uncertainty for the FVLCD calculation are the alumina price and the discount rate. To illustrate these sensitivities, a 5% reduction in the alumina price, equivalent to a US$17 per tonne decrease in the long run, would have reduced the recoverable amount by approximately US$505 million with all other inputs remaining constant. A one percentage point increase in the post-tax real-terms discount rate would have resulted in a lower recoverable amount by approximately US$160 million.

Aluminium – ISAL Smelter, Iceland

In 2018, we reached agreement with Hydro to sell the ISAL Smelter in Iceland, our 53.3% interest in the Aluchemie anode plant in the Netherlands and our 50% share in the Aluminium fluoride plant in Sweden (ISAL). The anticipated headline sales price of US$345 million was lower than the carrying value of these assets, leading us to recognise an impairment charge of US$123 million. This was based on a fair value less cost of disposal (FVLCD) model, against property, plant and equipment and acquired software. Subsequently, Hydro withdrew its offer.

At 30 June 2019, these assets no longer met the accounting criteria to be classified as assets held for sale. Accordingly these non-current assets were tested for impairment. We calculated the recoverable amount for the cash-generating units based on the IAS 36 value-in-use methodology by reference to the net present value of post-tax cash flows expressed in real terms and discounted at 6.9%. These were US$302 million for the cash-generating unit comprising ISAL and Aluchemie and US$46 million for Alufluor. This resulted in a pre-tax impairment charge of US$109 million allocated to property, plant and equipment and intangibles in the ISAL and Aluchemie cash-generating unit. At 31 December 2019, there were no further indicators of impairment or impairment reversals.

Energy & Minerals – Rössing, Namibia

In 2017, our annual impairment trigger assessment at the Rössing Uranium cash-generating unit identified a drop in forecast prices for uranium due to oversupply in the market. When we assessed the recoverable amount of the assets, we determined that the property, plant and equipment and certain other non-current assets should be fully impaired, resulting in a pre-tax impairment charge of US$267 million.

In 2018, we agreed to sell our share of Rössing Uranium to China National Uranium Corporation Limited. Based on the expected disposal proceeds, we recognised a pre-tax impairment charge of US$9 million on transfer to assets held for sale to write off the property, plant and equipment purchased during 2018. We completed the sale on 16 July 2019 – refer to note 37.

Energy & Minerals – Roughrider, Canada

In 2017, after reassessing our planned exploration spend, we decided not to plan or budget for evaluating the Roughrider deposit. We identified this as an impairment indicator under IFRS 6, and, due to uncertainty around whether there are viable quantities of uranium there, set a recoverable amount of US$nil for the evaluation and exploration assets. In light of this, we recorded an impairment charge of US$357 million to write off the mineral interests recognised when we acquired Roughrider.

Copper & Diamonds – Argyle Diamond Mine, Australia

In 2017, our annual impairment trigger assessment at the Argyle cash-generating unit identified impairment indicators because of lower production volumes compared with forecast, a smaller than expected contribution from productivity improvements and lower realised prices. In assessing the recoverable amount of the assets, we determined that the property, plant and equipment, including an updated closure asset, was fully impaired, resulting in a pre-tax impairment charge of US$172 million. The impairment charge resulted in the recognition of deferred tax assets of US$34 million which will be recovered by other business units in the same tax group.

7 Share of profit after tax of equity accounted units

	2019 US$m	2018 US$m	2017 US$m
Sales revenue: Rio Tinto share[a]	**2,358**	2,497	1,960
Operating costs	**(1,812)**	(1,656)	(1,400)
Profit before finance items and taxation	**546**	841	560
Finance items	**(65)**	(69)	(47)
Share of profit after tax of equity accounted units	**10**	14	17
Profit before taxation	**491**	786	530
Taxation	**(190)**	(273)	(191)
Profit for the year (Rio Tinto share)	**301**	513	339

(a) Sales revenue of equity accounted units includes sales by equity accounted units to Group subsidiaries.

Further information relating to the Group's interests in joint ventures and associates is given in notes 35 and 36.

8 Finance income and finance costs

	Note	2019 US$m	2018 US$m	2017 US$m
Finance income from equity accounted units		**4**	7	4
Other finance income (including bank deposits, net investment in leases, and other financial assets)		**296**	242	137
Total finance income		**300**	249	141
Interest on:				
– Financial liabilities at amortised cost (excluding lease liabilities) and associated derivatives		**(816)**	(775)	(819)
– Lease liabilities		**(55)**	(2)	(3)
Fair value movements:				
– Bonds designated as hedged items in fair value hedges		**(185)**	96	28
– Derivatives designated as hedging instruments in fair value hedges		**181**	(73)	(22)
Loss on early redemption of bonds[a]		**—**	(94)	(256)
Amounts capitalised	14	**321**	296	224
Total finance costs		**(554)**	(552)	(848)

(a) In 2018, loss on early redemption of bonds included a premium charge of US$72 million; unamortised debt issuance costs and fees of US$9 million, the write-off of the fair value hedge adjustment of US$16 million and the reclassification of a gain out of the cost of hedging reserve of US$3 million. In 2017, loss of early redemption of bonds included a premium charge of US$238 million; unamortised debt issuance costs and fees of US$14 million and the write-off of the fair value hedge adjustment of US$4 million. We did not buy back any bonds in 2019. See note 30.

Notes to the 2019 financial statements continued

9 Taxation

Taxation charge

	Note	2019 US$m	2018 US$m	2017 US$m
– Current		**4,436**	3,726	3,270
– Deferred	17	**(289)**	516	695
Total taxation charge		**4,147**	4,242	3,965

Prima facie tax reconciliation

	2019 US$m	2018 US$m	2017 US$m
Profit before taxation	**11,119**	18,167	12,816
Deduct: share of profit after tax of equity accounted units	**(301)**	(513)	(339)
Parent companies' and subsidiaries' profit before tax	**10,818**	17,654	12,477
Prima facie tax payable at UK rate of 19% (2018: 19%; 2017: 19%)	**2,055**	3,354	2,371
Higher rate of taxation on Australian underlying earnings	**1,495**	1,106	1,069
Impact of items excluded in arriving at underlying earnings[a]:			
– Impairment charges[b]	**340**	—	10
– Net gains and losses on consolidation and disposal of interests in businesses	**55**	(251)	(123)
– Exchange and gains/losses on derivatives	**(22)**	32	(48)
– Losses from increases to closure estimates (non-operating and fully impaired sites)	**—**	30	—
– Gain relating to surplus land at Kitimat	**—**	(81)	—
– Changes in corporate tax rates in the US and France[c]	**—**	—	439
– Tax charge relating to expected divestments[d]	**—**	—	202
– Other exclusions	**38**	—	14
Impact of changes in tax rates and laws	**1**	47	21
Other tax rates applicable outside the UK and Australia on underlying earnings	**(110)**	(47)	(92)
Resource depletion and other depreciation allowances	**(57)**	(46)	(33)
Recognition of previously unrecognised deferred tax assets	**—**	—	(40)
Write-down of previously recognised deferred tax assets[e]	**42**	13	160
Other items[f]	**310**	85	15
Total taxation charge[g]	**4,147**	4,242	3,965

(a) The impact for each item includes the effect of tax rates applicable outside the UK.
(b) The tax impact of impairment includes the write-down of deferred tax assets in respect of prior year tax losses in Mongolia and recognition of deferred tax on impaired assets. Refer to note 6.
(c) In 2017, deferred tax assets were re-measured to reflect lower corporate income tax rates in the US and France as a result of tax legislation changes substantively enacted in December 2017.
(d) In 2017, deferred tax assets were derecognised as a result of revised profit forecasts in France due to expected divestments of Dunkerque and ISAL. The Dunkerque divestment completed in 2018.
(e) The write-down of previously recognised deferred tax assets in 2017 primarily relates to a reduction in recognised deferred tax assets on brought forward losses in Grasberg.
(f) Other items include non-deductible costs and withholding taxes, and various adjustments to provisions for taxation of current and prior periods, the most significant of which relate to transfer pricing matters, including issues under discussion with the Australian Tax Office.
(g) This tax reconciliation relates to the Group's parent companies, subsidiaries and joint operations. The Group's share of profit of equity accounted units is net of tax charges of US$190 million (2018: US$273 million; 2017: US$191 million).

	2019 US$m	2018 US$m	2017 US$m
Tax on fair value movements:			
– Cash flow hedge fair value gains	**(6)**	(54)	(1)
Tax credit/(charge) on actuarial gains and losses on post-retirement benefit plans	**83**	(271)	(12)
Adjustments to deferred tax on post-retirement benefit plans due to changes in corporate tax rates in the US and France	**—**	—	(140)
Tax relating to components of other comprehensive income/(loss) for the year[a]	**77**	(325)	(153)

(a) This comprises a deferred tax credit of US$77 million (2018: charge of US$325 million; 2017: charge of US$153 million) and a current tax charge of US$nil (2018: US$nil 2017: US$nil (see note 17).

10 Earnings per ordinary share

	2019 Earnings US$m	2019 Weighted average number of shares (millions)	2019 Per share amount (cents)	2018 Earnings US$m	2018 Weighted average number of shares (millions)	2018 Per share amount (cents)
Basic earnings per share attributable to ordinary shareholders of Rio Tinto[a]	**8,010**	**1,630.1**	**491.4**	13,638	1,719.3	793.2
Diluted earnings per share attributable to ordinary shareholders of Rio Tinto[b]	**8,010**	**1,642.1**	**487.8**	13,638	1,731.7	787.6

	2017 Earnings US$m	2017 Weighted average number of shares (millions)	2017 Per share amount (cents)
Basic earnings per share attributable to ordinary shareholders of Rio Tinto[a]	8,762	1,786.7	490.4
Diluted earnings per share attributable to ordinary shareholders of Rio Tinto[b]	8,762	1,799.5	486.9

(a) The weighted average number of shares is calculated as the average number of Rio Tinto plc shares outstanding not held as treasury shares of 1,259.4 million (2018: 1,312.7 million; 2017: 1,364.5 million) plus the average number of Rio Tinto Limited shares outstanding of 370.7 million (2018: 406.6 million; 2017: 422.3 million) over the relevant period. No Rio Tinto Limited ordinary shares were held by Rio Tinto plc in any of the periods presented.

(b) For the purposes of calculating diluted earnings per share, the effect of dilutive securities of 12.0 million shares in 2019 (2018: 12.4 million; 2017: 12.8 million) is added to the weighted average number of shares described in (a) above. This effect is calculated under the treasury stock method, in accordance with IAS 33 "Earnings per share". The Group's only potential dilutive ordinary shares are share options for which terms and conditions are described in note 43.

11 Dividends

	2019 US$m	2018 US$m	2017 US$m
Rio Tinto plc previous year final dividend paid	**2,245**	2,446	1,725
Rio Tinto plc previous year special dividend paid	**3,032**	—	—
Rio Tinto plc interim dividend paid	**1,930**	1,666	1,530
Rio Tinto plc interim special dividend paid	**780**	—	—
Rio Tinto Limited previous year final dividend paid	**666**	731	523
Rio Tinto Limited previous year special dividend paid	**900**	—	—
Rio Tinto Limited interim dividend paid	**556**	513	472
Rio Tinto Limited interim special dividend paid	**225**	—	—
Dividends paid during the year	**10,334**	5,356	4,250
Dividends per share: paid during the year	**635.0c**	307.0c	235.0c
Final dividends per share: proposed in the announcement of the results for the year	**231.0c**	180.0c	180.0c
Special dividends per share: proposed in the announcement of the results for the year	**—**	243.0c	—

	Dividends per share 2019	Dividends per share 2018	Dividends per share 2017
Rio Tinto plc previous year final (pence)	**135.96p**	129.43p	100.56p
Rio Tinto plc previous year special (pence)	**183.55p**	—	—
Rio Tinto plc interim (pence)	**123.32p**	96.82p	83.13p
Rio Tinto plc interim special (pence)	**49.82p**	—	—
Rio Tinto Limited previous year final – fully franked at 30% (Australian cents)	**250.89c**	228.53c	163.62c
Rio Tinto Limited previous year special – fully franked at 30% (Australian cents)	**338.70c**	—	—
Rio Tinto Limited interim – fully franked at 30% (Australian cents)	**219.08c**	170.84c	137.72c
Rio Tinto Limited interim special – fully franked at 30% (Australian cents)	**88.50c**	—	—

	Number of shares 2019 (millions)	Number of shares 2018 (millions)	Number of shares 2017 (millions)
Rio Tinto plc previous year final	**1,265.0**	1,334.8	1,374.6
Rio Tinto plc previous year special	**1,265.0**	N/A	N/A
Rio Tinto plc interim	**1,256.4**	1,308.4	1,366.1
Rio Tinto plc interim special	**1,256.4**	N/A	N/A
Rio Tinto Limited previous year final	**371.2**	412.4	424.0
Rio Tinto Limited previous year special	**371.2**	N/A	N/A
Rio Tinto Limited interim	**371.2**	412.4	424.0
Rio Tinto Limited interim special	**371.2**	N/A	N/A

Notes to the 2019 financial statements continued

11 Dividends continued

The dividends paid in 2019 are based on the following US cents per share amounts: 2018 final – 180.0 cents, 2018 special – 243.0 cents, 2019 interim – 151.0 cents, 2019 interim special 61.0 cents (2018 dividends paid: 2017 final – 180.0 cents, 2018 interim – 127.0 cents; 2017 dividends paid: 2016 final – 125.0 cents, 2017 interim – 110.0 cents).

The number of shares on which Rio Tinto plc dividends are based excludes those held as treasury shares and those held by employee share trusts which waived the right to dividends. Employee share trusts waived dividends on 852,283 Rio Tinto plc ordinary shares and 37,678 American Depository Receipts (ADRs) for the 2018 final and special dividend and on 564,099 Rio Tinto plc ordinary shares and 47,674 ADRs for the 2019 interim and special dividend (2018: on 132,294 Rio Tinto plc ordinary shares and 22,824 ADRs for the 2017 final dividend and on 314,529 Rio Tinto plc ordinary shares and 36,321 ADRs for the 2018 interim dividend; 2017: on 277,946 Rio Tinto plc ordinary shares and 22,021 ADRs for the 2016 final dividend and on 173,297 Rio Tinto plc ordinary shares and 24,377 ADRs for the 2017 interim dividend). In 2019, 2018 and 2017, no Rio Tinto Limited shares were held by Rio Tinto plc.

The number of shares on which Rio Tinto Limited dividends are based excludes those held by shareholders who have waived the rights to dividends. Employee share trusts waived dividends on 628,566 Rio Tinto Limited ordinary shares for the 2018 final dividend and on 342,062 shares for the 2019 interim dividend (2018: on 130,129 shares for the 2017 final dividend and 251,394 shares for the 2018 interim dividend; 2017: on 214,278 shares for the 2016 final dividend and 274,899 shares for the 2017 interim dividend).

In addition, the directors of Rio Tinto announced a final dividend of 231 cents per share on 26 February 2020. This is expected to result in payments of US $3.7 billion. The dividend will be paid on 16 April 2020 to Rio Tinto plc and Rio Tinto Limited shareholders on the register at the close of business on 6 March 2020.

The proposed Rio Tinto Limited dividends will be franked out of existing franking credits or out of franking credits arising from the payment of income tax during 2020.

The approximate amount of the Rio Tinto Limited consolidated tax group's retained profits and reserves that could be distributed as dividends and franked out of available credits that arose from net payments of income tax in respect of periods up to 31 December 2019 (after deducting franking credits expected to be utilised on the 2019 final dividend declared) is US$8,599 million (2018: US$6,178 million; 2017: US$8,542 million).

12 Goodwill

	2019 US$m	2018 US$m
Net book value		
At 1 January	**912**	1,037
Adjustment on currency translation	**10**	(125)
At 31 December	**922**	912
– cost	**16,926**	15,861
– accumulated impairment	**(16,004)**	(14,949)
At 1 January		
– cost	**15,861**	17,942
– accumulated impairment	**(14,949)**	(16,905)

At 31 December, goodwill has been allocated as follows:

	2019 US$m	2018 US$m
Net book value		
Richards Bay Minerals	**487**	474
Pilbara	**349**	351
Dampier Salt	**86**	87
	922	912

12 Goodwill continued

Impairment tests for goodwill

Richards Bay Minerals

Richards Bay Minerals' annual impairment review resulted in no impairment charge for 2019 (2018: no impairment charge). The recoverable amount has been assessed by reference to fair value less cost of disposal (FVLCD), in line with the policy set out in note 1(i) and classified as level 3 under the fair value hierarchy. FVLCD was determined by estimating cash flows until the end of the life-of-mine plan including anticipated expansions. In arriving at FVLCD, a post-tax discount rate of 8.6% (2018: 8.8%) has been applied to the post-tax cash flows expressed in real terms.

The key assumptions to which the calculation of FVLCD for Richards Bay Minerals is most sensitive and the corresponding decrease in FVLCD are set out below:

	US$m
5% decrease in the titanium slag price	**230**
1% increase in the discount rate applied to post-tax cash flows	**237**
10% strengthening of the South African rand	**762**

Other assumptions include the long-term pig iron and zircon prices and operating costs. Future selling prices and operating costs have been estimated in line with the policy set out in note 1(i). The recoverable amount of the cash-generating unit (CGU) exceeds the carrying value when each of these sensitivities are applied whilst keeping all other assumptions constant.

Pilbara

The annual impairment review of the Pilbara CGU has been assessed by reference to FVLCD using discounted cash flows, which is in line with the policy set out in note 1(i) and is classified as level 3 under the fair value hierarchy. In arriving at FVLCD, a post-tax discount rate of 6.6% (2018: 6.8%) has been applied to the post-tax cash flows expressed in real terms. The recoverable amount was determined to be significantly in excess of carrying value, and there are no reasonably possible changes in key assumptions that would cause the remaining goodwill to be impaired.

13 Intangible assets

Year ended 31 December 2019	**Exploration and evaluation[a] US$m**	**Trademarks, patented and non-patented technology US$m**	**Contract based intangible assets[b] US$m**	**Other intangible assets US$m**	**Total US$m**
Net book value					
At 1 January 2019	**233**	**59**	**1,982**	**505**	**2,779**
Adjustment on currency translation	**(1)**	**(1)**	**74**	**(1)**	**71**
Expenditure during the year	**57**	**—**	**—**	**34**	**91**
Amortisation for the year[c]	**—**	**(14)**	**(8)**	**(111)**	**(133)**
Impairment charges[d]	**—**	**—**	**—**	**(1)**	**(1)**
Disposals, transfers and other movements[e]	**(116)**	**—**	**(101)**	**47**	**(170)**
At 31 December 2019	**173**	**44**	**1,947**	**473**	**2,637**
– cost	**2,306**	**214**	**3,002**	**1,516**	**7,038**
– accumulated amortisation and impairment	**(2,133)**	**(170)**	**(1,055)**	**(1,043)**	**(4,401)**

Year ended 31 December 2018	Exploration and evaluation[e] US$m	Trademarks, patented and non-patented technology US$m	Contract based intangible assets[b] US$m	Other intangible assets US$m	Total US$m
Net book value					
At 1 January 2018	393	75	2,188	463	3,119
Adjustment on currency translation	(25)	(3)	(171)	(46)	(245)
Expenditure during the year	90	1	—	83	174
Amortisation for the year[c]	—	(14)	(23)	(96)	(133)
Impairment charges[d]	—	—	—	(2)	(2)
Disposals, transfers and other movements[e]	(225)	—	(12)	103	(134)
At 31 December 2018	233	59	1,982	505	2,779
– cost	2,346	217	3,114	1,538	7,215
– accumulated amortisation and impairment	(2,113)	(158)	(1,132)	(1,033)	(4,436)

Notes to the 2019 financial statements continued

(a) Exploration and evaluation assets' useful lives are not determined until transferred to property, plant and equipment.
(b) The Group benefits from certain intangible assets acquired with Alcan, including power supply contracts, customer contracts and water rights. The water rights are expected to contribute to the efficiency and cost effectiveness of operations for the foreseeable future: accordingly, these rights are considered to have indefinite lives and are not subject to amortisation but are tested annually for impairment. These water rights constitute the majority of the amounts in "Contract based intangible assets".
The remaining carrying value of the water rights (US$1,759 million) as at 31 December 2019 (31 December 2018: US$1,684 million) relates wholly to the Quebec smelters cash-generating unit (CGU). The Quebec smelters CGU was tested for impairment by reference to fair value less cost of disposal (FVLCD) using discounted cash flows, which is in line with the policy set out in note 1(i). The recoverable amount of the Quebec smelters is classified as level 3 under the fair value hierarchy. In arriving at FVLCD, post-tax cash flows expressed in real terms have been estimated over the expected useful economic lives of the underlying smelting assets and discounted using a real post-tax discount rate of 6.6% (2018: 6.8%).
The recoverable amounts were determined to be significantly in excess of carrying value, and there are no reasonably possible changes in key assumptions that would cause the remaining water rights to be impaired.
(c) Finite life intangible assets are amortised over their useful economic lives on a straight line or units of production basis, as appropriate. Where amortisation is calculated on a straight line basis, the following useful lives have been determined:
Trademarks, patented and non-patented technology
Trademarks: 14 to 20 years
Patented and non-patented technology: ten to 20 years
Contract-based intangible assets
Power contracts/water rights: two to 45 years
Other purchase and customer contracts: five to 15 years
Other intangible assets
Internally generated intangible assets and computer software: two to five years
Other intangible assets: two to 20 years
(d) Impairment charges in 2019 relate to the ISAL Smelter. Impairment charges in 2018 relate to the ISAL Smelter. See note 6.
(e) Disposals, transfers and other movements includes the transfer from exploration and evaluation of the Zulti South project at Richards Bay Minerals to construction in progress following approval in April 2019 and reclassification of certain mineral rights from contract based intangibles to property, plant and equipment. In 2018, disposals, transfers and other movements included transfers to assets held for sale relating to Rössing Uranium and ISAL assets and transfers to Mining properties and leases in relation to the Koodaideri mine from Exploration and evaluation, offset by transfers into other intangibles as part of the Autohaul project.

Exploration and evaluation expenditure

The charge for the year and the net amount of intangible assets capitalised during the year are as follows:

	2019 US$m	2018 US$m	2017 US$m
Net expenditure in the year (net of cash proceeds of US$10 million (2018: US$233 million; 2017: US$3 million) on disposal of undeveloped projects)	**(671)**	(345)	(493)
Non-cash movements and non-cash proceeds on disposal of undeveloped projects	**—**	45	(24)
Amount capitalised during the year	**57**	90	57
Net charge for the year	**(614)**	(210)	(460)
Reconciliation to income statement			
Exploration and evaluation costs	**(624)**	(488)	(445)
Profit/(loss) relating to interests in undeveloped projects[a]	**10**	278	(15)
Net charge for the year	**(614)**	(210)	(460)

(a) During 2018, profit relating to interests in undeveloped properties related to the gains on the sales of Valeria (US$83 million) and Winchester South (US$195 million) undeveloped properties which were included within underlying earnings.

At 31 December 2019, a total of US$173 million had been capitalised related to projects which had not yet been approved to proceed (31 December 2018: US$233 million).

14 Property, plant and equipment

Property, plant and equipment comprises owned and leased assets. Refer to note 45 for additional information relating to the Group's implementation of IFRS 16 "Leases" on 1 January 2019.

	2019 US$m	2018 US$m
Property, plant and equipment – owned	**56,307**	56,330
Right of use assets – leased	**1,065**	—
Finance leases under IAS 17	**—**	31
Net book value	**57,372**	56,361

Property, plant and equipment - Owned

Year ended 31 December 2019	Note	Mining properties and leases[a] US$m	Land and buildings[b] US$m	Plant and equipment US$m	Capital works in progress US$m	Total US$m
Net book value						
At 1 January 2019		**11,063**	**6,263**	**32,019**	**7,016**	**56,361**
Adjustment for transition to new accounting standard	45	—	—	(31)	—	(31)
Restated opening balance		**11,063**	**6,263**	**31,988**	**7,016**	**56,330**
Adjustment on currency translation[c]		**27**	**72**	**286**	**41**	**426**
Adjustments to capitalised closure costs	26	**840**	—	—	—	**840**
Interest capitalised[d]	8	—	—	—	**321**	**321**
Additions		**433**	**46**	**616**	**4,435**	**5,530**
Depreciation for the year[a][e]		**(729)**	**(381)**	**(2,869)**	—	**(3,979)**
Impairment charges[f]		**(1,339)**	**(96)**	**(1,115)**	**(926)**	**(3,476)**
Disposals		—	**(9)**	**(44)**	**(19)**	**(72)**
Transfers and other movements[h]		**107**	**508**	**2,629**	**(2,857)**	**387**
At 31 December 2019		**10,402**	**6,403**	**31,491**	**8,011**	**56,307**
– cost		**24,875**	**11,517**	**66,705**	**9,188**	**112,285**
– accumulated depreciation and impairment		**(14,473)**	**(5,114)**	**(35,214)**	**(1,177)**	**(55,978)**
Non-current assets pledged as security[i]		**1,805**	**571**	**5,111**	**5,271**	**12,758**

Year ended 31 December 2018	Note	Mining properties and leases[a] US$m	Land and buildings[b] US$m	Plant and equipment US$m	Capital works in progress US$m	Total US$m
Net book value						
At 1 January 2018		11,488	7,376	36,285	6,944	62,093
Adjustment on currency translation[c]		(689)	(548)	(2,671)	(249)	(4,157)
Adjustments to capitalised closure costs	26	486	—	—	—	486
Interest capitalised[d]	8	—	—	—	296	296
Additions		403	80	459	4,359	5,301
Depreciation for the year[a][e]		(664)	(382)	(2,836)	—	(3,882)
Impairment charges[f]		(3)	(20)	(101)	(6)	(130)
Disposals		(1)	(54)	(71)	(4)	(130)
Subsidiaries no longer consolidated[g]		(1,103)	(377)	(1,392)	(514)	(3,386)
Transfers and other movements[h]		1,146	188	2,346	(3,810)	(130)
At 31 December 2018		11,063	6,263	32,019	7,016	56,361
– cost		23,318	10,601	63,051	7,324	104,294
– accumulated depreciation and impairment		(12,255)	(4,338)	(31,032)	(308)	(47,933)
Non-current assets held under finance leases		—	—	31	—	31
Non-current assets pledged as security[i]		3,054	385	5,194	4,588	13,221

(a) At 31 December 2019, the net book value of capitalised production phase stripping costs totalled US$2,276 million, with US$1,833 million within Property, plant and equipment and a further US$443 million within Investments in equity accounted units (2018: total of US$2,050 million, with US$1,572 million in Property, plant and equipment and a further US$478 million within Investments in equity accounted units). During the year capitalisation of US$536 million was partly offset by depreciation of US$316 million (including amounts recorded within equity accounted units). Depreciation of deferred stripping costs in respect of subsidiaries of US$139 million (2018: US$134 million; 2017: US$194 million) is included within "Depreciation for the year".

(b) At 31 December 2019, the net book value amount for land and buildings includes freehold US$6,377 million (2018: US$6,240 million) and long leasehold US$26 million (2018: US$23 million).

(c) Adjustment on currency translation represents the impact of exchange differences arising on the translation of the assets of entities with functional currencies other than the US dollar, recognised directly in the currency translation reserve. The adjustment in 2019 arose from the strengthening of the Canadian dollar against US dollar partially offset by weakening of other currencies against US dollar.

(d) Interest is capitalised at a rate based on the Group or relevant subsidiary's cost of borrowing or at the rate on project specific debt, where applicable. The Group's average borrowing rate used for capitalisation of interest is 5.30% (2018: 4.90%).

(e) Assets within operations for which production is not expected to fluctuate significantly from one year to another or which have a physical life shorter than the related mine are depreciated on a straight line basis as follows:
Land and buildings
Land: not depreciated
Buildings: five to 50 years
Plant and equipment
Other plant and equipment: three to 50 years
Power assets: 25 to 50 years
Capital work in progress: not depreciated

(f) During 2019, impairment charges relate to the Oyu Tolgoi underground project, Yarwun alumina refinery and the ISAL Smelter (see note 6). During 2018, impairment charges primarily related to the ISAL smelter (see note 6).

(g) During 2018, "Subsidiaries no longer consolidated" related primarily to the disposal of Kestrel and Hail Creek, which completed on 1 August 2018 and the disposal of Grasberg on 21 December 2018. Refer to note 37.

(h) "Transfers and other movements" includes reclassifications between categories and the transfer from assets held for sale of ISAL assets at 30 June 2019 as these assets no longer met the criteria to be classified as assets held for sale (see note 19). In 2018, the movement included transfers to assets held for sale relating to Rössing Uranium and ISAL assets.

(i) Excludes assets held under capitalised lease arrangements. Non-current assets pledged as security represent amounts pledged as collateral against US$4,540 million (2018: US$4,562 million) of loans, which are included in note 22.

Notes to the 2019 financial statements continued

14 Property, plant and equipment continued

Right-of-use assets - Leased

	Land and buildings US$m	Plant and equipment US$m	Total US$m
Net book value			
31 December 2019	**507**	**558**	**1,065**
1 January 2019[a]	463	559	1,022
Additions for the year			
31 December 2019	**89**	**212**	**301**
Depreciation for the year (included within operating costs)			
31 December 2019	**(69)**	**(203)**	**(272)**
Impairment charges[b]			
31 December 2019	**(6)**	**(4)**	**(10)**

(a) The net book value of right of use assets at 1 January 2019 was US$1,022 million, comprising an adjustment upon transition to IFRS 16 of US$991 million, and assets previously held under finance leases under IAS 17 of US$31 million. Refer to note 45 for additional information relating to the Group's implementation of IFRS 16 "Leases".
(b) Impairment charges related to the ISAL smelter (see note 6).

The leased assets of the Group comprise land and buildings (mainly office buildings) and plant and equipment, the majority of which are vessels. Lease terms are negotiated on an individual basis and contain a wide range of terms and conditions. Right of use assets are depreciated on a straight line basis over the life of the lease, taking into account any extensions that are likely to be enacted.

15 Investments in equity accounted units

Summary balance sheet (Rio Tinto share)

	2019 US$m	2018 US$m
Rio Tinto's share of assets		
– Non-current assets	**5,820**	6,000
– Current assets	**831**	887
	6,651	6,887
Rio Tinto's share of liabilities		
– Current liabilities	**(675)**	(607)
– Non-current liabilities	**(2,005)**	(1,981)
	(2,680)	(2,588)
Rio Tinto's share of net assets	**3,971**	4,299

Further details of investments in equity accounted units are set out in notes 35 and 36.

At 31 December 2019 and 2018, the Group had no investments in equity accounted units with shares listed on recognised stock exchanges.

At 31 December 2019, net debt of equity accounted units, excluding amounts due to Rio Tinto, was US$1,248 million (2018: US$1,158 million).

16 Inventories

	2019 US$m	2018 US$m
Raw materials and purchased components	**675**	734
Consumable stores	**925**	862
Work in progress	**1,066**	1,026
Finished goods and goods for resale	**936**	977
Total inventories	**3,602**	3,599
Comprising:		
Expected to be used within one year	**3,463**	3,447
Expected to be used after more than one year	**139**	152
Total inventories	**3,602**	3,599

During 2019, the Group recognised a net inventory write-downs of US$42 million. This comprised inventory write-offs of US$134 million partly offset by write-back of previously written down inventory due to an increase in realisable values amounting to US$92 million. In 2018, the Group recognised inventory write-downs, net of reversals, amounting to US$48 million.

At 31 December 2019, US$611 million (2018: US$566 million) of inventories were pledged as security for liabilities.

17 Deferred taxation

	2019 US$m	2018 US$m
At 1 January – deferred tax liability	**536**	233
Adjustment to opening balance on transition to new accounting standards	**(4)**	(71)
At 1 January – restated opening balance	**532**	162
Adjustment on currency translation	**77**	(172)
(Credited)/charged to the income statement	**(289)**	516
(Credited)/charged to statement of comprehensive income[a]	**(77)**	325
Disposals	**—**	(203)
Other movements[b]	**(125)**	(32)
At 31 December – deferred tax liability	**118**	536
Comprising:		
– deferred tax liabilities[c][d]	**3,220**	3,673
– deferred tax assets[c][e][f]	**(3,102)**	(3,137)

Notes to the 2019 financial statements continued

17 Deferred taxation continued

Deferred tax balances for which there is a right of offset within the same tax jurisdiction are presented net on the face of the balance sheet as permitted by IAS 12. The closing deferred tax liabilities and assets, prior to this offsetting of balances, are shown below.

Analysis of deferred tax

	Total 2019 US$m	Total 2018 US$m
Deferred tax liabilities arising from:		
Capital allowances	**4,742**	4,408
Unremitted earnings[d]	**411**	454
Capitalised interest	**387**	259
Unrealised exchange gains	**3**	5
Other temporary differences	**289**	309
Total	**5,832**	5,435
Deferred tax assets arising from:		
Tax losses[e]	**(1,847)**	(1,894)
Provisions	**(1,810)**	(1,585)
Capital allowances	**(604)**	(154)
Post-retirement benefits	**(346)**	(293)
Unrealised exchange losses	**(176)**	(187)
Other temporary differences	**(931)**	(786)
Total	**(5,714)**	(4,899)
Charged/(credited) to the income statement		
Unrealised exchange losses	**21**	57
Tax losses	**164**	(30)
Provisions	**(175)**	(19)
Capital allowances	**(181)**	461
Tax on unremitted earnings	**5**	(33)
Post-retirement benefits	**18**	30
Other temporary differences	**(141)**	50
Total	**(289)**	516

(a) The amounts (credited)/charged directly to the Statement of comprehensive income include provisions for tax on exchange differences on intragroup loans qualifying for reporting as part of the net investment in subsidiaries, on cash flow hedges and on actuarial gains and losses on pension schemes and on post-retirement healthcare plans.

(b) "Other movements" include deferred tax relating to tax payable recognised by subsidiary holding companies on the profits of the equity accounted units to which it relates.

(c) The deferred tax liability of US$3,220 million (2018: US$3,673 million) includes US$3,202 million (2018: US$3,658 million) due in more than one year. The deferred tax asset of US$3,102 million (2018: US$3,137 million) includes US$3,087 million (2018: US$3,133 million) receivable in more than one year. All amounts are shown as non-current on the face of the balance sheet as required by IAS 12.

(d) Deferred tax is not recognised on the unremitted earnings of subsidiaries and joint ventures totalling US$3,861 million (2018: US$3,726 million) where the Group is able to control the timing of the remittance and it is probable that there will be no remittance in the foreseeable future. If these earnings were remitted, tax of US$164 million (2018: US$157 million) would be payable.

(e) There is a limited time period, the shortest of which is six years, for the recovery of US$1,186 million (2018: US$1,519 million) of tax losses and other tax assets which have been recognised as deferred tax assets in the financial statements.

(f) Recognised and unrecognised deferred tax assets are shown in the table below and totalled US$6,264 million at 31 December 2019 (2018: US$5,647 million). Of this total, US$3,102 million has been recognised as deferred tax assets (2018: US$3,137 million), leaving US$3,162 million (2018: US$2,510 million) unrecognised, as recovery is not considered probable.

The recognised amounts do not include deferred tax assets that have been netted off against deferred tax liabilities.

Analysis of deferred tax assets

	Recognised		Unrecognised	
At 31 December	2019 US$m	2018 US$m	2019 US$m	2018 US$m
France	**—**	—	**1,111**	1,122
Canada	**492**	545	**566**	559
US	**920**	932	**51**	12
Australia	**698**	796	**316**	289
Mongolia[a]	**704**	703	**721**	87
Other[b]	**288**	161	**397**	441
Total	**3,102**	3,137	**3,162**	2,510

(a) Deferred tax assets in Mongolia include US$130 million (2018: US$469 million) from tax losses that expire if not recovered against taxable profits within eight years. Tax losses have been calculated in accordance with the provisions of the Oyu Tolgoi Investment Agreement and Mongolian laws. Recovery of the recognised deferred tax assets is expected to commence from 2025 based on projected cash flows, consistent with the mine design options used in the impairment test described in note 6. Tax law in Mongolia and its interpretation by the tax authority has been, and is expected to continue to be, subject to change. Such future changes could have a material impact on the amount and period of recovery of these deferred tax assets. During 2019, an impairment charge of US $359 million was recognised for tax losses that are now expected to expire without utilisation. Refer to note 6.

(b) US$695 million (2018: US$684 million) of the unrecognised assets relate to realised or unrealised capital losses, the recovery of which depends on the existence of capital gains in future years. There are time limits, the shortest of which is three years, for the recovery of US$491 million of these unrecognised assets (2018: US$96 million).

18 Trade and other receivables

	Non-current 2019 US$m	Current 2019 US$m	Total 2019 US$m	Non-current 2018 US$m	Current 2018 US$m	Total 2018 US$m
Trade receivables[a]	1	2,097	2,098	—	2,167	2,167
Other financial receivables[a]	286	453	739	240	550	790
Receivables relating to net investment in finance leases[a]	52	11	63	—	—	—
Amounts due from equity accounted units[a]	—	38	38	—	50	50
Other receivables	123	209	332	129	226	355
Prepayment of tolling charges to jointly controlled entities[b]	221	—	221	228	—	228
Pension surpluses (note 44)	984	—	984	935	—	935
Other prepayments	49	219	268	53	186	239
Total	1,716	3,027	4,743	1,585	3,179	4,764

(a) At 31 December 2019, trade and other financial receivables, receivables relating to net investment in finance leases and amounts due from equity accounted units are stated net of allowances for expected credit losses of US$54 million (2018: US$15 million).
(b) These prepayments will be charged to Group operating costs as processing takes place.

There is no material element of trade and other receivables that is interest-bearing or financing in nature.

The fair value of current trade and other receivables and the majority of amounts classified as non-current trade and other receivables approximates to their carrying value.

19 Assets and liabilities held for sale

At 31 December 2019, no assets or liabilities were held for sale.

At 31 December 2018, assets and liabilities held for sale included Rio Tinto's interest in the Rössing Uranium mine (US$106 million) and the ISAL Smelter, the Aluchemie anode plant and the Alufluor aluminium fluoride plant ("the ISAL assets") (US$334 million).

During 2019, following the withdrawal in 2018 of the offer by Hydro to acquire the ISAL assets, these assets no longer met the accounting criteria to be classified as assets held for sale and were transferred back to the relevant balance sheet accounts.

On 16 July 2019, we announced the completion of the sale of our entire 68.62% stake in Rössing Uranium to China National Uranium Corporation Limited (see note 37).

The major classes of assets and liabilities of those entities classified as held for sale at 31 December 2018, were:

	2018 US$m
Assets	
Intangible assets	4
Property, plant and equipment	238
Investments in equity accounted units	5
Inventories	186
Deferred tax assets	66
Trade and other receivables	58
Other financial assets (including loans to equity accounted units)	60
Cash and cash equivalents	117
Assets of disposal groups held for sale	734
Liabilities	
Trade and other payables	(134)
Provisions including post-retirement benefits	(160)
Liabilities of disposal groups held for sale	(294)
Net assets associated with disposal groups	440

Notes to the 2019 financial statements continued

20 Other financial assets

	Non-current 2019 US$m	Current 2019 US$m	Total 2019 US$m	Non-current 2018 US$m	Current 2018 US$m	Total 2018 US$m
Derivative financial instruments	**308**	**58**	**366**	468	88	556
Equity shares and quoted funds	**52**	**9**	**61**	53	77	130
Other investments, including loans[a]	**236**	**2,603**	**2,839**	255	2,527	2,782
Loans to equity accounted units	**39**	**—**	**39**	38	—	38
Total	**635**	**2,670**	**3,305**	814	2,692	3,506

(a) Current "Other investments, including loans" includes US$2,584 million (2018: US$2,522 million) of highly liquid financial assets held in managed investment funds classified as held for trading.

Detailed information relating to other financial assets is given in note 30.

21 Cash and cash equivalents

	Note	2019 US$m	2018 US$m
Cash at bank and in hand		**978**	740
Money market funds and other cash equivalents		**7,049**	10,033
Balance per Group balance sheet		**8,027**	10,773
Bank overdrafts repayable on demand (unsecured)	22	**—**	(1)
Cash and cash equivalents included in Assets held for sale	19	**—**	117
Balance per Group cash flow statement		**8,027**	10,889

Restricted cash and cash equivalent analysis
Cash and cash equivalents of US$315 million (2018: US$186 million) are held in countries where there are restrictions on remittances. Of this balance, US$245 million (2018: US$142 million) could be used to repay subsidiaries' third-party borrowings.

There are also restrictions on a further US$1,644 million (2018: US$1,090 million) of cash and cash equivalents, the majority of which is held by partially owned subsidiaries and is not available for use in the wider Group due to legal and contractual restrictions currently in place. Of this balance US$1,442 million (2018: US$864 million) could be used to repay subsidiaries' third-party borrowings.

22 Borrowings and other financial liabilities

Borrowings at 31 December

	Note	Non-current 2019 US$m	Current 2019 US$m	Total 2019 US$m	Non-current 2018 US$m	Current 2018 US$m	Total 2018 US$m
Rio Tinto Finance plc Euro Bonds 2.0% due 2020[a][b]		—	455	455	468	—	468
Rio Tinto Finance plc Euro Bonds 2.875% due 2024[a][b]		508	—	508	514	—	514
Rio Tinto Finance (USA) Limited Bonds 3.75% 2025[a]		1,229	—	1,229	1,170	—	1,170
Rio Tinto Finance (USA) Limited Bonds 7.125% 2028[a]		958	—	958	927	—	927
Alcan Inc. Debentures 7.25% due 2028[a]		104	—	104	104	—	104
Rio Tinto Finance plc Sterling Bonds 4.0% due 2029[a][b]		647	—	647	633	—	633
Alcan Inc. Debentures 7.25% due 2031		419	—	419	421	—	421
Alcan Inc. Global Notes 6.125% due 2033		742	—	742	741	—	741
Alcan Inc. Global Notes 5.75% due 2035		289	—	289	288	—	288
Rio Tinto Finance (USA) Limited Bonds 5.2% 2040[a]		1,137	—	1,137	1,095	—	1,095
Rio Tinto Finance (USA) plc Bonds 4.75% 2042[a]		483	—	483	462	—	462
Rio Tinto Finance (USA) plc Bonds 4.125% 2042[a]		716	—	716	685	—	685
Oyu Tolgoi LLC MIGA Insured Loan LIBOR plus 2.65% due 2027[c]		676	3	679	676	—	676
Oyu Tolgoi LLC Commercial Banks "B Loan" LIBOR plus 3.4% due 2027[c]		1,581	8	1,589	1,588	—	1,588
Oyu Tolgoi LLC Export Credit Agencies Loan 2.3% due 2028[c]		273	3	276	272	—	272
Oyu Tolgoi LLC Export Credit Agencies Loan LIBOR plus 3.65% due 2029[c]		869	5	874	871	—	871
Oyu Tolgoi LLC International Financial Institutions "A Loan" LIBOR plus 3.78% due 2030[c]		771	4	775	768	—	768
Other secured loans		302	45	347	345	42	387
Other unsecured loans		382	197	579	373	264	637
Lease liabilities	23	1,007	302	1,309	39	5	44
Bank overdrafts	21	—	—	—	—	1	1
Total borrowings including overdrafts[d]		13,093	1,022	14,115	12,440	312	12,752

(a) These borrowings are subject to hedging arrangements and are summarised in the interest rate risk section of note 30.
(b) Rio Tinto has a US$10 billion (2018: US$10 billion) European Debt Issuance Programme against which the cumulative amount utilised was US$1.6 billion equivalent at 31 December 2019 (2018: US $1.6 billion). The carrying value of these bonds after hedge accounting adjustments amounted to US$1.6 billion (2018: US$1.6 billion) in aggregate.
(c) These borrowings relate to the Oyu Tolgoi LLC project finance facility. The project finance facility provides for interest-only payments for the first five years from 2016 followed by minimum repayments according to a stepped amortisation schedule for the remaining life of the facility. The due dates stated represent the final repayment date. The interest rates stated are pre-completion and will increase by 1% post-completion.
(d) The Group's borrowings of US$14.1 billion (2018: US$12.8 billion) include US$4.5 billion (2018: US$4.6 billion) of subsidiary entity borrowings that are subject to various financial and general covenants with which the respective borrowers were in compliance as at 31 December 2019.

Other financial liabilities

	Non-current 2019 US$m	Current 2019 US$m	Total 2019 US$m	Non-current 2018 US$m	Current 2018 US$m	Total 2018 US$m
Derivative financial instruments	248	103	351	407	95	502
Other financial liabilities	—	247	247	—	666	666
Total other financial liabilities	248	350	598	407	761	1,168
Total borrowings including overdrafts (as above)	13,093	1,022	14,115	12,440	312	12,752
Total borrowings and other financial liabilities	13,341	1,372	14,713	12,847	1,073	13,920

23 Leases

Transition

Refer to note 45 for additional information relating to our implementation of IFRS 16 "Leases" at 1 January 2019.

Lessee arrangements

We have made the following payments associated with leases during 2019:

Description of payment	2019 US$m	Included within
Principal lease payments	315	Cash flows from financing activities
Interest payments on leases	53	Cash flows from operating activities
Payments for short-term leases	327	Net operating costs
Payments for variable lease components	15	Net operating costs
Payments for low value leases (>12 months in duration)	1	Net operating costs
Total lease payments	711	

Notes to the 2019 financial statements continued

23 Leases continued

Lease liabilities

The maturity profile of lease liabilities recognised at the balance sheet is:

	Note	2019 US$m	2018 US$m
Lease liabilities[a]			
Due within 1 year		**349**	5
Between 1 and 3 years		**424**	10
Between 3 and 5 years		**226**	18
More than 5 years		**671**	12
Total undiscounted cash payments expected to be made		**1,670**	45
Effect of discounting		**(361)**	(1)
Present value of minimum lease payments	22	**1,309**	44

(a) Amounts for 2018 represent finance lease liabilities under IAS 17 "Leases".

At 31 December 2019, commitments for leases not yet commenced were US$119 million; commitments relating to short-term leases which had already commenced at 31 December 2019 were US$108 million. As permitted by IFRS 16, short-term and low-value leases are not recognised on the balance sheet as a lease liability and are expensed as incurred.

Lessor arrangements

We sub-lease owned and right-of-use assets in cases where we no longer require the assets for our own use. At 31 December 2019 the Group recognised a net investment asset of US$63 million relating to the discounted value of cash expected to be received from assets leased out under finance leases (refer to note 18). During the year, we also recognised sub-lease income of US$5 million within net operating costs. This represents the income received in the year relating to assets subject to operating leases.

24 Consolidated net (debt)/cash

	Financing liabilities[b]			Other assets		
Year ended 31 December 2019	**Borrowings excluding overdrafts[a] US$m**	**Lease liabilities[e] US$m**	**Debt-related derivatives (included in Other financial assets/ liabilities)[c] US$m**	**Cash and cash equivalents[b] US$m**	**Other investments[d] US$m**	**Net (debt)/cash US$m**
Analysis of changes in consolidated net (debt)/cash						
Opening balance	**(12,707)**	**(44)**	**(288)**	**10,772**	**2,522**	**255**
Adjustment for transition to new accounting standard (see note 45)	**—**	**(1,248)**	**—**	**—**	**—**	**(1,248)**
Foreign exchange adjustment	**(5)**	**(9)**	**3**	**(54)**	**—**	**(65)**
Cash movements excluding exchange movements	**123**	**315**	**—**	**(2,808)**	**28**	**(2,342)**
Other non-cash movements	**(217)**	**(323)**	**138**	**117**	**34**	**(251)**
Closing balance	**(12,806)**	**(1,309)**	**(147)**	**8,027**	**2,584**	**(3,651)**

	Financing liabilities[b]			Other assets		
Year ended 31 December 2018	Borrowings excluding overdrafts[a] US$m	Finance leases US$m	Debt-related derivatives (included in Other financial assets/ liabilities)[c] US$m	Cash and cash equivalents[b] US$m	Other investments[d] US$m	Net (debt)/cash US$m
Analysis of changes in consolidated net (debt)/cash						
Opening balance	(15,120)	(53)	(177)	10,547	958	(3,845)
Foreign exchange adjustment	123	3	(64)	151	—	213
Cash movements excluding exchange movements	2,240	6	51	191	1,557	4,045
Other non-cash movements	50	—	(98)	(117)	7	(158)
Closing balance	(12,707)	(44)	(288)	10,772	2,522	255

(a) *Borrowings excluding overdrafts and including lease liabilities at 31 December 2019 of US$14,115 million (2018: US$12,751 million) differ from total borrowings and other financial liabilities of* US$14,713 million (2018: US$13,920 million) on the balance sheet as they exclude other current financial liabilities of US$350 million (31 December 2018: US$761 million); other non-current financial liabilities of US$248 million (31 December 2018: US$407 million) and, at 31 December 2018, overdrafts of US$1 million.

(b) Closing cash and cash equivalents at 31 December 2018 differ from cash and cash equivalents on the balance sheet as they include overdrafts of US$1 million which have been classified as a financial liability; there were no overdrafts at 31 December 2019. Other non-cash movements at 31 December 2019 of US$117 million represents the elimination of cash movements during the year in respect of assets held for sale which are included in the cash flow statement. In 2018, this represents the reclassification of cash and cash equivalents in disposal groups to assets held for sale (US$117 million).

(c) Included within "Debt-related derivatives" are interest rate and cross currency interest rate swaps that are in hedge relationships with the Group's debt.

(d) Other investments comprise US$2,584 million (2018: US$2,522 million) of highly liquid financial assets held in managed investment funds classified as held for trading.

(e) Other movements in lease liabilities include the net impact of additions, modifications and terminations during the year.

Further information relating to the currency and interest rate exposures arising from net debt and related derivatives is given in note 30.

25 Trade and other payables

	Non-current 2019 US$m	Current 2019 US$m	Total 2019 US$m	Non-current 2018 US$m	Current 2018 US$m	Total 2018 US$m
Trade payables	—	2,855	2,855	—	3,180	3,180
Other financial payables	272	668	940	256	653	909
Other payables	110	97	207	165	114	279
Deferred income[a]	143	200	343	176	234	410
Accruals	27	1,305	1,332	11	1,229	1,240
Employee entitlements	—	650	650	—	630	630
Royalties and mining taxes	4	596	600	1	487	488
Amounts owed to equity accounted units	167	104	271	156	67	223
Government grants deferred	71	5	76	76	6	82
Total	794	6,480	7,274	841	6,600	7,441

(a) Deferred income includes contract liabilities of US$158 million (2018: US$198 million).

The fair value of trade payables and financial instruments within other payables approximates their carrying value.

26 Provisions (including post-retirement benefits)

	Note	Pensions and post-retirement healthcare[a] US$m	Other employee entitlements[b] US$m	Close-down and restoration/ environmental[c] US$m	Other US$m	Total 2019 US$m	Total 2018 US$m
At 1 January		2,486	360	9,975	787	13,608	14,642
Adjustment to opening balance on transition to new accounting standard	45	—	—	—	(66)	(66)	—
Restated opening balance		2,486	360	9,975	721	13,542	14,642
Adjustment on currency translation		51	(1)	17	(2)	65	(898)
Adjustments to mining properties:	14						
– changes in estimate		—	—	840	—	840	486
Charged/(credited) to profit:							
– increases to existing and new provisions		166	90	171	423	850	1,137
– unused amounts reversed		—	(20)	(19)	(61)	(100)	(144)
– exchange losses on provisions		—	—	3	—	3	16
– amortisation of discount		—	—	383	4	387	381
Utilised in year		(205)	(78)	(330)	(131)	(744)	(837)
Actuarial losses/(gains) recognised in equity		235	—	—	—	235	(781)
Subsidiaries no longer consolidated[d]		—	—	—	—	—	(318)
Transfers and other movements[e]		(19)	3	50	(9)	25	(76)
At 31 December		2,714	354	11,090	945	15,103	13,608
Balance sheet analysis:							
Current		73	260	541	525	1,399	1,056
Non-current		2,641	94	10,549	420	13,704	12,552
Total		2,714	354	11,090	945	15,103	13,608

(a) The main assumptions used to determine the provision for pensions and post-retirement healthcare, and other information, including the expected level of future funding payments in respect of those arrangements, are given in note 44.

(b) The provision for other employee entitlements includes a provision for long service leave of US$248 million (2018: US$242 million), based on the relevant entitlements in certain Group operations and includes US$30 million (2018: US$46 million) of provision for redundancy and severance payments.

(c) The Group's policy on close-down and restoration costs is described in note 1(l) and in paragraph (iv) under "Critical accounting policies and estimates" on pages 160 and 164. Close-down and restoration costs are a normal consequence of mining, and the majority of close-down and restoration expenditure is incurred in the years following closure of the mine, refinery or smelter. Remaining lives of operations and infrastructure range from one to over 60 years with an average for all sites, weighted by present closure obligation, of around 18 years (2018: 17 years). Although the ultimate cost to be incurred is uncertain, the Group's businesses estimate their respective costs based on current restoration standards and techniques. Provisions of US$11,090 million (2018: US$9,975 million) for close-down and restoration costs and environmental clean-up obligations are based on risk-adjusted cash flows. These estimates have been discounted to their present value at a real risk-free rate of 2% per annum, based on an estimate of the long-term, risk-free, pre-tax cost of borrowing. If the risk-free rate was decreased by 0.5% then the provision would be US$979 million higher.
Non-current provisions for close-down and restoration/environmental expenditure include amounts relating to environmental clean-up of US$382 million (2018: US$535 million) expected to take place between one and five years from the balance sheet date, and US$883 million (2018: US$683 million) expected to take place later than five years after the balance sheet date. Close-down and restoration/environmental liabilities at 31 December 2019 have not been adjusted for amounts of US$113 million (2018: US$110 million) arising from closure related receivables from the co-owners of the Diavik Joint Venture and insurance recoveries and other financial assets held for the purposes of meeting these obligations.

(d) In 2018 Subsidiaries no longer consolidated related primarily to the disposal of Kestrel and Hail Creek, which completed on 1 August 2018 and the disposal of Grasberg on 21 December 2018. Refer to note 37.

(e) Transfers and other movements includes the transfer of ISAL's provisions from Liabilities held for sale at 30 June 2019. In 2018, it included transfers to Liabilities held for sale relating to provisions recognised by Rössing Uranium and ISAL.

Notes to the 2019 financial statements continued

27 Share capital – Rio Tinto plc

	2019 Number (million)	2018 Number (million)	2017 Number (million)	2019 US$m	2018 US$m	2017 US$m
Issued and fully paid up share capital of 10p each						
At 1 January	**1,287.660**	1,351.609	1,384.520	**211**	220	224
Ordinary shares issued[a][c]	**0.041**	0.035	0.026	**—**	—	—
Shares purchased and cancelled[b]	**(28.356)**	(63.984)	(32.937)	**(4)**	(9)	(4)
At 31 December	**1,259.345**	1,287.660	1,351.609	**207**	211	220
Shares held by public						
At 1 January	**1,278.215**	1,342.058	1,374.822			
Shares reissued from treasury[a]	**0.024**	0.106	0.147			
Ordinary shares issued[a][c]	**0.041**	0.035	0.026			
Shares purchased and cancelled[b]	**(28.356)**	(63.984)	(32.937)			
At 31 December	**1,249.924**	1,278.215	1,342.058			
Shares held in treasury	**9.421**	9.445	9.551			
Shares held by public	**1,249.924**	1,278.215	1,342.058			
Total share capital	**1,259.345**	1,287.660	1,351.609			
Other share classes						
Special Voting Share of 10p each[d]	**1 only**	1 only	1 only			
DLC Dividend Share of 10p each[d]	**1 only**	1 only	1 only			
Equalisation Share of 10p each[d]	**1 only**	1 only	1 only			

(a) 40,974 ordinary shares were issued in 2019 under the Global Employee Share Plan (GESP). 23,659 ordinary shares were reissued from treasury during the year resulting from the vesting of awards and the exercise of options under Rio Tinto plc employee share-based payment plans, with exercise prices and market values between £36.33 and £49.74 per share (2018: 35,380 ordinary shares were issued under the GESP and 106,045 ordinary shares were reissued from treasury with exercise prices and market values between £16.53 and £43.79 per share; 2017: 26,241 ordinary shares were issued under the GESP and 147,126 ordinary shares reissued from treasury with exercise prices and market values between £28.63 and £37.78 per share).

(b) The authority for the company to buy back its ordinary shares was renewed at the 2019 annual general meeting. 28,356,034 shares were bought back and cancelled in 2019 under the on-market buy-back programme. 63,984,287 shares were bought back and cancelled in 2018 under the on-market buy-back programme. 32,937,109 shares were bought back in 2017 under the on-market buy-back programme.

(c) The aggregate consideration for new shares issued under the GESP was US$1.1 million (2018: US$1.0 million; 2017: US$1.0 million). The difference between the nominal value and the issue price of the shares issued was credited to the share premium account. The aggregate consideration received for treasury shares reissued was US$1 million (2018: US$6 million; 2017: US$2 million). No new shares were issued as a result of the exercise of options under Rio Tinto plc employee share-based payment plans in 2019, 2018 and 2017.

(d) The "Special Voting Share" was issued to facilitate the joint voting by shareholders of Rio Tinto plc and Rio Tinto Limited on Joint Decisions, following the DLC Merger. The "DLC Dividend Share" was issued to facilitate the efficient management of funds within the DLC structure. Directors have the ability to issue an Equalisation Share if that is required under the terms of the DLC Merger Sharing Agreement.

During 2019, US$43 million of shares and ADRs (2018: US$140 million; 2017: US$39 million) were purchased by employee share ownership trusts on behalf of Rio Tinto plc to satisfy future share options and awards as they vest. At 31 December 2019, 821,589 shares and 44,666 ADRs were held in the employee share ownership trusts on behalf of Rio Tinto plc.

Information relating to share options and other share-based incentive schemes is given in note 43.

Subsequent to 31 December 2019, 3,233,874 number of shares were bought back and cancelled under the on-market buy-back programme.

28 Share capital – Rio Tinto Limited

	2019 Number (million)	2018 Number (million)	2017 Number (million)	2019 US$m	2018 US$m	2017 US$m
Issued and fully paid up share capital						
At 1 January	**371.21**	412.41	424.19	**3,477**	4,140	3,915
Adjustment on currency translation				**(29)**	(382)	310
Ordinary shares purchased and cancelled[a][b]	**—**	(41.20)	(11.78)	**—**	(281)	(85)
At 31 December	**371.21**	371.21	412.41	**3,448**	3,477	4,140
– Special Voting Share[c]	**1 only**	1 only	1 only			
– DLC Dividend Share[c]	**1 only**	1 only	1 only			
Total share capital	**371.21**	371.21	412.41			

(a) In November 2018, 41,198,134 Rio Tinto Limited ordinary shares were purchased at A$69.69 per share and cancelled under an off-market share buy-back programme carried out pursuant to the shareholder approval granted at Rio Tinto Limited's 2018 annual general meeting for off-market and on-market buy-backs of up to 41.2 million Rio Tinto Limited ordinary shares.

(b) In November 2017, 11,778,064 Rio Tinto Limited ordinary shares were purchased at A$63.67 per share and cancelled under an off-market share buy-back programme carried out pursuant to the shareholder approval granted at Rio Tinto Limited's 2017 annual general meeting for off-market and on-market buy-backs of up to 42.4 million Rio Tinto Limited ordinary shares.

(c) The "Special Voting Share" was issued to facilitate the joint voting by shareholders of Rio Tinto Limited and Rio Tinto plc on Joint Decisions following the DLC Merger. The "DLC Dividend Share" was issued to facilitate the efficient management of funds within the DLC structure. Directors have the ability to issue an Equalisation Share if that is required under the terms of the DLC Merger Sharing Agreement.

During 2019, US$63 million of shares (2018: US$114 million; 2017: US$38 million) were purchased by employee share ownership trusts on behalf of Rio Tinto Limited to satisfy future share options and awards as they vest. At 31 December 2019, 944,467 shares were held in the employee share ownership trusts on behalf of Rio Tinto Limited.

Information relating to share options and other share-based incentive schemes is given in note 43.

29 Other reserves and retained earnings

	2019 US$m	2018 US$m	2017 US$m
Capital redemption reserve[a]			
At 1 January	**47**	38	34
Own shares purchased and cancelled	**4**	9	4
At 31 December	**51**	47	38
Cash flow hedge reserve			
At 1 January	**195**	32	32
Adjustment for transition to new accounting pronouncements at 1 January 2018 (note 45)	**—**	(4)	—
Cash flow hedge gains	**12**	156	62
Cash flow hedge (gains)/losses transferred to the income statement	**(41)**	40	(62)
Tax on the above	**(6)**	(54)	—
Transfers and other movements	**—**	25	—
At 31 December	**160**	195	32
Available for sale revaluation reserves			
At 1 January	**—**	20	(126)
Adjustment for transition to new accounting pronouncements at 1 January 2018 (note 45)	**—**	(20)	—
Gains on available for sale securities	**—**	—	19
Losses on available for sale securities transferred to the income statement	**—**	—	6
Tax on the above	**—**	—	(1)
Transfers and other movements	**—**	—	122
At 31 December	**—**	—	20
Fair value through other comprehensive income reserve			
At 1 January	**(6)**	—	—
Adjustment for transition to new accounting pronouncements at 1 January 2018 (note 45)	**—**	8	—
Losses on equity investments	**(5)**	(11)	—
Transfers to retained earnings	**—**	(3)	—
At 31 December	**(11)**	(6)	—
Cost of hedging reserve			
At 1 January	**(13)**	—	—
Adjustment for transition to new accounting pronouncements at 1 January 2018 (note 45)	**—**	26	—
Cost of hedging deferred to reserves during the year	**3**	(36)	—
Transfer of cost of hedging to the income statement	**—**	(3)	—
At 31 December	**(10)**	(13)	—
Other reserves[b]			
At 1 January	**11,650**	11,714	11,861
Own shares purchased from Rio Tinto Limited shareholders to satisfy share options	**(63)**	(114)	(64)
Employee share options: value of services	**52**	52	31
Deferred tax on share options	**4**	(2)	10
Companies no longer consolidated	**—**	—	(124)
At 31 December	**11,643**	11,650	11,714
Foreign currency translation reserve[c]			
At 1 January	**(3,212)**	480	(2,585)
Parent and subsidiaries currency translation and exchange adjustments	**331**	(3,658)	2,942
Equity accounted units currency translation adjustments	**10**	(48)	34
Currency translation reclassified on disposal	**215**	14	78
Transfers and other movements	**—**	—	11
At 31 December	**(2,656)**	(3,212)	480
Total other reserves per balance sheet	**9,177**	8,661	12,284

Notes to the 2019 financial statements continued

29 Other reserves and retained earnings continued

	2019 US$m	2018 US$m	2017 US$m
Retained earnings[d]			
At 1 January	**27,025**	23,761	21,631
Adjustment for transition to new accounting pronouncements at 1 January (note 45)	**(113)**	(179)	—
Parent and subsidiaries' profit for the year	**7,709**	13,125	8,423
Equity accounted units' profit after tax for the year	**301**	513	339
Actuarial (losses)/gains[e]	**(259)**	894	1
Tax relating to components of other comprehensive income	**81**	(269)	(150)
Total comprehensive income for the year	**7,832**	14,263	8,613
Share buy-back programme	**(1,135)**	(5,423)	(2,312)
Dividends paid	**(10,334)**	(5,356)	(4,250)
Change in equity interest held by Rio Tinto	**85**	60	43
Companies no longer consolidated	**—**	—	130
Own shares purchased/treasury shares reissued for share options and other movements	**(43)**	(140)	(18)
Employee share options and other IFRS 2 charges taken to the income statement	**70**	61	57
Transfer from FVOCI reserve	**—**	3	—
Transfers and other movements	**—**	(25)	(133)
At 31 December	**23,387**	27,025	23,761

(a) The capital redemption reserve was set up to comply with section 733 of the UK Companies Act 2006 (previously section 170 of the UK Companies Act 1985) when shares of a company are redeemed or purchased wholly out of the company's profits. Balances reflect the amount by which the company's issued share capital is diminished in accordance with this section.

(b) Other reserves includes US$11,936 million which represents the difference between the nominal value and issue price of the shares issued arising from Rio Tinto plc's rights issue completed in July 2009. No share premium was recorded in the Rio Tinto plc financial statements through the operation of the merger relief provisions of the UK Companies Act 1985.
Other reserves also include the cumulative amount recognised under IFRS 2 in respect of options granted but not exercised to acquire shares in Rio Tinto Limited, less, where applicable, the cost of shares purchased to satisfy share options exercised. The cumulative amount recognised under IFRS 2 in respect of options granted but not exercised to acquire shares in Rio Tinto plc is recorded in retained earnings.

(c) Exchange differences arising on the translation of the Group's net investment in foreign controlled companies are taken to the foreign currency translation reserve, as described in note 1(d). The cumulative differences relating to an investment are transferred to the income statement when the investment is disposed of.

(d) Retained earnings and movements in reserves of subsidiaries include those arising from the Group's share of joint operations.

(e) There were US$7 million actuarial losses relating to equity accounted units in 2019 (31 December 2018: nil; 31 December 2017: nil).

30 Financial instruments and risk management

In this note, except where stated, the information relates to the financial instruments of the parent companies and their subsidiaries and joint operations, and excludes those of equity accounted units. We have grouped the information in the following sections:

A – Financial assets and liabilities by categories
B – Derivative financial instruments
C – Fair values

A (a) Financial assets and liabilities by categories

At 31 December 2019	Note	Total US$m	Amortised cost US$m	Fair value through other comprehensive income US$m	Fair value through profit and loss US$m
Financial assets					
Cash and cash equivalents	21	**8,027**	**2,707**	**—**	**5,320**
Trade and other financial receivables[a][b]	18	**2,938**	**1,801**	**—**	**1,137**
Equity shares and quoted funds	20	**61**	**—**	**50**	**11**
Other investments, including loans[c]	20	**2,839**	**21**	**—**	**2,818**
Derivatives related to net debt: designated as hedges[d]	20, 24	**151**	**—**	**—**	**151**
Derivatives and embedded derivatives not related to net debt: not designated as hedges[d]	20	**149**	**—**	**—**	**149**
Embedded derivatives not related to net debt: designated as hedges[d]	20	**66**	**—**	**—**	**66**
Loans to equity accounted units including quasi equity loans		**152**	**152**	**—**	**—**
Total financial assets		**14,383**	**4,681**	**50**	**9,652**
Financial liabilities					
Trade and other financial payables[e]	25	**(5,398)**	**(5,341)**		**(57)**
Short-term borrowings and bank overdrafts	22	**(1,022)**	**(1,022)**		**—**
Medium-term and long-term borrowings	22	**(13,093)**	**(13,093)**		**—**
Derivatives related to net debt: designated as hedges[d]	22, 24	**(298)**	**—**		**(298)**
Derivatives and embedded derivatives not related to net debt: not designated as hedges[d]	22	**(29)**	**—**		**(29)**
Embedded derivatives not related to net debt: designated as hedges[d]	22	**(24)**	**—**		**(24)**
Other financial liabilities	22	**(247)**	**(247)**		**—**
Total financial liabilities		**(20,111)**	**(19,703)**		**(408)**

At 31 December 2018	Note	Total US$m	Amortised cost US$m	Fair value through other comprehensive income US$m	Fair value through profit and loss US$m
Financial assets					
Cash and cash equivalents	21	10,773	2,779	—	7,994
Trade and other financial receivables[a][b]	18	3,007	2,015	—	992
Equity shares and quoted funds	20	130	—	53	77
Other investments, including loans[c]	20	2,782	6	—	2,776
Derivatives related to net debt: designated as hedges[d]	20, 24	70	—	—	70
Derivatives and embedded derivatives not related to net debt: not designated as hedges[d]	20	432	—	—	432
Embedded derivatives not related to net debt: designated as hedges[d]	20	54	—	—	54
Loans to equity accounted units including quasi equity loans		167	167	—	—
Total financial assets		17,415	4,967	53	12,395
Financial liabilities					
Trade and other financial payables[e]	25	(5,552)	(5,513)		(39)
Short-term borrowings and bank overdrafts	22	(312)	(312)		—
Medium-term and long-term borrowings	22	(12,440)	(12,440)		—
Derivatives related to net debt: designated as hedges[d]	22, 24	(358)	—		(358)
Derivatives and embedded derivatives not related to net debt: not designated as hedges[d]	22	(98)	—		(98)
Embedded derivatives not related to net debt: designated as hedges[d]	22	(46)	—		(46)
Other financial liabilities	22	(666)	(666)		—
Total financial liabilities		(19,472)	(18,931)		(541)

(a) Trade and other financial receivables comprise trade receivables, other financial receivables, receivables relating to net investments in finance leases and amounts due from equity accounted units within note 18.
(b) Provisionally priced receivables are fair valued.
(c) Other investments, including loans, include US$2,584 million (2018: US$2,522 million) of highly liquid financial assets in managed investment funds classified as held for trading.
(d) These financial assets and liabilities in aggregate agree to the total derivative financial instruments disclosed in notes 20 and 22.
(e) Trade and other financial payables comprise trade payables, other financial payables, accruals and amounts due to equity accounted units within note 25. The trade and other payables held at fair value are valued using Level 2 inputs.

Notes to the 2019 financial statements continued

30 Financial instruments and risk management continued
A (b) Financial risk management
Objectives and policy
Our financial risk management objectives are:
- to have in place a robust capital structure to manage the organisation through the commodity cycle; and
- to allow our financial exposures to float with the market.

Any exceptions to these require formal approval by the board.

The Group operates a floating prices and rates policy for the management of our key economic exposure to commodity price, foreign exchange and interest rates risks. We do not seek to hedge this floating exposure and will re-float, where possible, any material price or rates that are fixed. Where this is impossible (or sub-optimal) any non-floating price risks are managed within defined market risk tolerances. Derivatives are used as and when required in order to manage our exposure in accordance with this underlying financial risk management principle.

In the paragraphs below, we summarise the risks that we are exposed to, and outline how our Treasury and Commercial teams manage these risks in accordance with agreed policies. These teams operate under a strong control environment, within approved limits. Our board reviews and approves limits at least annually.

(i) Capital and liquidity risk
Our overriding objective when managing capital and liquidity is to safeguard the business as a going concern. Capital is allocated in a consistent and disciplined manner, prioritising sustaining capital expenditure, followed by the ordinary dividend and then an iterative allocation between investing in compelling growth opportunities, maintaining balance sheet strength and delivering further returns to shareholders.

Our board and senior management regularly review the capital structure and liquidity of the Group. They take into account our strategic priorities, the economic and business conditions, and any identified investment opportunities, along with the expected returns to shareholders. We expect total cash returns to shareholders over the longer term to be in a range of 40–60% of underlying earnings in aggregate throughout the commodity cycle.

We consider various financial metrics when managing our risk, including net debt, gearing, the overall level of borrowings and their maturity profile, liquidity levels, total capital, future cash flows, EBITDA and interest cover ratios.

Our total capital as at 31 December was:

Total capital	Note	2019 US$m	2018 US$m
Equity attributable to owners of Rio Tinto (see Group balance sheet)		**40,532**	43,686
Equity attributable to non-controlling interests (see Group balance sheet)		**4,710**	6,137
Net debt/(cash)	24	**3,651**	(255)
Total capital		**48,893**	49,568

Our net debt increased to US$3.7 billion at 31 December 2019 from a net cash position of US$0.3 billion at 31 December 2018. This mainly reflects cash returns to shareholders during the year, capital expenditure and a non-cash increase of US$1.2 billion following the implementation of IFRS 16 "Leases" on 1 January 2019, partially offset by operating cash flows. At 31 December 2019 net gearing was 7% (2018: (1)%) and interest cover was 28 times (2018: 22 times).

We have access to various forms of financing including our US Shelf Programme, European Debt Issuance Programme, Commercial Paper and credit facilities. We did not issue any debt in 2019 or 2018 under these programmes.

In 2018, as part of our liability management programme, we redeemed bonds, issued by Rio Tinto Finance (USA) plc, Rio Tinto Finance plc and Rio Tinto Finance (USA) Limited, with a notional principal value of US$1.9 billion. We also closed out interest rate swaps, with the same notional value which were in a fair value hedge relationship with the bonds. The aggregate cash outflow on the bond redemptions amounted to US$2.0 billion before fees, including early redemption costs. The close out of the swaps generated a net cash outflow of US$51 million, including accrued interest of US$11 million. We did not buy back any bonds in 2019.

We have a US$1.9 billion facility, which we extended in 2019 to November 2022 and a US$5.6 billion facility, which includes a US$ denominated same day access swing-line facility. This also expires in November 2022. The funds available can be used for general corporate purposes. At 31 December 2019 the facilities were undrawn. Advances under these revolving facilities bear an interest rate per annum based on LIBOR (or EURIBOR, CDOR or BBSW in relation to any euro, Canadian dollar or Australian dollar loans respectively) plus a margin (which is dependent on our long-term credit rating as determined by Moody's and Standard & Poor's and the level of drawdown). The facility agreements contain no financial covenants.

Our credit ratings, as provided by Standard & Poor's and Moody's investor services, as at 31 December were:

	2019	2018
Long-term rating	**A/A2**	A/A3
Short-term rating	**A-1/P-1**	A-1/P-2
Outlook	**Stable/Stable**	Stable/Stable

Our unified credit status is maintained through cross guarantees, which mean the contractual obligations of Rio Tinto plc and Rio Tinto Limited are automatically guaranteed by the other.

In the table below, we summarise the maturity profile of our financial liabilities based on contractual undiscounted payments, which will therefore not necessarily agree with the amounts disclosed in the balance sheet.

Financial liability analysis

At 31 December 2019 (Outflows)/Inflows	Within 1 year or on demand US$m	Between 1 and 2 years US$m	Between 2 and 3 years US$m	Between 3 and 4 years US$m	Between 4 and 5 years US$m	After 5 years US$m	Total US$m
Non-derivative financial liabilities							
Trade and other financial payables[a]	(4,841)	(45)	(12)	(14)	(15)	(380)	(5,307)
Expected lease liability payments[b]	(349)	(267)	(157)	(133)	(93)	(671)	(1,670)
Borrowings before swaps	(723)	(171)	(665)	(741)	(1,209)	(9,320)	(12,829)
Expected future interest payments[a]	(607)	(594)	(590)	(551)	(514)	(3,518)	(6,374)
Other financial liabilities	(247)	—	—	—	—	—	(247)
Derivative financial liabilities[c]							
Derivatives related to net debt – net settled	(16)	(16)	(16)	9	(3)	3	(39)
Derivatives related to net debt – gross settled[a]:							
– gross inflows	495	40	40	40	507	788	1,910
– gross outflows	(588)	(53)	(53)	(53)	(599)	(977)	(2,323)
Derivatives not related to net debt – net settled	(31)	—	—	(2)	(4)	(23)	(60)
Derivatives not related to net debt – gross settled:							
– gross inflows	699	—	—	—	—	—	699
– gross outflows	(703)	—	—	—	—	—	(703)
Total	(6,911)	(1,106)	(1,453)	(1,445)	(1,930)	(14,098)	(26,943)

At 31 December 2018 (Outflows)/Inflows	Within 1 year or on demand US$m	Between 1 and 2 years US$m	Between 2 and 3 years US$m	Between 3 and 4 years US$m	Between 4 and 5 years US$m	After 5 years US$m	Total US$m
Non-derivative financial liabilities							
Trade and other financial payables	(5,129)	(423)	—	—	—	—	(5,552)
Borrowings before swaps	(312)	(562)	(166)	(660)	(741)	(10,476)	(12,917)
Expected future interest payments[a]	(651)	(653)	(636)	(630)	(586)	(4,082)	(7,238)
Other financial liabilities	(666)	—	—	—	—	—	(666)
Derivative financial liabilities[c]							
Derivatives related to net debt – net settled	(36)	(36)	(36)	(36)	4	(8)	(148)
Derivatives related to net debt – gross settled[a]:							
– gross inflows	48	508	39	39	39	1,278	1,951
– gross outflows	(79)	(595)	(58)	(58)	(58)	(1,581)	(2,429)
Derivatives not related to net debt – net settled	(27)	(13)	(5)	(5)	(5)	(28)	(83)
Derivatives not related to net debt – gross settled:							
– gross inflows	1,664	—	—	—	—	—	1,664
– gross outflows	(1,733)	—	—	—	—	—	(1,733)
Total	(6,921)	(1,774)	(862)	(1,350)	(1,347)	(14,897)	(27,151)

(a) The interest payable at year end was removed from trade and other financial payables and is shown within expected future interest payments. Interest payments have been projected using interest rates applicable at the end of the applicable financial year. Where debt is subject to variable interest rates, future interest payments are subject to change in line with market rates.
(b) In 2019 we have included expected future lease payments following adoption of IFRS 16 "Leases". Refer to note 45 for further information.
(c) The maturity grouping is based on the earliest payment date.

Offsetting and enforceable master netting agreements

When we have a legally enforceable right to offset our financial assets and liabilities and an intention to settle on a net basis, or realise the asset and settle the liability simultaneously, we report the net amount in the consolidated balance sheet. During the year, there were no material amounts offset in the balance sheet, and no material enforceable master netting agreements were identified.

(ii) Commodity price risk

Our broad commodity base means our exposure to commodity prices is diversified. Our normal policy is to sell our products at prevailing market prices. Exceptions to this rule are subject to strict limits laid down by the board, and to defined market risk tolerances and internal controls.

We sell our products to customers under contracts which vary in tenure and pricing mechanisms, including some volumes sold in the spot market. Sales revenue may be subject to adjustment if product specifications do not conform to the terms specified in a sales contract.

Pricing for iron ore is on a range of terms, the majority being either monthly or quarterly average pricing mechanisms. We sell a smaller proportion of iron ore volumes on the spot market.

Notes to the 2019 financial statements continued

30 Financial instruments and risk management continued

(ii) Commodity price risk (continued)

We generally sell copper and aluminium under contracts which vary in tenure and pricing mechanisms, with some volumes sold in the spot market. The prices are determined by reference to prevailing market prices on terminal markets, such as the London Metal Exchange (LME) and the Commodities Exchange (COMEX) in New York. Prices fluctuate widely in response to changing levels of supply and demand but, in the long run, prices are related to the marginal cost of supply. Gold is also priced in an active market in which prices respond to daily changes in quantities offered and sought. Newly mined gold is only one source of supply; investment and disinvestment can be important elements of supply and demand.

At the date revenue is recognised, certain of our products are provisionally priced, based on the amount we expect to receive in the future. After initial recognition of revenue, we record any change in revenue relating to market prices separately in Other revenue (refer to note 3). Substantially all iron ore and aluminium sales are reflected at final prices at each reporting period. Final prices for copper concentrate, however, are normally determined between 30 and 180 days after delivery to our customer.

At 31 December 2019, we had 220 million pounds of copper sales (31 December 2018: 240 million pounds) that were provisionally priced at US 271 cents per pound (2018: US 277 cents per pound). The final price of these sales will be determined during the first half of 2020. A 10% change in the price of copper realised on the provisionally priced sales, all other factors held constant, would increase or reduce net earnings by US$38 million (2018: US$37 million).

For some products, particularly aluminium, we are also exposed to fluctuations in power prices.

Hedging strategy

We do not generally consider that using derivatives to fix commodity prices would provide a long-term benefit to our shareholders. However, for certain physical commodity transactions for which the price was fixed at the contract date, we enter into derivatives to achieve the prevailing market prices at the point of revenue recognition.

To mitigate our exposure to changes in the relationship between aluminium prices and power prices, we have a number of electricity purchase contracts which are directly linked to the daily official LME cash ask price for high grade aluminium ("LME price") and to the US Midwest Transaction Premium ("Midwest premium").

In 2018, on transition to IFRS 9, we elected to apply hedge accounting to two existing embedded derivatives within our power contracts. The embedded derivatives (notional aluminium forward sales) have been designated as the hedging instrument. The forecasted aluminium sales, priced using the LME price and the Midwest premium, represent the hedged item.

The hedging ratio is 1:1, as the quantity of sales designated as being hedged matches the notional amount of the hedging instrument. The hedging instrument's notional amount, expressed in equivalent metric tonnes of aluminium, is derived from our expected electricity consumption under the power contracts as well as other relevant contract parameters.

When we designate such embedded derivatives as the hedging instrument in a cash flow hedge, we recognise the effective portion of the change in the fair value of the hedging instrument in other comprehensive income, and it is accumulated in the cash flow hedge reserve. The amount that is recognised in other comprehensive income is limited to the lesser of the cumulative change in the fair value of the hedging instrument and the cumulative change in the fair value of the hedged item, in absolute terms.

We recognise any ineffectiveness relating to the hedging relationship immediately in the income statement.

Sources of ineffectiveness include: differences in the timing of the cash flows between the hedged item and the hedging instrument, non-zero initial fair value of the hedging instrument, the existence of a cap on the Midwest premium in the hedging instrument and counterparty credit risk.

We held the following notional aluminium forward sales contracts embedded in the power contracts:

At 31 December 2019	Total	Within 1 year	Between 1 and 5 years	Between 5 and 10 years	After 10 years
Notional amount (in tonnes)	**704,370**	**65,226**	**286,617**	**352,527**	**—**
Notional amount (in US$ millions)	**1,656**	**138**	**647**	**871**	**—**
Average hedged rate (in US$ per tonne)	**2,351**	**2,114**	**2,257**	**2,471**	**—**

At 31 December 2018	Total	Within 1 year	Between 1 and 5 years	Between 5 and 10 years	After 10 years
Notional amount (in tonnes)	767,111	56,481	286,666	358,416	65,548
Notional amount (in US$ millions)	1,786	114	634	870	168
Average hedged rate (in US$ per tonne)	2,328	2,013	2,210	2,426	2,562

The impact on our financial statements of these hedging instruments and hedging items are:

	Aluminium embedded derivatives separated from the power contract (Hedging instrument)[a]			Highly probable forecast aluminium sales (Hedged item)				
	Nominal US$m	Carrying amount US$m	Change in fair value in the period US$m	Cash flow hedge reserve[b] US$m	Change in fair value in the period US$m	Total hedging gain/(loss) recognised in reserves US$m	Hedge ineffectiveness in the period[c] US$m	Amount reclassified from reserves to income statement[d] US$m
2019	**1,656**	**42**	**29**	**196**	**(50)**	**36**	**(7)**	**19**
2018	1,786	8	205	179	(182)	181	24	2

(a) Aluminium embedded derivatives (forward contracts and options) are contained within certain aluminium smelter electricity purchase contracts. US$66 million (2018: US$54 million) of the carrying value is shown within Other financial assets and US$24 million (2018: US$46 million) shown within other financial liabilities.
(b) The difference between this amount and the total cash flow hedge reserve of the Group (shown in note 29) relates to our cash flow hedge on the sterling bond (refer to interest rate risk section).
(c) Hedge ineffectiveness is included in net operating costs (raw material, consumables, repairs and maintenance) in the income statement.
(d) On realisation of the hedge, realised amounts are reclassified from reserves to consolidated sales revenue in the income statement.

There was no cost of hedging recognised in 2019 or 2018 relating to this hedge relationship.

We set out details of our commodity derivatives that are not designated as hedges in section B.

Sensitivities
Our commodity derivatives are impacted by changes in market prices. The table below summarises the impact that changes in aluminium market prices have on aluminium forward and option contracts embedded in power supply agreements outstanding at 31 December 2019. Any change in price will result in an offsetting change in our future earnings.

	Change in market prices	2019 US$m	2018 US$m
Effect on net earnings	**+10 %**	**(28)**	(102)
	(10)%	**27**	35
Effect on equity	**+10 %**	**(97)**	(101)
	(10)%	**101**	103

We exclude our "own use contracts" from this sensitivity analysis as they are outside the scope of IFRS 9. Our business units continue to hold these types of contracts to satisfy their expected purchase, sale or usage requirements.

(iii) Credit risk
We are exposed to credit risk in our operating activities (primarily from customer receivables); and from our investing activities (primarily investments in separately managed funds). We are also exposed to credit risk arising from our deposits in treasury and liquidity funds, deposits with banks and financial institutions and from our interest rate and currency derivative contracts.

Credit risks related to receivables
Our Commercial team manages customer credit risk subject to our established policy, procedures and controls. The team establishes credit limits for all of our customers. Where customers are rated by an independent credit rating agency, these ratings are used to set credit limits. Where there are no independent credit ratings available, we assess the credit quality of the customer through a credit rating scorecard. The Commercial team monitor outstanding customer receivables regularly and highlight any credit concerns to senior management. Shipments to major customers are often covered by letters of credit or other forms of credit insurance.

At 31 December 2019, we had 78 customers (2018: 113 customers) owing more than US$5 million each and accounting for approximately 90% (2018: 84%) of all trade receivables. There were 22 customers (2018: 17 customers) owing more than US$20 million and accounting for approximately 55% (2018: 34%) of all trade receivables.

The expected credit loss on our trade receivable portfolio is insignificant (see note 18).

Credit risk related to financial instruments and cash deposits
Our Treasury team manages credit risk from investments in government securities (primarily US Government), corporate and asset-backed securities, reverse re-purchase agreements, money market funds, and balances with banks and financial institutions in accordance with a board-approved credit risk framework which sets the risk appetite. Our board reviews this annually. We make investments of surplus funds only with approved investment grade (BBB- and above) counterparties who have been assigned specific credit limits. The limits are set to minimise the concentration of credit risk and therefore mitigate the potential for financial loss through counterparty failure.

Notes to the 2019 financial statements continued

30 Financial instruments and risk management continued

The maximum credit risk exposure arising on our financial assets at the balance sheet date is as follows:

	Note	2019 US$m	2018 US$m
Cash and cash equivalents	21	**8,027**	10,773
Trade and other financial receivables	18	**2,938**	3,007
Investments	20	**2,839**	2,782
Derivative assets	20	**366**	556
Loans to equity accounted units		**39**	38
Total		**14,209**	17,156

(iv) Foreign exchange risk

The broad geographic spread of our sales and operations means that our earnings, cash flows and shareholders' equity are influenced by a wide variety of currencies.

The majority of our sales are denominated in the US dollar.

Our operating costs are influenced by the currencies of those countries where our mines and processing plants are located, and by those currencies in which we buy imported equipment and services. The US dollar, the Australian dollar and the Canadian dollar are the most important currencies influencing our costs. In any particular year, currency fluctuations may have a significant impact on our financial results. A strengthening of the US dollar against the currencies in which our costs are partly denominated has a positive effect on our underlying earnings. However, a strengthening of the US dollar reduces the value of non-US dollar-denominated net assets, and therefore total equity.

Our external borrowings and cash are mainly denominated in US dollars, either directly or through the use of derivatives, as we consider the US dollar the most appropriate currency for financing our operations.

In most cases our debt and other financial assets and liabilities, including intragroup balances, is held in the functional currency of the relevant subsidiary. There are instances where these balances are held in currencies other than the functional currency of the relevant subsidiary. This means we recognise exchange gains and losses in our income statement (except where they can be taken to equity) as these balances are translated into the functional currency of the relevant subsidiary. Our income statement also includes exchange gains and losses arising on US dollar net debt and intragroup balances. On consolidation, these balances are retranslated to our US dollar presentation currency and there is a corresponding and offsetting exchange difference recognised directly in the currency translation reserve. There is no impact on total equity.

The table below summarises, by currency, our net debt, after taking into account relevant cross currency interest rate swaps and foreign exchange contracts:

Net (debt)/cash by currency	Total borrowings excluding overdrafts US$m	Lease liabilities US$m	Derivatives related to net debt US$m	Cash and cash equivalents US$m	Other investments US$m	Net (debt)/ cash 2019 US$m	Net (debt)/ cash 2018 US$m
US dollar	**(12,233)**	**(503)**	**(147)**	**7,456**	**2,584**	**(2,843)**	464
Australian dollar	**(382)**	**(349)**	**—**	**170**	**—**	**(561)**	(255)
Euro	**(4)**	**(23)**	**—**	**37**	**—**	**10**	(22)
South African rand	**—**	**(2)**	**—**	**173**	**—**	**171**	95
Canadian dollar	**(185)**	**(154)**	**—**	**17**	**—**	**(322)**	(134)
Other	**(2)**	**(278)**	**—**	**174**	**—**	**(106)**	107
Total	**(12,806)**	**(1,309)**	**(147)**	**8,027**	**2,584**	**(3,651)**	255

Hedging strategy

Under normal market conditions, we do not consider that active currency hedging of transactions would provide long-term benefits to shareholders. We review our exposure on a regular basis and will undertake hedging if deemed appropriate. We may deem currency protection measures appropriate in specific commercial circumstances. Capital expenditures and other significant financial items such as acquisitions, disposals, tax and dividend cash flows may be economically hedged subject to strict limits laid down by the board. Details of the cross-currency interest rate swaps and the currency forward contracts used to manage our currency risk exposures at 31 December 2019 are in section B.

Sensitivities
The table below shows the estimated retranslation effect on financial assets and financial liabilities, including intragroup balances, of a 10% strengthening in the closing exchange rate of the US dollar against significant currencies. We deem 10% to be the annual exchange rate movement that is reasonably probable (on an annual basis over the long run) for any of our significant currencies and therefore an appropriate representation.

We calculate sensitivities in relation to the functional currencies of our individual entities. We translate the impact of these on net earnings and underlying earnings into US dollars at the exchange rates on which the sensitivities are based. The impact to net earnings associated with a 10% weakening of a particular currency, shown below, is broadly offset within equity through movements in the currency translation reserve and therefore generally has no impact on our net assets. The impact is expressed in terms of the effect on net earnings, underlying earnings, and equity, assuming that each exchange rate moves in isolation. The sensitivities are based on financial assets and financial liabilities held at 31 December 2019, where balances are not denominated in the functional currency of the subsidiary or joint operation, and exclude financial assets and liabilities held by equity accounted units. These balances will not remain constant throughout 2020, and therefore the following information should be used with care.

At 31 December 2019
Gains/(losses) associated with 10% strengthening of the US dollar

Currency exposure	Closing exchange rate US cents	Effect on net earnings US$m	Of which amount impacting underlying earnings U$m	Impact directly on equity US$m
Australian dollar	**70**	**453**	**(4)**	**(1,002)**
Canadian dollar	**77**	**(143)**	**7**	**—**
Euro	**112**	**178**	**4**	**—**

At 31 December 2018
Gains/(losses) associated with 10% strengthening of the US dollar

Currency exposure	Closing exchange rate US cents	Effect on net earnings US$m	Of which amount impacting underlying earnings US$m	Impact directly on equity US$m
Australian dollar	70	346	1	(993)
Canadian dollar	73	(82)	7	—
Euro	114	202	5	—

(v) Interest rate risk
Our interest rate management policy is generally to borrow and invest at floating interest rates. This approach is based on the historically lower cost of borrowing at floating rates, and the historical correlation between interest rates and commodity prices. It does mean, however, that movements in market interest rates impact our earnings. In certain circumstances, we may elect to maintain a higher proportion of fixed-rate funding.

Hedging strategy
Because we aim to borrow and invest at floating interest rates, we enter into interest rate swaps and review these positions on a regular basis. During 2019, we entered into new swaps to convert the remaining US$75 million of the Rio Tinto Finance (USA) Limited Bonds (7.125% maturing in 2028) to floating interest rates and to swap US$100 million Alcan debentures (7.250% maturing in 2028) to floating interest rates.

At 31 December 2019, US$4.5 billion (2018: US$4.3 billion) US dollar notional fixed-rate US dollar borrowings continue to be swapped to floating US dollar rates and €818 million (2018: €818 million) euro notional fixed-rate borrowings continue to be fully swapped to floating US dollar interest rates at an effective exchange rate of 1.3105. These swaps are in fair value hedge relationships.

Since 2012, we have also held cross-currency interest rate swaps to convert the principal and annual interest coupons, of the Rio Tinto Finance plc £500m Sterling Bond to a US dollar notional with fixed US dollar annual interest coupons. We applied cash flow hedge accounting to this relationship to limit our US dollar cash flow exposure on the principal and interest payments. The hedge was fully effective in the 2019 and 2018 financial years as the notional amount, maturity, payment and reset dates match.

				2019		2018	
Nominal amount of the bond	Nominal amount of the hedging instrument	Maturity	Effective exchange rate	Loss in fair value of the hedging instrument US$m	Gain in fair value of the hedged item US$m	Loss in fair value of the hedging instrument US$m	Gain in fair value of the hedged item US$m
£500 million	US$807 million	November 2029	1.6132	**(24)**	**24**	(25)	25

In 2019, we decided to further swap the resulting fixed US dollar annual interest coupon payments to floating rates. Fair value hedge accounting has been applied to this relationship in addition to the pre-existing cash flow hedge.

Notes to the 2019 financial statements continued

30 Financial instruments and risk management continued

The effective interest rate of our borrowings, impacted by swaps, are summarised below. All nominal values are fully hedged unless otherwise stated:

Borrowings in a hedge relationship	Nominal value US$m	Weighted average interest rate after swaps	Swap maturity	Carrying Value 2019 US$m	Carrying Value 2018 US$m
Rio Tinto Finance plc Euro Bonds 2.0% due 2020	526	3 month LIBOR +1.35%	2020	**455**	468
Rio Tinto Finance plc Euro Bonds 2.875% due 2024	546	3 month LIBOR +1.64%	2024	**508**	514
Rio Tinto Finance (USA) Limited Bonds 3.75% 2025	1200	3 month LIBOR +1.39%	2025	**1,229**	1,170
Rio Tinto Finance (USA) Limited Bonds 7.125% 2028[a]	750	3 month LIBOR +3.27%	2028	**958**	927
Alcan Inc. Debentures 7.25% due 2028[b]	100	3 month LIBOR +5.43%	2024	**104**	104
Rio Tinto Finance plc Sterling Bonds 4.0% due 2029[b]	807	3 month LIBOR +2.65%	2024	**647**	633
Rio Tinto Finance (USA) Limited Bonds 5.2% 2040	1150	3 month LIBOR +3.79%	2022	**1,137**	1,095
Rio Tinto Finance (USA) plc Bonds 4.75% 2042	500	3 month LIBOR +3.42%	2023	**483**	462
Rio Tinto Finance (USA) plc Bonds 4.125% 2042	750	3 month LIBOR +2.83%	2023	**716**	685

(a) In 2018 US$675 million US dollar notional of this bond was swapped to floating rates. The weighted average interest rate after swaps relating to the swapped portion of this bond was 3 month LIBOR +3.02%.
(b) In 2019 we entered into new swaps to convert these bonds from having fixed interest rate terms in 2018 (as stated in note 22) to floating rates in the current period.

The fair value of interest rate and cross currency interest rate swaps at 31 December 2019 was US$151 million (2018: US$70 million) asset and US$298 million (2018: US$358 million) liability, respectively. These are included within "Other financial assets" and "Other financial liabilities" in the balance sheet.

The main sources of ineffectiveness of the fair value hedges include changes in the timing of the cash flows of the hedging instrument compared to the underlying hedged item, and changes in the credit risk of parties to the hedging relationships. Refer to note 8 for the changes in fair value of the bonds and the swaps as well as the ineffectiveness recognised in the period. For the year ended 31 December 2019, we adopted "Amendments to IFRS 9, IAS 39 and IFRS 7 - Interest rate benchmark reform". This has allowed us temporary relief from applying specific hedge accounting requirements to our hedging arrangements directly impacted by reform of the London Interbank Offered Rate (LIBOR). Refer to note 45.

Taking into account the interest and currency interest rate swaps and the implementation of IFRS 16 "Leases", at 31 December 2019, US$10.8 billion (2018: US$10.2 billion) of our adjusted gross borrowings were at floating rates. This has resulted in a floating to fixed debt ratio of 76% floating to 24% fixed (2018: 79% floating to 21% fixed). Our weighted average debt maturity was approximately 10 years (2018: 11 years) based on current interest rates and the carrying value of gross borrowings at the year end.

Sensitivities

Based on our floating rate financial instruments outstanding at 31 December 2019, the effect on our net earnings of a 100 basis point increase in US dollar LIBOR interest rates, with all other variables held constant, would be an expense of US$20 million (2018: income of US$8 million), reflecting the net debt position in 2019 versus the net cash position in 2018. We have an exposure to interest rate volatility within shareholders' equity arising from fair value movements on derivatives in the cash flow hedge reserve. These derivatives have an underlying exposure to sterling and US dollars. With all factors remaining constant, and based on the composition of derivatives impacting the cash flow reserve at 31 December 2019, the sensitivity of a 100 basis point increase in interest rates in each of the currencies in isolation would impact equity, before tax, by a charge of US$68 million (2018: US$69 million charge) for sterling and a credit of US$78 million (2018: US$78 million credit) for US dollars. A 100 basis point decrease would have broadly the same impact in the opposite direction. These balances will not remain constant throughout 2020, and therefore this information should be used with care.

B Derivative financial instruments

In the table below we summarise our derivatives, including embedded derivatives, as at 31 December.

	Total fair value			
	2019		2018	
	Asset US$m	Liability US$m	Asset US$m	Liability US$m
Derivatives designated as hedges				
Interest rate swaps[a]	**151**	**(38)**	70	(137)
Cross-currency interest rate swaps[b]	**—**	**(260)**	—	(221)
Aluminium embedded derivatives[c]	**66**	**(24)**	54	(46)
Total derivatives designated as hedges	**217**	**(322)**	124	(404)
Derivatives not designated as hedges				
Currency forward contracts and swaps	**13**	**(5)**	—	(68)
Aluminium embedded derivatives[c]	**96**	**—**	346	—
Other embedded derivatives	**14**	**—**	6	—
Other commodity contracts[d]	**26**	**(24)**	80	(30)
Total derivatives not designated as hedges	**149**	**(29)**	432	(98)
Total derivative instruments	**366**	**(351)**	556	(502)
Analysed by maturity:				
Less than 1 year	**58**	**(103)**	88	(95)
Between 1 and 5 years	**96**	**(86)**	153	(205)
More than 5 years	**212**	**(162)**	315	(202)
Total	**366**	**(351)**	556	(502)
Total net derivative instruments	**15**		54	

Reconciliation to balance sheet	Note	*2019* US$m	*2018* US$m
Non-current assets	20	**308**	468
Current assets	20	**58**	88
Current liabilities	22	**(103)**	(95)
Non-current liabilities	22	**(248)**	(407)
Total net derivative instruments		**15**	54

(a) The interest rate swaps are used to convert certain fixed rate borrowings to a floating rate.
(b) The cross-currency interest rate swaps are used to convert non-US dollar denominated borrowings to either fixed or floating US dollar borrowings.
(c) Aluminium embedded derivatives (forward contracts and options) are contained within certain aluminium smelter electricity purchase contracts. These contracts reduce our margin exposure to movements in the aluminium price.
(d) Other commodity derivatives mainly relate to forward contracts which we have entered into to swap some of our fixed priced product sales to prevailing market prices at the point of revenue recognition. None of these derivatives is in a hedge relationship.

C Fair values

The following table shows the carrying amounts and fair values of all of our financial instruments which are not carried at an amount which approximates their fair value at 31 December 2019 and 31 December 2018. The fair values of our cash equivalents, loans to equity-accounted units and other financial liabilities approximate their carrying values because of their short maturity, or because they carry floating rates of interest.

		31 December 2019[a]		31 December 2018	
	Note	Carrying value US$m	Fair value US$m	Carrying value US$m	Fair value US$m
Short-term borrowings	22	**(720)**	**(720)**	(312)	(312)
Medium-term and long-term borrowings	22	**(12,086)**	**(13,958)**	(12,440)	(13,554)

(a) The carrying value and fair value at 31 December 2019 excludes lease liabilities. This reflects the amendments made to IFRS 7 upon implementation of IFRS 16.

Total borrowings with a carrying value of US$7.7 billion (2018: US$7.5 billion) relate to listed bonds with a fair value of US$9.1 billion (2018: US$8.3 billion) and are categorised as level 1 in the fair value hierarchy.

Long-term borrowings with a carrying value of US$4.2 billion (2018: US$4.2 billion) relate to project finance drawn down by Oyu Tolgoi, with a fair value of US$4.7 billion (2018: US$4.6 billion) and are categorised as level 3 in the fair value hierarchy. We have calculated the fair value of these borrowings using level 3 valuation inputs including market yield over the pre-completion period, the variability of which we consider a reasonable indicator of fair value movements on amounts outstanding under the project finance facility. Post-completion, we estimate the fair value with reference to the annual interest rate on each tranche of the facility, and after considering factors that could indicate a change in the credit assessment of Oyu Tolgoi LLC as a counterparty to project finance. These factors include in-country risk relating to the Oyu Tolgoi project, and the assumed date of transition from pre-completion to post-completion. The transition from pre-completion to post-completion is determined by a set of tests for both completion of physical infrastructure and the ability to extract and process ore of defined grades over a defined period. Note 31 describes Rio Tinto's guarantee arrangements with respect to these project finance borrowings.

Notes to the 2019 financial statements continued

30 Financial instruments and risk management continued

Our remaining borrowings have a fair value measured by discounting estimated cash flows with an applicable market-quoted yield, and we categorise them as level 2 in the fair value hierarchy.

C (a) Valuation hierarchy

The tables below show the financial instruments by valuation method at 31 December 2019 and 31 December 2018.

			Held at fair value			
At 31 December 2019	**Note**	**Total US$m**	**Level 1[a] US$m**	**Level 2[b] US$m**	**Level 3[c] US$m**	**Held at amortised cost US$m**
Assets						
Cash and cash equivalents[d]		**8,027**	**5,320**	**—**	**—**	**2,707**
Investments in equity shares and funds		**61**	**26**	**—**	**35**	**—**
Other investments, including loans[e]	20	**2,839**	**2,607**	**—**	**211**	**21**
Trade and other financial receivables[f]	18	**2,938**	**15**	**1,122**	**—**	**1,801**
Derivatives (net)						
Forward contracts and option contracts: designated as hedges[g] (Section B)		**42**	**—**	**—**	**42**	**—**
Forward contracts and option contracts, not designated as hedges[g] (Section B)		**120**	**—**	**25**	**95**	**—**
Derivatives related to net debt[h] (Section B)		**(147)**	**—**	**(147)**	**—**	**—**
Liabilities						
Trade and other financial payables	25	**(5,398)**	**—**	**(57)**	**—**	**(5,341)**
Total		**8,482**	**7,968**	**943**	**383**	**(812)**

			Held at fair value			
At 31 December 2018	Note	Total US$m	Level 1[a] US$m	Level 2[b] US$m	Level 3[c] US$m	Held at amortised costs US$m
Assets						
Cash and cash equivalents[d]		10,773	7,994	—	—	2,779
Investments in equity shares and funds		130	92	—	38	—
Other investments, including loans[e]	20	2,782	2,544	—	232	6
Trade and other financial receivables[f]	18	3,007	20	972	—	2,015
		16,692	10,650	972	270	4,800
Derivatives (net)						
Forward contracts and option contracts: designated as hedges[g] (Section B)		8	—	—	8	—
Forward contracts and option contracts, not designated as hedges[g] (Section B)		334	—	(25)	359	—
Derivatives related to net debt[h] (Section B)		(288)	—	(288)	—	—
Liabilities						
Trade and other financial payables	25	(5,552)	—	(39)	—	(5,513)
Total		11,194	10,650	620	637	(713)

(a) Valuation is based on unadjusted quoted prices in active markets for identical financial instruments. This category includes listed equity shares and other quoted funds.
(b) Valuation is based either on inputs which include quoted prices for similar instruments or identical instruments in markets which are not considered to be active, or on inputs, which are directly or indirectly based on observable market data.
(c) Valuation is based on inputs that are not based on observable market data (unobservable inputs).
(d) Cash and cash equivalents include money market funds which are treated as fair value through profit or loss (FVPL) with the fair value movements going into finance income.
(e) Other investments, including loans, comprise: cash deposits in rehabilitation funds, government bonds, managed investment funds and royalty receivables. The royalty receivables are valued based on future expected output as well as future expected commodity prices.
(f) Trade receivables include provisionally priced receivables relating to sales contracts where the selling price is determined after delivery to the customer, based on the market price at the relevant quotation point stipulated in the contract. Revenue is recognised on provisionally priced sales based on the forward selling price for the period stipulated in the contract. Provisionally priced receivables at 31 December 2019 were US$1,040 million and were held at fair value (31 December 2018: US$889 million).
(g) Level 3 derivatives consist of derivatives embedded in electricity purchase contracts linked to the LME with terms expiring between 2025 and 2030 (2018: 2025 and 2030). The embedded derivatives are measured using discounted cash flows and option model valuation techniques.
(h) Interest rate and currency interest rate swaps are valued using applicable market-quoted swap yield curves adjusted for relevant basis and credit default spreads. Currency interest rate swap valuations also use market-quoted foreign exchange rates. A discounted cash flow approach is applied to the cash flows derived from the inputs to determine fair value.

There were no transfers between level 1 and level 2, or between level 2 and level 3 in the year ended 31 December 2019 or in the year ended 31 December 2018.

C (b) Level 3 financial assets and financial liabilities
The table below shows the reconciliation of our level 3 financial assets and financial liabilities.

	2019 Level 3 financial assets and financial liabilities US$m	2018 Level 3 financial assets and financial liabilities US$m
Opening balance	**637**	(7)
Adjustment from transition to IFRS 9	**—**	19
Currency translation adjustments	**(1)**	(23)
Total realised (losses)/gains included in:		
– net operating costs	**(7)**	9
Total unrealised (losses)/gains included in:		
– net operating costs	**(254)**	375
Total unrealised gains transferred into other comprehensive income through cash flow hedges	**28**	181
Additions	**1**	67
Disposals/maturity of financial instruments	**(21)**	(6)
Transfers	**—**	22
Closing balance	**383**	637
Total (losses)/gains for the year included in the income statement for assets and liabilities held at year end	**(263)**	346

Sensitivity analysis in respect of level 3 derivatives
To value the long-term aluminium embedded derivatives, which had a fair value of US$120 million at 31 December 2019 (2018: US$338 million), we use unobservable inputs when the term of the derivative extends beyond observable market prices. In 2019, changing the level 3 inputs to reasonably possible alternative assumptions does not change the fair value significantly, taking into account the expected remaining term of contracts. In 2018 our most significant assumption involved flat lining aluminium prices beyond the market forward curve and increasing the price by expected inflation up to the date of expiry of each contract (market prices used in 2018:US$2,426 per metric tonne in 2029 to US$2,507 in 2030). The effect of a 10% increase in this pricing assumption was a US$22 million decrease in carrying value. A 10% decrease in long-term metal pricing assumptions resulted in a US$14 million increase in carrying value.

We also have royalty receivables, with a carrying value of US$124 million (2018: US$158 million), arising from the sale of our coal assets in prior periods. These are classified as 'Other investments, including loans' within the balance sheet. The fair values are determined using level 3 unobservable inputs.

The main unobservable input is the long-term coal price used over the life of the royalty receivable. A 15% increase in the coal spot price would result in a US$214 million increase (2018: US$181 million increase) in the carrying value. A 15% decrease in the coal spot price would result in a US$57 million decrease (2018: US$95 million decrease) in the carrying value. We have used a 15% assumption to calculate our exposure as it represents the annual coal price movement that we deem to be reasonably probable (on an annual basis over the long run).

31 Contingencies and commitments

	2019 US$m	2018 US$m
Capital commitments excluding the Group's share of joint venture capital commitments		
Within 1 year	**3,069**	1,742
Between 1 and 3 years	**851**	439
Between 3 and 5 years	**133**	66
After 5 years	**—**	36
Total	**4,053**	2,283
Group's share of joint venture capital commitments		
Within 1 year	**92**	115
Between 1 and 3 years	**1**	1
Total	**93**	116

Our capital commitments include open purchase orders for managed operations and expenditure on major projects already authorised by our Investment Committee for non-managed operations. On a legally enforceable basis, capital commitments would be approximately US$0.9 billion (2018: US$0.4 billion) as many of the contracts relating to the Group's projects have various cancellation clauses.

Notes to the 2019 financial statements continued

31 Contingencies and commitments continued

Unrecognised commitments to contribute funding or resources to joint ventures

We have a commitment to purchase and market a portion (in excess of the Group's ownership interest) of the output of Sohar Aluminium Company L.L.C., an aluminium smelter in which the Group is a joint venture partner. The Group immediately sells the purchased products to third parties.

Along with the other joint venture partners, we have commitments to provide emergency funding (ie funding required to preserve the life or assets of the company or to comply with applicable laws) if required by Sohar Aluminium Company L.L.C., subject to approved thresholds.

At 31 December 2019, Minera Escondida Ltda held an undrawn shareholder line of credit for US$225 million (Rio Tinto share) (31 December 2018: US$225 million). The current facility has been extended during the year and will mature in September 2022.

Operating leases

Refer to note 45 for details of the Group's transition to IFRS 16 "Leases". Commitments disclosed as non-cancellable operating leases under IAS 17 "Leases" have been recorded as lease liabilities from 1 January 2019, with the exception of short-term and low-value leases. Refer to note 23 for the maturity profile of the Group's lease liabilities, amounts relating to commitments for leases not yet commenced, and short-term leases which had commenced at 31 December 2019.

The aggregate amounts of minimum lease payments under non-cancellable operating leases at 31 December 2018, prepared and reported under IAS 17 "Leases", were as follows:

	2018 US$m
Within 1 year	475
Between 1 and 3 years	587
Between 3 and 5 years	270
After 5 years	385
Total[a]	1,717

(a) Operating leases included leases of dry bulk vessels and offices as well as other property, plant and equipment. Leases for dry bulk vessels included costs for crewing services.

Purchase obligations

The aggregate amount of future payment commitments under purchase obligations outstanding at 31 December was:

	2019 US$m	2018 US$m
Within 1 year	**2,920**	2,804
Between 1 and 2 years	**1,705**	1,565
Between 2 and 3 years	**1,431**	1,344
Between 3 and 4 years	**1,084**	1,097
Between 4 and 5 years	**1,082**	882
After 5 years	**8,697**	9,358
Total	**16,919**	17,050

Purchase obligations are enforceable and legally binding agreements to buy goods or services. They specify all significant terms, including: fixed or minimum quantities to be purchased or consumed; fixed, minimum or variable price provisions; and the approximate timing of the transactions.

Purchase obligations for goods mainly relate to purchases of raw materials and consumables and purchase obligations for services mainly relate to charges for the use of infrastructure, commitments to purchase power and freight contracts. These goods and services are expected to be used in the business. To the extent that this changes, a provision for onerous obligations may be made as described in note 1(iii).

Purchases from joint arrangements or associates are included if the quantity purchased is in excess of our ownership interest in the entity. However, purchase obligations exclude contracted purchases of bauxite, alumina and aluminium from joint arrangements and associates and contracted purchases of alumina from third parties. This is because these purchases are made for commercial reasons and the Group is, overall, a net seller of these commodities.

As described above, we also have a commitment to buy and market a portion (in excess of our ownership interest) of the output of Sohar Aluminium Company L.L.C..

Contingent liabilities (subsidiaries and joint operations)

	2019 US$m	2018 US$m
Indemnities and other performance guarantees[a][b]	**204**	317

(a) Indemnities and other performance guarantees represent the potential outflow of funds from the Group for the satisfaction of obligations including those under contractual arrangements (for example undertakings related to supplier agreements) not provided for in the balance sheet, where the likelihood of the guarantees or indemnities being called is assessed as possible rather than probable or remote.

(b) There were no material contingent liabilities arising in relation to the Group's joint ventures and associates.

Contingent liabilities
In October 2017, Rio Tinto announced that it had been notified by the U.S. Securities and Exchange Commission (SEC) that the SEC had filed a complaint in relation to Rio Tinto's disclosures and timing of the impairment of Rio Tinto Coal Mozambique (RTCM). The impairment was reflected in Rio Tinto's 2012 year-end accounts. The SEC alleges that Rio Tinto, a former chief executive, Tom Albanese, and a former chief financial officer, Guy Elliott, committed violations of the antifraud, reporting, books and records and internal control provisions of the federal securities law by not accurately disclosing the value of RTCM and not impairing it when Rio Tinto published its 2011 year-end accounts in February 2012 or its 2012 interim results in August 2012. In June 2019, the court dismissed an associated US class action on behalf of securities holders. The dismissal is being appealed by the securities holders.

In March 2018, the Australian Securities and Investments Commission (ASIC) filed civil proceedings in the NSW District Registry of the Federal Court of Australia against Rio Tinto Limited, Albanese, and Elliott. On 1 May 2018, ASIC expanded its proceedings. ASIC alleges that Rio Tinto committed violations of the disclosure, accounting, and misleading or deceptive conduct provisions of the Corporations Act by making misleading or deceptive statements related to RTCM in its 2011 Annual report and its 2012 interim financial statements, not complying with accounting standards in respect of its 2012 interim financial statements, and not disclosing an impairment of RTCM in its 2012 interim financial statements. ASIC further alleges Albanese and Elliott breached their duties as directors or officers, and failed to take all reasonable steps to comply with relevant accounting requirements.

Rio Tinto believes that the SEC case and the ASIC proceedings are unwarranted and that, when all the facts are considered by the courts, the claims will be rejected. Rio Tinto will defend the allegations vigorously.

In addition, Rio Tinto continues to co-operate fully with relevant authorities in connection with their investigations in relation to contractual payments totalling US$10.5 million made to a consultant who had provided advisory services in 2011 on the Simandou project in Guinea. In August 2018, the court dismissed a related US class action commenced on behalf of securities holders.

The outcomes of these matters remain uncertain, but they could ultimately expose the Group to material financial cost. The board is giving these matters its full and proper attention and a dedicated board committee continues to monitor the progress of these matters, as appropriate.

The Group continues to monitor developments in relation to the European Commission's (EC) State Aid investigation into the UK's Controlled Foreign Company (CFC) tax regime. On 25 April 2019, the EC released its decision in relation to the group company finance exemption in the UK's CFC rules finding that the exemption constitutes unlawful state aid if the exempted profits arise in connection with UK activity. The UK Government disagrees with the findings and has appealed against the decision to the European Court. Rio Tinto has also lodged an appeal to the European Court to protect its rights. Having analysed the EC's decision and applied subsequent HMRC guidance to the Group's facts and circumstances, the Group does not currently consider it has a liability in relation to EU State Aid and therefore does not consider any provision is required.

The Group has not established provisions for certain additional legal claims in cases where we have assessed that a payment is either not probable or cannot be reliably estimated. A number of Group companies are, and will likely continue to be, subject to various legal proceedings and investigations that arise from time to time. As a result, the Group may become subject to substantial liabilities that could affect our business, financial position and reputation. Litigation is inherently unpredictable and large judgements may at times occur. The Group may incur, in the future, judgements or enter into settlements of claims that could lead to material cash outflows. We do not believe that any of these proceedings will have a materially adverse effect on our financial position.

Guarantees by parent companies
Rio Tinto plc and Rio Tinto Limited have, jointly and severally, fully and unconditionally guaranteed the following securities issued by the following 100% owned finance subsidiaries: US$4.4 billion (31 December 2018: US$4.4 billion) Rio Tinto Finance (USA) Limited and Rio Tinto Finance (USA) plc bonds with maturity dates up to 2042; and US$1.6 billion (31 December 2018: US$1.6 billion) on the European Debt Issuance Programme. In addition, Rio Tinto Finance plc and Rio Tinto Finance Limited have entered into facility arrangements for an aggregate amount of US$7.5 billion (31 December 2018: US$7.5 billion). The facilities are guaranteed by Rio Tinto plc and Rio Tinto Limited.

Rio Tinto plc has provided a guarantee, known as the completion support undertaking (CSU), in favour of the Oyu Tolgoi LLC project finance lenders. At 31 December 2019, US$4.3 billion of project finance debt was outstanding under this facility (2018: US$4.3 billion). Oyu Tolgoi LLC is jointly owned by Erdenes Oyu Tolgoi LLC (34%), which is controlled by the Government of Mongolia, and Turquoise Hill Resources Ltd (66%, of which Rio Tinto owns 51%). The project finance has been raised for development of the underground mine and the CSU will terminate on the completion of the underground mine according to a set of completion tests set out in the project finance facility.

The Rio Tinto guarantee applies to the extent that Turquoise Hill Resources Ltd cannot satisfy Oyu Tolgoi LLC's project finance debt servicing obligations under its own guarantee to the lenders, called the sponsor debt service undertaking (DSU). Both the CSU and DSU contain a carve-out for certain political risk events.

Contingent assets
The Group has, from time to time, various insurance claims outstanding with reinsurers.

Notes to the 2019 financial statements continued

32 Average number of employees

	Subsidiaries and joint operations			Equity accounted units (Rio Tinto share)			Group total		
	2019	2018	2017	2019	2018	2017	2019	2018	2017
Principal locations of employment:									
Australia and New Zealand	**19,195**	19,017	19,041	**619**	578	602	**19,814**	19,595	19,643
Canada	**11,576**	10,620	10,256	**—**	—	—	**11,576**	10,620	10,256
UK	**190**	287	309	**—**	—	—	**190**	287	309
Europe	**959**	1,418	1,505	**—**	—	—	**959**	1,418	1,505
Africa	**3,121**	3,496	3,461	**1,250**	1,262	1,269	**4,371**	4,758	4,730
US	**3,400**	3,792	3,429	**—**	—	—	**3,400**	3,792	3,429
Mongolia	**3,215**	2,886	2,861	**—**	—	—	**3,215**	2,886	2,861
Indonesia	**—**	1,615	1,642	**—**	—	—	**—**	1,615	1,642
South America	**243**	210	197	**1,270**	1,289	1,237	**1,513**	1,499	1,434
India	**272**	288	310	**—**	—	—	**272**	288	310
Singapore	**430**	422	434	**—**	—	—	**430**	422	434
Other countries[a]	**267**	278	254	**—**	—	—	**267**	278	254
Total	**42,868**	44,329	43,699	**3,139**	3,129	3,108	**46,007**	47,458	46,807

(a) "Other countries" primarily includes employees in the Middle East (excluding Oman which is included in Africa), and other countries in Asia which are not shown separately in the table above.

Employee numbers, which represent the average for the year, include 100% of employees of subsidiary companies. Employee numbers for joint operations and equity accounted units are proportional to the Group's interest under contractual agreements. Average employee numbers include a part-year effect for companies acquired or disposed of during the year.

Part-time employees are included on a full-time-equivalent basis. Temporary employees are included in employee numbers.

People employed by contractors are not included.

33 Principal subsidiaries
At 31 December 2019

Company and country of incorporation/operation	Principal activities	Class of shares held	Proportion of class held (%)	Group interest (%)	Non-controlling interest (%)
Australia					
Argyle Diamonds Limited	Mining and processing of diamonds	Ordinary	100	100	—
Dampier Salt Limited	Salt and gypsum production	Ordinary	68.36	68.36	31.64
Energy Resources of Australia Ltd	Uranium processing	Ordinary	68.39	68.39	31.61
Hamersley Iron Pty Limited	Iron ore mining	Ordinary	100	100	—
North Mining Limited[a]	Iron ore mining	Ordinary	100	100	—
Rio Tinto Aluminium (Holdings) Limited	Bauxite mining; alumina production; primary aluminium smelting	Ordinary	100	100	—
Robe River Mining Co Pty Ltd[a]	Iron ore mining	Class A	40	60	40
		Class B	76.36		
Brazil					
Alcan Alumina Ltda.[b]	Alumina production and bauxite mining	Quota	100	100	—
Canada					
Iron Ore Company of Canada[c]	Iron ore mining; iron ore pellets production	Common	58.72	58.72	41.28
Rio Tinto Fer et Titane Inc.	Titanium dioxide feedstock; high purity iron and steel production	Common	100	100	—
		Class B preference	100	100	—
		CAD 0.01 preferred	100	100	—
Rio Tinto Alcan Inc.	Bauxite mining; alumina refining; aluminium smelting	Common	100	100	—
Diavik Diamond Mines (2012) Inc.[d]	Diamond mining and processing	Common	100	100	—
Guinea					
Simfer Jersey Limited[e]	Iron ore project	Ordinary	53	53	47
Madagascar					
QIT Madagascar Minerals SA[f]	Ilmenite mining	Common	80	80	15
		Investment certificates	100	100	
		Voting certificates	80	80	20
Mongolia					
Turquoise Hill Resources Ltd (including Oyu Tolgoi LLC)[g]	Copper and gold mining	Common	50.79	50.79	49.21
South Africa					
Richards Bay Titanium (Proprietary) Limited[h]	Titanium dioxide; high purity iron production	B Ordinary	100	74	26
		B preference	100		
		Parent Preference	100		
Richards Bay Mining (Proprietary) Limited[h]	Ilmenite, rutile and zircon mining	B Ordinary	100	74	26
		B preference	100		
		Parent Preference	100		
US					
Kennecott Holdings Corporation (including Kennecott Utah Copper and Kennecott Exploration)	Copper and gold mining, smelting and refining and exploration activities	Common US$0.01	100	100	—
U.S. Borax Inc.	Mining, refining and marketing of borates	Common US$0.01	100	100	—

This list includes only those companies that have a more significant impact on the profit or operating assets of the Group. Refer to note 47 for a list of related undertakings.

Notes to the 2019 financial statements continued

33 Principal subsidiaries continued

The Group's principal subsidiaries are mostly held by intermediate holding companies and not directly by Rio Tinto plc or Rio Tinto Limited.

(a) Robe River Mining Co Pty Ltd (which is 60% owned by the Group) holds a 30% interest in Robe River Iron Associates (Robe River). North Mining Ltd (which is wholly owned by the Group) holds a 35% interest in Robe River. Through these companies the Group recognises a 65% share of the assets, liabilities, revenues and expenses of Robe River, with a 12% non-controlling interest. The Group therefore has a 53% beneficial interest in Robe River.

(b) Alcan Alumina Ltda holds the Group's 10% interest in Consórcio De Aluminio Do Maranhão, a joint operation in which the Group participates but is not a joint operator. The Group recognises its share of assets, liabilities, revenues and expenses relating to this arrangement.

(c) Iron Ore Company of Canada is incorporated in the US, but operates in Canada.

(d) Diavik Diamond Mines (2012) Inc. (DDMI) is the legal entity that owns the Group's 60% interest in the Diavik Joint Venture, an unincorporated arrangement. The Group recognises its share of assets, revenue and expenses relating to this arrangement. Liabilities are recognised according to DDMI's contractual obligations, with a corresponding 40% receivable or contingent asset representing the co-owner's share where applicable.

(e) Simfer Jersey Limited, a company incorporated in Jersey in which the Group has a 53% interest, has an 85% interest in Simfer S.A., the company that operates the Simandou mining project in Guinea. The Group therefore has a 45.05% indirect interest in Simfer S.A. These entities are consolidated as subsidiaries and together referred to as the Simandou iron ore project.

(f) The Group's shareholding in QIT Madagascar Minerals SA carries an 80% economic interest and 80% of the total voting rights; a further 5% economic interest is held through non-voting investment certificates to give an economic interest of 85%. The non-controlling interests have a 15% economic interest and 20% of the total voting rights.

(g) The Group has a 50.79% interest in Turquoise Hill Resources Ltd, which holds a 66% interest in Oyu Tolgoi LLC (OT) which is a subsidiary of Turquoise Hill Resources Ltd. The Group therefore has a 33.5% indirect interest in OT. Turquoise Hill Resources Ltd is incorporated in Canada but operates principally in Mongolia.

(h) Additional classes of shares issued by Richards Bay Titanium (Proprietary) Limited and Richards Bay Mining (Proprietary) Limited representing non-controlling interests are not shown. The Group's total legal and beneficial interest in Richards Bay Titanium (Proprietary) Limited and Richards Bay Mining (Proprietary) Limited is 74%.

Summary financial information for subsidiaries that have non-controlling interests that are material to the Group

This summarised financial information is shown on a 100% basis. It represents the amounts shown in the subsidiaries' financial statements prepared in accordance with IFRS under Group accounting policies, including fair value adjustments, and before intercompany eliminations.

	Iron Ore Company of Canada 2019 US$m	Iron Ore Company of Canada 2018 US$m	**Energy Resources of Australia 2019 US$m**	Energy Resources of Australia 2018 US$m	**Turquoise Hill[a][b][c] 2019 US$m**	Turquoise Hill[a][b][c] 2018 US$m
Revenue	**2,014**	1,561	**145**	151	**1,166**	1,180
Profit/(loss) after tax	**543**	298	**5**	(241)	**(2,137)**	139
– attributable to non-controlling interests	**224**	122	**2**	1	**(1,490)**	14
– attributable to Rio Tinto	**319**	176	**3**	(242)	**(647)**	125
Other comprehensive income/(loss)	**57**	(136)	**2**	2	**—**	(4)
Total comprehensive income/(loss)	**600**	162	**7**	(239)	**(2,137)**	135
Non-current assets	**2,585**	2,376	**76**	74	**9,589**	10,375
Current assets	**610**	459	**258**	311	**2,449**	3,813
Current liabilities	**(532)**	(351)	**(127)**	(123)	**(493)**	(540)
Non-current liabilities	**(927)**	(791)	**(462)**	(522)	**(4,405)**	(4,367)
Net assets/(liabilities)	**1,736**	1,693	**(255)**	(260)	**7,140**	9,281
– attributable to non-controlling interests	**718**	699	**—**	(6)	**2,369**	3,936
– attributable to Rio Tinto	**1,018**	994	**(255)**	(254)	**4,771**	5,345
Cash flow from operations	**1,039**	553	**(73)**	(64)	**298**	357
Dividends paid to non-controlling interests	**(228)**	(178)	**—**	**—**	**—**	**—**

(a) Turquoise Hill Resources Ltd holds a controlling interest in Oyu Tolgoi LLC (OT).

(b) Under the terms of the project finance facility held by OT, there are certain restrictions on the ability of OT to make shareholder distributions.

(c) Since 2011, Turquoise Hill has funded common share investments in OT on behalf of Erdenes Oyu Tolgoi LLC ("Erdenes"). In accordance with the Amended and Restated Shareholders Agreement dated 8 June 2011, such funded amounts earn interest at an effective annual rate of Libor plus 6.5% and are repayable to them via a pledge over Erdenes' share of future OT common share dividends. Erdenes also has the right to reduce the outstanding balance by making payments directly to Turquoise Hill. Common share investments funded on behalf of Erdenes are recorded as a reduction to the net carrying value of non-controlling interests. As at 31 December 2019, the cumulative amount of such funding was US$1,241 million (31 December 2018: US$1,021 million), excluding accrued interest of US$655 million (31 December 2018: US$506 million) relating to this funding.

	Robe River Mining Co Pty 2019 US$m	Robe River Mining Co Pty 2018 US$m	Other companies and eliminations[d] 2019 US$m	Other companies and eliminations[d] 2018 US$m	Robe River 2019 US$m	Robe River 2018 US$m
Revenue	**1,493**	1,082	**1,743**	1,262	**3,236**	2,344
Profit after tax	**808**	561	**825**	543	**1,633**	1,104
– attributable to non-controlling interests	**312**	218	**—**	—	**312**	218
– attributable to Rio Tinto	**496**	343	**825**	543	**1,321**	886
Other comprehensive loss	**(13)**	(313)	**(12)**	(203)	**(25)**	(516)
Total comprehensive income	**795**	248	**813**	340	**1,608**	588
Non-current assets	**2,622**	2,610	**3,687**	3,739	**6,309**	6,349
Current assets	**1,161**	710	**1,873**	2,368	**3,034**	3,078
Current liabilities	**(173)**	(111)	**(303)**	(235)	**(476)**	(346)
Non-current liabilities	**(84)**	(117)	**(3,392)**	(3,977)	**(3,476)**	(4,094)
Net assets	**3,526**	3,092	**1,865**	1,895	**5,391**	4,987
– attributable to non-controlling interests	**1,404**	1,237	**—**	—	**1,404**	1,237
– attributable to Rio Tinto	**2,122**	1,855	**1,865**	1,895	**3,987**	3,750
Cash flow from operations	**1,255**	933	**1,447**	1,151	**2,702**	2,084
Dividends paid to non-controlling interests	**(139)**	(224)	**—**	—	**(139)**	(224)

(d) "Other companies and eliminations" includes North Mining Limited (a wholly owned subsidiary of the Group which accounts for its interest in Robe River) and goodwill of US$349 million (2018: US $351 million) that arose on the Group's acquisition of its interest in Robe River.

34 Principal joint operations
At 31 December 2019

Company and country of incorporation/operation	Principal activities	Group interest (%)
Australia		
Tomago Aluminium Joint Venture	Aluminium smelting	51.6
Gladstone Power Station	Power generation	42.1
Hope Downs Joint Venture	Iron ore mining	50
Queensland Alumina Limited[a] [b]	Alumina production	80
Pilbara Iron arrangement	Infrastructure, corporate and mining services	[c]
New Zealand		
New Zealand Aluminium Smelters Limited[a] [b]	Aluminium smelting	79.4
Canada		
Aluminerie Alouette Inc.	Aluminium production	40
US		
Pechiney Reynolds Quebec Inc[b] [d]	Aluminium smelting	50.2

This list includes only those joint operations that have a more significant impact on the profit or operating assets of the Group. Refer to note 47 for a list of related undertakings.

The Group's joint operations are held by intermediate holding companies and not directly by Rio Tinto plc or Rio Tinto Limited.

(a) Although the Group has a 79.4% interest in New Zealand Aluminium Smelters Limited and an 80% interest in Queensland Alumina Limited, decisions about activities that significantly affect the returns that are generated require agreement of both parties to the arrangements, giving rise to joint control.

(b) Queensland Alumina Limited, New Zealand Aluminium Smelters Limited and Pechiney Reynolds Quebec Inc. are joint arrangements that are primarily designed for the provision of output to the parties sharing joint control; this indicates that the parties have rights to substantially all the economic benefits of the assets. The liabilities of the arrangements are in substance satisfied by cash flows received from the parties; this dependence indicates that the parties in effect have obligations for the liabilities. It is these facts and circumstances that give rise to the classification of these entities as joint operations.

(c) A number of arrangements are in place between the Australian Iron Ore operations managed by Rio Tinto which allow their respective assets to be operated as a single integrated network across the Pilbara region. The arrangements are managed through two wholly owned subsidiaries: Pilbara Iron (Company) Services Pty Ltd and Pilbara Iron Pty Ltd. In assessing the Pilbara Iron arrangements, it has been concluded that they collectively constitute a joint operation on the basis that decisions about relevant activities require unanimous consent. The resulting efficiencies are shared between Rio Tinto and Robe River Iron Associates (Robe River), and the parties fund all of the cash flow requirements of Pilbara Iron (Company) Services Pty Ltd and Pilbara Iron Pty Ltd.

(d) Pechiney Reynolds Quebec Inc. has a 50.1% interest in the Aluminerie de Bécancour, Inc. aluminium smelter, which is located in Canada.

Notes to the 2019 financial statements continued

35 Principal joint ventures
At 31 December 2019

Company and country of incorporation/operation	Principal activities	Number of shares held	Class of shares held	Proportion of class held (%)	Group interest (%)
Chile					
Minera Escondida Ltda[a]	Copper mining and refining	—	—	—	30
Oman					
Sohar Aluminium Co. L.L.C.[b]	Aluminium smelting; power generation	37,500	Ordinary	20	20

This list includes only those joint ventures that have a more significant impact on the profit or operating assets of the Group. Refer to note 47 for a list of related undertakings.

The Group's principal joint ventures are held by intermediate holding companies and not directly by Rio Tinto plc or Rio Tinto Limited.

(a) Although the Group has a 30% interest in Minera Escondida Ltda, participant and management agreements provide for an Owners' Council whereby significant commercial and operational decisions about the relevant activities that significantly affect the returns that are generated in effect require the joint approval of both Rio Tinto and BHP Billiton (holders of a 57.5% interest). It is therefore determined that Rio Tinto has joint control.
The year end of Minera Escondida Ltda is 30 June. The amounts included in the consolidated financial statements of Rio Tinto are, however, based on accounts of Minera Escondida Limitada that are coterminous with those of the Group.

(b) Although the Group holds a 20% interest in Sohar Aluminium Co. L.L.C, decisions about relevant activities that significantly affect the returns that are generated require agreement of all parties to the arrangement. It is therefore determined that Rio Tinto has joint control.

Summary information for joint ventures that are material to the Group

This summarised financial information is shown on a 100% basis. It represents the amounts shown in the joint ventures' financial statements prepared in accordance with IFRS under Group accounting policies, including fair value adjustments and amounts due to and from Rio Tinto.

	Minera Escondida Ltda[a] 2019 US$m	Minera Escondida Ltda[a] 2018 US$m	Sohar Aluminum Co.L.L.C.[b] 2019 US$m	Sohar Aluminum Co.L.L.C.[b] 2018 US$m
Revenue	**7,120**	7,580	**715**	810
Depreciation and amortisation	**(1,693)**	(1,727)	**(115)**	(120)
Other operating costs	**(3,670)**	(3,230)	**(505)**	(440)
Operating profit	**1,757**	2,623	**95**	250
Finance expense	**(157)**	(163)	**(35)**	(35)
Income tax	**(627)**	(873)	**(10)**	(40)
Profit after tax	**973**	1,587	**50**	175
Other comprehensive loss	**(17)**	—	**—**	—
Total comprehensive income	**956**	1,587	**50**	175
Non-current assets	**12,450**	13,027	**3,045**	3,085
Current assets	**2,250**	2,413	**290**	340
Current liabilities	**(1,827)**	(1,637)	**(205)**	(230)
Non-current liabilities	**(4,670)**	(4,460)	**(845)**	(955)
Net assets	**8,203**	9,343	**2,285**	2,240
Assets and liabilities above include:				
– cash and cash equivalents	**603**	697	**20**	15
– current financial liabilities	**(807)**	(230)	**(110)**	(100)
– non-current financial liabilities	**(2,380)**	(2,763)	**(675)**	(795)
Dividends received from joint venture (Rio Tinto share)	**666**	786	**—**	—

Reconciliation of the above amounts to the investment recognised in the Group balance sheet

Group interest	30%	30%	20%	20%
Net assets	**8,203**	9,343	**2,285**	2,240
Group's ownership interest	**2,461**	2,803	**457**	448
Other adjustments	**—**	—	**—**	(1)
Carrying value of Group's interest	**2,461**	2,803	**457**	447

(a) In addition to its "Investment in equity accounted units", the Group recognises deferred tax liabilities of US$362 million (2018: US$413 million) relating to tax on unremitted earnings of equity accounted units.

(b) Under covenants stipulated in the agreement to Sohar Aluminium Co. L.L.C.'s secured loan facilities, Sohar Aluminium Co. L.L.C. is currently restricted from making any shareholder distributions until 2021 unless a specified amount of the loan facilities is funded.

36 Principal associates
At 31 December 2019

Company and country of incorporation/operation	Principal activities	Number of shares held	Class of shares held	Proportion of class held (%)	Group interest (%)
Australia					
Boyne Smelters Limited[a]	Aluminium smelting	153,679,560	Ordinary	59.4	59.4
Brazil					
Mineração Rio do Norte S.A.[b]	Bauxite mining	25,000,000,000	Ordinary	12.5	12
		47,000,000,000	Preferred	11.75	
US					
Halco (Mining) Inc.[c]		4,500	Common	45	45

This list includes only those associates that have a more significant impact on the profit or operating assets of the Group. Refer to note 47 for a list of related undertakings.

The Group's principal associates are held by intermediate holding companies and not directly by Rio Tinto plc or Rio Tinto Limited.

(a) The parties that collectively control Boyne Smelters Limited do so through decisions that are determined on an aggregate voting interest that can be achieved by several combinations of the parties. Although each combination requires Rio Tinto's approval, this is not joint control as defined under IFRS 11. Rio Tinto is therefore determined to have significant influence over this company.
(b) Although the Group holds only 12% of Mineração Rio do Norte S.A., it has representation on its board of directors and a consequent ability to participate in the financial and operating policy decisions. It is therefore determined that Rio Tinto has significant influence.
(c) Halco (Mining) Inc. has a 51% indirect interest in Compagnie des Bauxites de Guinée, a bauxite mine, the core assets of which are located in Guinea.

Summary information for associates that are material to the Group

This summarised financial information is shown on a 100% basis. It represents the amounts shown in the associate's financial statements prepared in accordance with IFRS under Group accounting policies, including fair value adjustments and amounts due to and from Rio Tinto.

	Boyne Smelters Limited[a] 2019 US$m	Boyne Smelters Limited[a] 2018 US$m
Revenue	—	—
Loss after tax	(7)	(12)
Other comprehensive loss[b]	(3)	(68)
Total comprehensive loss	(10)	(80)
Non-current assets	1,229	1,268
Current assets	96	93
Current liabilities	(114)	(113)
Non-current liabilities	(814)	(842)
Net assets	397	406

Reconciliation of the above amount to the investment recognised in the Group balance sheet

Group interest	59.4%	59.4%
Net assets	397	406
Group's ownership interest	236	241
Loans to equity accounted units	113	129
Carrying value of Group's interest	349	370

(a) *Boyne Smelters Limited is a tolling operation; as such it is dependent on its participants for funding which is provided through cash calls. Rio Tinto has made certain prepayments to Boyne for toll processing of alumina. These are charged to Group operating costs as processing takes place.*
(b) Other comprehensive loss" is net of amounts recognised by subsidiaries in relation to quasi equity loans.

Notes to the 2019 financial statements continued

36 Principal associates continued
Summary information for joint ventures and associates that are not individually material to the Group

	Joint Ventures 2019 US$m	Joint Ventures 2018 US$m	Associates 2019 US$m	Associates 2018 US$m
Carrying value of Group's interest	—	—	**704**	679
Profit after tax	—	—	**3**	9
Other comprehensive income	—	—	**10**	(23)
Total comprehensive income	—	—	**13**	(14)

37 Purchases and sales of subsidiaries, joint ventures, associates and other interests in businesses
Acquisitions
We have made no material acquisitions over the last three years.

In 2018, we created a joint venture, ELYSIS, with Alcoa and other partners to develop a carbon-free aluminium smelting process. We treated this as an acquisition and accounted for our interest in ELYSIS using the equity method. We invested cash of US$5 million and contributed patents and licensed intellectual property (IP) to the venture. The patents and IP had no carrying value; however, on formation of the arrangement, they were recorded at fair value to reflect the contributions of the other parties in the joint venture. This value was US$171 million (US$141 million after tax).

Also, in May 2017, our subsidiary, Simfer Jersey Limited (Rio Tinto share: 53%) purchased a 4.25% interest in Simfer SA from International Finance Corporation (IFC) for US$194 million in accordance with a put option exercised by IFC. As a result, we increased our effective share of Simfer SA from 42.80% to 45.05%.

2019 disposals
On 16 July 2019 we disposed of our entire 68.62% interest in Rössing Uranium to China National Uranium Corporation Limited for gross cash proceeds of US$6.5 million. After adjusting for cash held on Rössing's balance sheet at the date of disposal and included in the sale, we reported a net cash outflow of US$118 million and recognised a loss on disposal of US$289 million. This includes cumulative currency translation losses of US $212 million recycled from the currency translation reserve on sale of the business.

2018 disposals
On 1 June 2018 we disposed of our entire 75% interest in the Winchester South coal development project in Queensland, Australia to Whitehaven Coal Limited for US$200 million. This comprised US$150 million cash which was received during 2018 and an unconditional cash payment of US$50 million which was subsequently received in June 2019. Both *receipts were recognised within "net cash generated from operating* activities" within the cash flow statement. We recognised a gain on disposal of US$195 million within "profit relating to interests in undeveloped projects" in the income statement.

On 1 August 2018 we completed the sale of our entire interest in the Hail Creek coal mine (82.0%) and the Valeria coal development project (71.2%) in Queensland, Australia to Glencore for a total consideration of US$1.7 billion.

We received net proceeds of US$1,545 million after completion adjustments in respect of the Hail Creek component of this transaction, resulting in a pre-tax gain of US$1,141 million. During 2019 we received a further US$26 million relating to working capital adjustments in respect of this sale. We also received cash proceeds in 2018 of US$170 million in respect of Valeria. Of this amount, US$87 million, relating to the sale of land and investments in associates, was included in investing cash flow, resulting in a pre-tax gain of US$18 million. The remaining US$83 million proceeds were recognised in operating cash flow, resulting in a pre-tax gain of US$83 million in "profit relating to interests in undeveloped projects".

Also on 1 August 2018, we completed the sale of our entire interest in the Kestrel underground coal mine (80.0%) for US$2.25 billion to a consortium comprising EMR Capital (EMR) and PT Adaro Energy Tbk (Adaro). We received net cash proceeds of US$2,270 million, resulting in a pre-tax gain of US$1,010 million.

On 14 December 2018 we completed the sale of the Dunkerque aluminium smelter in northern France to Liberty House for US$500 million, subject to final adjustments. In 2018 we received net cash proceeds of US$385 million. We recognised a pre-tax gain on disposal of US$128 million.

On 21 December 2018 we sold our interest in the Grasberg mine for US$3.5 billion as part of a series of transactions involving Inalum (PT Indonesia Asahan Aluminium (Persero)) and Freeport-McMoRan Inc.. Of the US$3.5 billion received, US$107 million related to our attributable share of copper and gold revenues for 2018, net of our capital contribution for the year. The remaining net proceeds of US$3,392 million were included in investing cash flows and gave rise to a gain on disposal of US$2,146 million.

2017 disposals
On 1 September 2017, we disposed of our 100% shareholding in Coal & Allied Industries Limited to Yancoal Australia Limited for a total consideration of US$2.69 billion (before working capital adjustments). This comprised US$2.45 billion in cash paid on the closing date and a further US$240 million of unconditional guaranteed royalty payments. Total net cash proceeds received in 2017, net of working capital adjustments, transaction costs and cash transferred, were US$2.54 billion. This included receipt of US$110 million of the unconditional royalty payments. In 2018 we received a further US$90 million of unconditional royalty payments and in 2019 an additional US$20 million. We expect to receive the remaining US$20 million in two equal instalments in 2020 and 2021.

38 Directors' and key management remuneration

Aggregate remuneration, calculated in accordance with the UK Companies Act 2006, of the directors of the parent companies was as follows:

	2019 US$'000	2018 US$'000	2017 US$'000
Emoluments	**7,524**	9,069	8,339
Long-term incentive plans	**4,748**	2,923	4,685
	12,272	11,992	13,024
Pension contributions: defined contribution plans	**42**	80	135
Gains made on exercise of share options	**—**	107	—

The Group defines key management personnel as the directors and members of the Executive Committee. The Executive Committee comprises the executive directors, product group chief executive officers and Group executives. Details of the directors and members of the Executive Committee are shown in the Directors report on pages 84 to 87.

The aggregate remuneration including pension contributions incurred by Rio Tinto plc in respect of its directors was US$11,565,000 (2018: US$11,465,000; 2017: US$12,624,000). The aggregate pension contribution to defined contribution plans was US$42,000 (2018: US$80,000; 2017: US$135,000). The aggregate remuneration, including pension contributions and other retirement benefits, incurred by Rio Tinto Limited in respect of its directors was US$749,000 (2018: US$607,000; 2017: US$535,000). The aggregate pension contribution to defined contribution plans was US$nil (2018: US$nil; 2017: US$nil).

In 2019, 2018 and 2017, no directors accrued retirement benefits under defined benefit arrangements, and two directors (2018: three; 2017: two) accrued retirement benefits under defined contribution arrangements.

Emoluments included in the table above have been translated from local currency at the average exchange rate for the year with the exception of bonus payments, which have been translated at the year-end rate.

Detailed information concerning directors' remuneration, shareholdings and options is shown in the Remuneration report, including tables 1 to 3, on pages 110 to 138.

Aggregate compensation, representing the expense recognised under IFRS, as defined in note 1, of the Group's key management, including directors, was as follows:

	2019 US$'000	2018 US$'000	2017 US$'000
Short-term employee benefits and costs	**22,075**	23,978	23,095
Post-employment benefits	**477**	629	415
Employment termination benefits	**310**	69	—
Share-based payments	**17,632**	14,916	8,033
Total	**40,494**	39,592	31,543

The figures shown above include employment costs which comprise social security and accident premiums in Canada, the UK and US and payroll taxes in Australia paid by the employer as a direct additional cost of hire. In total, they amount to US$2,066,000 (2018: US$2,360,000; 2017: US$2,122,000) and, although disclosed here, are not included in table 1 of the Remuneration report.

More detailed information concerning the remuneration of key management is shown in the Remuneration report, including tables 1 to 3 on pages 110 to 138.

Notes to the 2019 financial statements continued

39 Auditors' remuneration

Group Auditors' remuneration[a]

	2019 US$m	2018 US$m	2017 US$m
Audit of the Group	**9.6**	9.2	6.2
Audit of subsidiaries	**6.8**	7.5	8.1
Total audit	**16.4**	16.7	14.3
Audit-related assurance service	**0.8**	0.9	1.0
Other assurance services[b]	**1.9**	3.3	2.3
Total assurance services	**2.7**	4.2	3.3
Tax compliance[c]	**0.1**	—	0.3
Tax advisory services[c]	**—**	—	0.2
Other non-audit services not covered above	**—**	0.2	0.7
Total non-audit services	**2.8**	4.4	4.5
Total Group auditors' remuneration	**19.2**	21.1	18.8
Audit fees payable to other accounting firms			
Audit of the financial statements of the Group's subsidiaries	**1.4**	1.4	2.0
Fees in respect of pension scheme audits	**0.1**	0.1	0.5
Total audit fees payable to other accounting firms	**1.5**	1.5	2.5

(a) The remuneration payable to PwC, the Group Auditors, is approved by the Audit Committee. The Committee sets the policy for the award of non-audit work to the auditors and approves the nature and extent of such work, and the amount of the related fees, to ensure that independence is maintained. The fees disclosed above consolidate all payments made to member firms of PwC by the companies and their subsidiaries, along with fees in respect of joint operations paid for by the Group. Non-audit services arise largely from assurance and/or regulation related work.
(b) Other assurance services relates to the review of non-statutory financial information including sustainability reporting.
(c) Tax compliance involves the review of returns for corporation, income and excise taxes.

40 Related-party transactions

Information about material related-party transactions of the Rio Tinto Group is set out below.

Subsidiary companies and joint operations

Details of investments in principal subsidiary companies are disclosed in note 33. Information relating to joint operations can be found in note 34.

Equity accounted units

Transactions and balances with equity accounted units are summarised below. Purchases, trade and other receivables, and trade and other payables relate largely to amounts charged by equity accounted units for toll processing of alumina and purchasing of bauxite and aluminium. Sales relate largely to sales of alumina to equity accounted units for smelting into aluminium.

	Note	2019 US$m	2018 US$m	2017 US$m
Income statement items				
Purchases from equity accounted units		**(1,155)**	(1,209)	(993)
Sales to equity accounted units		**268**	493	210
Cash flow statement items				
Dividends from equity accounted units		**669**	800	817
Net funding of equity accounted units		**(33)**	(9)	(3)
Balance sheet items				
Investments in equity accounted units[a]	15	**3,971**	4,299	4,486
Loans to equity accounted units	20	**39**	38	39
Loans from equity accounted units	22	**—**	—	(31)
Trade and other receivables: amounts due from equity accounted units[b]	18	**259**	278	299
Trade and other payables: amounts due to equity accounted units	25	**(271)**	(223)	(175)

(a) Investments in equity accounted units include quasi equity loans. Further information about investments in equity accounted units is set out in notes 35 and 36.
(b) This includes prepayments of tolling charges.

Pension funds

Information relating to pension fund arrangements is set out in note 44.

Directors and key management

Details of directors' and key management's remuneration are set out in note 38 and in the Remuneration report on pages 110 to 138.

41 Exchange rates in US$

The principal exchange rates used in the preparation of the 2019 financial statements were:

	Full-year average			Year-end		
	2019	2018	2017	**2019**	2018	2017
Sterling	**1.28**	1.34	1.29	**1.31**	1.27	1.34
Australian dollar	**0.70**	0.75	0.77	**0.70**	0.70	0.78
Canadian dollar	**0.75**	0.77	0.77	**0.77**	0.73	0.79
Euro	**1.12**	1.18	1.13	**1.12**	1.14	1.20
South African rand	**0.069**	0.076	0.075	**0.071**	0.069	0.081

42 Events after the balance sheet date

On 12 February 2020, we announced that we will conduct a strategic review of the ISAL smelter in Iceland to determine the operation's ongoing viability and explore options to improve its competitive position. We expect to complete the review in the first half of 2020.

On 20 February 2020, our subsidiary Energy Resources of Australia Ltd (ERA) announced the completion of an entitlement offer, which was underwritten by the Group. As a result of the issue of new shares to the Group, our interest in ERA has increased from 68.39% to 86.33%.

43 Share-based payments

Rio Tinto plc and Rio Tinto Limited have a number of share-based incentive plans, which are described in detail in the Remuneration report. These plans have been accounted for in accordance with the fair value recognition provisions of IFRS 2 "Share-based Payment".

The charge that has been recognised in the income statement for Rio Tinto's share-based incentive plans, and the related liability (for cash-settled plans), is set out in the table below.

	Charge recognised for the year			Liability at the end of the year	
	2019 US$m	2018 US$m	2017 US$m	**2019 US$m**	2018 US$m
Equity-settled plans	**118**	118	88	**—**	—
Cash-settled plans	**5**	4	3	**19**	16
Total	**123**	122	91	**19**	16

The main Rio Tinto plc and Rio Tinto Limited plans are as follows:

UK Share Plan (formerly the Share Ownership Plan)

The fair values of Matching and Free Shares made by Rio Tinto plc are taken to be the market value of the shares on the date of purchase. These awards are settled in equity.

Equity Incentive Plan

In 2018, shareholders approved the introduction of the Rio Tinto 2018 Equity Incentive Plan (the "EIP"). From 2018, all long-term incentive awards have been granted under this umbrella plan which allows for awards in the form of Performance Share Awards (PSA), Management Share Awards (MSA) and Bonus Deferral Awards (BDA) to be granted.

Performance Share Awards (Performance Share Plans prior to 2018)

Participants are generally assigned shares in settlement of their PSA on vesting and therefore the awards are accounted for in accordance with the requirements applying to equity-settled share-based payment transactions, including the dividends accumulated from date of award to vesting.

For the parts of awards with Total Shareholder Return (TSR) performance conditions, the fair value of the awards is calculated using a Monte Carlo simulation model taking into account the TSR performance conditions. One third of the awards granted up to 2017 (inclusive) are subject to an earnings margin performance target relative to ten global mining comparators. As this is a non-market related performance condition, under IFRS 2, the fair value recognised is reviewed at each accounting date based on the directors' expectations for the proportion vesting. Forfeitures prior to vesting are assumed at 5% per annum of outstanding awards (2018: 5% per annum).

For grants made from 2018, the earnings margin performance target applying to the PSA was removed and instead all of the awards are subject to the TSR performance conditions described above and in the Remuneration report.

Management Share Awards (Management Share Plans prior to 2018)

The vesting of these awards is dependent on service conditions being met. In general, the awards will be settled in equity, including the dividends accumulated from date of award to vesting. The awards are accounted for in accordance with the requirements applying to equity-settled share-based payment transactions.

The fair value of each award on the day of grant is equal to the share price on the day of grant less a small adjustment for the timing of dividends. For awards granted since 2017 this adjustment is negligible and therefore the fair value of each award is equal to the share price on the day of grant. Forfeitures prior to vesting are assumed at 7% per annum of outstanding awards (2018: 7% per annum).

Notes to the 2019 financial statements continued

43 Share-based payments continued

Bonus Deferral Awards (Bonus Deferral Plans prior to 2018)

Bonus Deferral Awards (BDA) provide for with the mandatory deferral of 50% of the bonuses for executive directors and Executive Committee members and 25% of the bonuses for other executives.

The vesting of these awards is dependent only on service conditions being met. In general, the awards will be settled in equity including the dividends accumulated from date of award to vesting. The awards are accounted for in accordance with the requirements applying to equity-settled share-based payment transactions. The fair value of each award on the day of grant is equal to the share price on the day of grant less a small adjustment for the timing of dividends. For awards granted since 2017 this adjustment is negligible and therefore the fair value of each award is equal to the share price on the day of grant. Forfeitures prior to vesting are assumed at 3% per annum of outstanding awards (2018: 3% per annum).

Share Option Plans

Awards are no longer granted under the Share Option Plans and all charges have been incurred as the remaining awards all vested before 2018. No awards remained outstanding under these plans at 31 December 2019 as the remaining vested options were exercised during 2019.

Global Employee Share Plans

The Global Employee Share Plans were introduced in 2012. The companies provide a matching share award for each investment share purchased by a participant. The vesting of these matching awards is dependent on service conditions being met and the continued holding of investment shares by the participant until vesting. These awards are settled in equity including the dividends accumulated from date of award to vesting. The fair value of each matching share on the day of grant is equal to the share price on the date of purchase less a deduction of 15% for cancellations (caused by employees electing to withdraw their investment shares before vesting of their matching shares). Forfeitures prior to vesting are assumed at 5% per annum of outstanding awards (2018: 5% per annum).

Summary of options outstanding

As at 31 December 2019 there were no options outstanding under the Rio Tinto Plc or the Rio Tinto Limited Share Option Plan. As at 31 December 2018 there were 40,114 options outstanding with an aggregate intrinsic value of US$1 million.

The Management Share Plans, Performance Share Plans, Bonus Deferral Plans, Equity Incentive Plans, Global Employee Share Plans and UK Share Plan together represent 100% (2018: 100%) of the total IFRS 2 charge for Rio Tinto plc and Rio Tinto Limited plans in 2019.

Performance Share Awards (granted under either the Performance Share Plans or the Equity Incentive Plans)

	Rio Tinto plc awards				Rio Tinto Limited awards			
	2019 number	Weighted average fair value at grant date 2019 £	2018 number	Weighted average fair value at grant date 2018 £	2019 number	Weighted average fair value at grant date 2019 A$	2018 number	Weighted average fair value at grant date 2018 A$
Non-vested shares at 1 January	**3,845,082**	**21.86**	3,555,274	20.47	**1,797,279**	**43.34**	1,609,154	40.13
Awarded	**755,735**	**24.68**	801,047	26.87	**297,189**	**54.55**	387,298	53.85
Forfeited	**(122,961)**	**23.95**	(188,761)	21.45	**(126,775)**	**44.02**	(36,530)	43.83
Failed performance conditions	**(384,130)**	**23.79**	(107,625)	14.54	**(188,956)**	**46.42**	(54,322)	27.67
Vested	**(290,332)**	**21.36**	(214,853)	21.57	**(142,220)**	**41.72**	(108,321)	40.85
Non-vested shares at 31 December	**3,803,394**	**22.20**	3,845,082	21.86	**1,636,517**	**45.11**	1,797,279	43.34

	Rio Tinto plc awards				Rio Tinto Limited awards			
	2019 number	Weighted average fair value at grant date 2019 £	2018 number	Weighted average fair value at grant date 2018 £	2019 number	Weighted average fair value at grant date 2019 A$	2018 number	Weighted average fair value at grant date 2018 A$
Vested awards settled in shares during the year (including dividend shares applied on vesting)	**339,821**	**45.52**	248,965	42.57	**151,607**	**100.30**	105,374	82.97
Vested awards settled in cash during the year (including dividend shares applied on vesting)	**1,279**	**43.65**	991	42.40	**1,347**	**92.97**	9,959	82.08

In addition to the equity-settled awards shown above, there were 49,019 Rio Tinto plc and 276,722 Rio Tinto Limited cash-settled awards outstanding at 31 December 2019 (2018: 40,365 Rio Tinto plc and 276,722 Rio Tinto Limited cash-settled awards outstanding). The total liability for these awards at 31 December 2019 was US$13 million (2018: US$11 million).

Management Share Awards, Bonus Deferral Awards (granted under the Management Share Plans, Bonus Deferral Plans or Equity Incentive Plans), Global Employee Share Plans and UK Share Plan (combined)

	Rio Tinto plc awards[a]				Rio Tinto Limited awards			
	2019 number	Weighted average fair value at grant date 2019 £	2018 number	Weighted average fair value at grant date 2018 £	2019 number	Weighted average fair value at grant date 2019 A$	2018 number	Weighted average fair value at grant date 2018 A$
Non-vested awards at 1 January	**3,042,020**	**31.43**	3,473,092	27.23	**2,613,930**	**61.71**	2,933,237	54.15
Awarded	**1,043,817**	**40.41**	1,135,103	39.49	**846,008**	**86.56**	943,315	78.36
Forfeited	**(224,402)**	**39.46**	(250,853)	30.26	**(174,025)**	**72.18**	(185,062)	64.60
Cancelled	**(24,043)**	**32.87**	(33,563)	26.52	**(35,481)**	**60.91**	(36,613)	52.84
Vested	**(1,224,379)**	**25.40**	(1,281,759)	27.54	**(976,763)**	**49.39**	(1,040,947)	55.30
Non-vested shares at 31 December	**2,613,013**	**37.14**	3,042,020	31.43	**2,273,669**	**75.46**	2,613,930	61.71
Comprising:								
– Management Share Awards	**1,398,039**	**38.68**	1,666,082	32.52	**1,363,601**	**78.67**	1,520,292	64.06
– Bonus Deferral Awards	**192,878**	**41.95**	203,900	37.86	**87,930**	**87.81**	127,423	71.93
– Global Employee Share Plan	**982,932**	**33.98**	1,102,322	28.68	**822,138**	**68.82**	966,215	56.66
– UK Share Plan	**39,164**	**37.86**	69,716	29.90	—	—	—	—

	2019 number	Weighted average fair value at grant date 2019 £	2018 number	Weighted average fair value at grant date 2018 £	2019 number	Weighted average fair value at grant date 2019 A$	2018 number	Weighted average fair value at grant date 2018 A$
Vested awards settled in shares during the year (including dividend shares applied on vesting):								
– Management Share Awards	**681,242**	**43.68**	669,678	40.03	**582,948**	**93.05**	570,173	80.87
– Bonus Deferral Awards	**163,076**	**42.53**	221,198	37.69	**85,142**	**97.30**	108,001	75.36
– Global Employee Share Plan	**543,426**	**43.04**	451,710	39.06	**421,614**	**91.50**	473,420	78.78
– UK Share Plan	**34,196**	**42.21**	16,968	38.21	—	—	—	—

(a) Awards of Rio Tinto American Depository Receipts (ADRs) under the Global Employee Share Plan are included within the totals for Rio Tinto plc awards for the purpose of these tables.

In addition to the equity-settled awards shown above, there were 52,881 Rio Tinto plc and 81,050 Rio Tinto Limited cash-settled awards outstanding at 31 December 2019 (2018: 46,543 Rio Tinto plc and 83,092 Rio Tinto Limited cash-settled awards outstanding). The total liability for these awards at 31 December 2019 was US$6 million (2018: US$5 million).

Notes to the 2019 financial statements continued

44 Post-retirement benefits

Description of plans

The Group operates a number of pension and post-retirement healthcare plans around the world. Some of these plans are defined contribution and some are defined benefit, with assets held in separate trusts, foundations and similar entities.

Defined benefit pension and post-retirement healthcare plans expose the Group to a number of risks:

Uncertainty in benefit payments	The value of the Group's liabilities for post-retirement benefits will ultimately depend on the amount of benefits paid out. This in turn will depend on the level of future pay increases, the level of inflation (for those benefits that are subject to some form of inflation protection) and how long individuals live.
Volatility in asset values	The Group is exposed to future movements in the values of assets held in pension plans to meet future benefit payments.
Uncertainty in cash funding	Movements in the values of the obligations or assets may result in the Group being required to provide higher levels of cash funding, although changes in the level of cash required can often be spread over a number of years. In some countries control over the rate of cash funding or over the investment policy for pension assets might rest to some extent with a trustee body or other body that is not under the Group's direct control. In addition the Group is also exposed to adverse changes in pension regulation.

For these reasons the Group has a policy of moving away from defined benefit pension provisions and towards defined contribution arrangements instead. The defined benefit pension plans for salaried employees are closed to new entrants in almost all countries. For unionised employees, some plans remain open.

The Group does not usually participate in multi-employer plans in which the risks are shared with other companies using those plans. The Group's participation in such plans is immaterial and consequently no detailed disclosures are provided in this note.

Pension plans

The majority of the Group's defined benefit pension obligations are in Canada, the UK, the US and Switzerland.

In Canada the benefits for salaried staff are generally linked to final average pay and the plans are generally closed to new entrants. Benefits for bargaining employees are reviewed in negotiation with unions and are typically either linked to final average pay or to a flat monetary amount per year of service. New employees join arrangements which are defined contribution from the Group's perspective, with any required additional funding being provided by employees. The plans are subject to the regulatory requirements that apply to Canadian pension plans in the relevant provinces and territories (predominantly Quebec). Pension Committees are responsible for ensuring that the plans operate in a manner that is compliant with the relevant regulations. The Pension Committees generally have a number of members appointed by the sponsor and a number appointed by the plan participants. In some cases there is also an independent Committee member.

The defined benefit sections of the UK arrangements are linked to final pay. New employees are admitted to defined contribution sections. The plans are subject to the regulatory requirements that apply to UK pension plans. Trustees are responsible for ensuring that the plans operate in a manner that is compliant with UK regulations. The trustee board governing the main UK plans has a number of directors appointed by the sponsor, a number appointed by the plan participants and an independent trustee director.

A number of defined benefit pension plans are sponsored by the US entities. Benefits for salaried staff are generally linked to final average pay. Benefits for bargaining employees are reviewed in negotiation with unions and are typically a flat monetary amount per year of service. New employees are admitted to defined contribution plans. A Benefits Governance Committee is responsible for ensuring that the plans are compliant with US regulations. Members of that Committee are appointed by the sponsor.

In Europe, there are defined benefit plans in Switzerland, Germany and France. The largest single plan is in Switzerland and provides benefits linked to final average pay. The Swiss plan is overseen by a foundation board which is responsible for ensuring that the plan complies with Swiss regulations. Foundation board members are appointed by the plan sponsor, by employees and by retirees.

In Australia, the main arrangements are principally defined contribution in nature but there are sections providing defined benefits linked to final pay, typically paid in lump sum form. These arrangements are managed by an independent financial institution. Rio Tinto may nominate candidates to be considered for appointment to the governing board, as may other employers. One third of the board positions are nominated by employers, with the remaining positions being filled by independent directors and directors nominated by participants.

The Group also operates a number of unfunded defined benefit plans, which are included in the figures below.

Post-retirement healthcare plans

Certain subsidiaries of the Group, mainly in the US and Canada, provide health and life insurance benefits to retired employees and in some cases to their beneficiaries and covered dependants. Eligibility for cover is dependent upon certain age and service criteria. These arrangements are generally unfunded, and are included in the figures below.

Plan assets

The assets of the pension plans are invested predominantly in a diversified range of equities, bonds and property. Consequently, the funding level of the pension plans is affected by movements in the level of equity markets and also by movements in interest rates. The Group monitors its exposure to changes in interest rates and equity markets and also measures its balance sheet pension risk using a value at risk approach. These measures are considered when deciding whether significant changes in investment strategy are required. Investment strategy reviews are conducted on a periodic basis for the main pension plans to determine the optimal investment mix bearing in mind the Group's tolerance for risk, the risk tolerance of the local sponsor companies and the views of the Pension Committees and trustee boards who are legally responsible for the investments of the plans. In Canada, the UK and Switzerland, the Group works with the governing bodies to ensure that the investment policy adopted is consistent with the Group's tolerance for risk. In the US the Group has direct control over the investment policy, subject to local investment regulations.

The proportions of the total fair value of assets in the pension plans for each asset class at the balance sheet date were:

	2019		2018	
Equities	**20.4%**		20.7%	
– Quoted		**17.0%**		16.7%
– Private		**3.4%**		4.0%
Bonds	**63.4%**		63.6%	
– Government fixed income		**18.4%**		18.0%
– Government inflation-linked		**16.2%**		15.5%
– Corporate and other publicly quoted		**24.1%**		27.1%
– Private		**4.7%**		3.0%
Property	**8.8%**		11.0%	
– Quoted property funds		**3.4%**		5.1%
– Unquoted property funds		**5.4%**		5.9%
Qualifying insurance policies	**3.1%**		0.1%	
Cash & other	**4.3%**		4.6%	
Total	**100.0%**		100.0%	

The assets of the plans are managed on a day-to-day basis by external specialist fund managers. These managers may invest in the Group's securities subject to limits imposed by the relevant fiduciary committees and local legislation. The approximate total holding of Group securities within the plans is US$3 million (2018: US$3 million).

The holdings of quoted equities are invested either in pooled funds or segregated accounts held in the name of the relevant pension funds. These equity portfolios are well diversified in terms of the geographic distribution and market sectors.

The holdings of government bonds are generally invested in the debt of the country in which a pension plan is situated. Corporate and other quoted bonds are usually of investment grade. Private debt is mainly held in the North American and UK pension funds and is invested in North American and European companies.

The property funds are invested in a diversified range of properties.

The holdings of cash & other are predominantly cash and short-term money market instruments.

Investments in private equity, private debt and property are less liquid than the other investment classes listed above and therefore the Group's investment in those asset classes is restricted to a level that does not endanger the liquidity of the pension plans.

The Group makes limited use of futures, repurchase agreements and other instruments to manage the interest rate risk in some of its plans in North America. Fund managers may also use derivatives to hedge currency movements within their portfolios and, in the case of bond managers, to take positions that could be taken using direct holdings of bonds but more efficiently.

Maturity of defined benefit obligations
An approximate analysis of the maturity of the obligations is given in the table below:

	Pension benefits	Other benefits	2019 Total	2018 Total	2017 Total
Proportion relating to current employees	20%	19%	**20%**	19%	20%
Proportion relating to former employees not yet retired	12%	0%	**12%**	11%	11%
Proportion relating to retirees	68%	81%	**68%**	70%	69%
Total	100%	100%	**100%**	100%	100%
Average duration of obligations (years)	14.5	13.4	**14.4**	13.4	13.9

Geographical distribution of defined benefit obligations
An approximate analysis of the geographic distribution of the obligations is given in the table below:

	Pension benefits	Other benefits	2019 Total	2018 Total	2017 Total
Canada	54%	44%	**53%**	48%	49%
UK	30%	2%	**28%**	28%	27%
US	7%	51%	**10%**	14%	14%
Switzerland	5%	0%	**5%**	5%	5%
Other	4%	3%	**4%**	5%	5%
Total	100%	100%	**100%**	100%	100%

Notes to the 2019 financial statements continued

44 Post-retirement benefits continued

Total expense recognised in the income statement

	Pension benefits US$m	Other benefits US$m	2019 Total US$m	2018 Total US$m	2017 Total US$m
Current employer service cost for defined benefit plans	(119)	(6)	**(125)**	(165)	(155)
Past service (cost)/income	—	—	**—**	(36)	4
Curtailment gains	—	—	**—**	2	1
Settlement gains	51	—	**51**	5	1
Net interest on net defined benefit liability	(22)	(36)	**(58)**	(79)	(79)
Non-investment expenses paid from the plans	(14)	—	**(14)**	(15)	(17)
Total defined benefit expense	(104)	(42)	**(146)**	(288)	(245)
Current employer service cost for defined contribution and industry-wide plans	(235)	(3)	**(238)**	(244)	(255)
Total expense recognised in the income statement	(339)	(45)	**(384)**	(532)	(500)

The above expense amounts are included as an employee cost within net operating costs. No amounts have been excluded from underlying earnings in 2019, 2018 or 2017.

The settlement gains in 2019 and 2018 were the result of certain US obligations being transferred to external insurance companies and of certain US obligations being settled through a lump sum window exercise being offered to members with a deferred pension. The past service cost in 2018 related primarily to benefit amendments in the US and also included US$9 million to reflect the estimated cost of equalising benefits in the Group's UK schemes, in line with the requirements of the court judgment on 26 October 2018 in the case involving Lloyds Banking Group and relating to Guaranteed Minimum Pensions.

Total amount recognised in other comprehensive income before tax

	2019 US$m	2018 US$m	2017 US$m
Actuarial (losses)/gains	**(1,295)**	1,382	(855)
Return on assets (net of interest on assets)	**1,033**	(527)	894
Gain/(loss) on application of asset ceiling	**—**	52	(33)
Total (loss)/gain recognised in other comprehensive income	**(262)**	907	6

Amounts recognised in the balance sheet

The following amounts were measured in accordance with IAS 19 at 31 December:

	Pension benefits US$m	Other benefits US$m	2019 Total US$m	2018 Total US$m
Total fair value of plan assets	13,923	—	**13,923**	13,203
Present value of obligations – funded	(14,311)	—	**(14,311)**	(13,482)
Present value of obligations – unfunded	(443)	(899)	**(1,342)**	(1,272)
Present value of obligations – total	(14,754)	(899)	**(15,653)**	(14,754)
Effect of asset ceiling	—	—	**—**	—
Net deficit to be shown in the balance sheet	(831)	(899)	**(1,730)**	(1,551)
Comprising:				
– Deficits	(1,815)	(899)	**(2,714)**	(2,486)
– Surpluses	984	—	**984**	935
Net deficits on pension plans	(831)	—	**(831)**	(680)
Unfunded post-retirement healthcare obligation	—	(899)	**(899)**	(871)

The surplus amounts shown above are included in the balance sheet as Trade and other receivables. See note 18.

Deficits are shown in the balance sheet within Provisions (including post-retirement benefits). See note 26.

Funding policy and contributions to plans

The Group reviews the funding position of its major pension plans on a regular basis and considers whether to provide funding above the minimum level required in each country. In Canada and the US the minimum level is prescribed by legislation. In the UK and Switzerland the minimum level is negotiated with the local trustee or foundation in accordance with the funding guidance issued by the local regulators. In deciding whether to provide funding above the minimum level the Group takes into account other possible uses of cash within the Group, the tax situation of the local sponsoring entity and any strategic advantage that the Group might obtain by accelerating contributions. The Group does not generally pre-fund post-retirement healthcare arrangements.

	Pension benefits US$m	Other benefits US$m	**2019 Total US$m**	2018 Total US$m	2017 Total US$m
Contributions to defined benefit plans	223	34	**257**	248	404
Contributions to defined contribution plans	232	3	**235**	244	243
Contributions to industry-wide plans	—	—	**—**	—	12
Total	455	37	**492**	492	659

The level of surplus in the Rio Tinto Pension Fund in the UK is now such that it may be used to pay for the employer contributions to the defined contribution section of that Fund, in accordance with the funding arrangements agreed with the Trustee of that Fund. Consequently, the cash paid to defined contribution plans is lower than the defined contribution service cost by $3 million. Contributions to defined benefit pension plans are kept under regular review and actual contributions will be determined in line with the Group's wider financing strategy, taking into account relevant minimum funding requirements. As contributions to many plans are reviewed on at least an annual basis, the contributions for 2020 and subsequent years cannot be determined precisely in advance. Most of the Group's largest pension funds are fully funded on their local funding basis and do not require long-term funding commitments at present. Contributions to defined benefit pension plans for 2020 are estimated to be around US$160 million but may be higher or lower than this depending on the evolution of financial markets and voluntary funding decisions taken by the Group. Contributions for subsequent years are expected to be at similar levels to 2020. Healthcare plans are generally unfunded and contributions for future years will be equal to benefit payments net of participant contributions. The Group's contributions in 2020 are expected to be similar to the amounts paid in 2019.

Movements in the net defined benefit liability

A summary of the movement in the net defined benefit liability is shown in the first table below. The subsequent tables provide a more detailed analysis of the movements in the present value of the obligations, the fair value of assets and the effect of the asset ceiling.

The amounts shown below include, where appropriate, 100% of the costs, contributions, gains and losses in respect of employees who participate in the plans and who are employed in associates and joint arrangements. Consequently, the costs, contributions, gains and losses may not correspond directly to the amounts disclosed above in respect of the Group. Defined contribution plans and industry-wide plans are excluded from the movements below.

	Pension benefits US$m	Other benefits US$m	**2019 Total US$m**	2018 Total US$m
Change in the net defined benefit liability				
Net defined benefit liability at the start of the year	(680)	(871)	**(1,551)**	(2,499)
Amounts recognised in Income statement	(104)	(42)	**(146)**	(288)
Amounts recognised in Other comprehensive income	(259)	(3)	**(262)**	907
Employer contributions	223	34	**257**	248
Arrangements added/divested	(5)	—	**(5)**	(10)
Assets transferred to defined contribution section	(3)	—	**(3)**	—
Currency exchange rate loss	(3)	(17)	**(20)**	91
Net defined benefit liability at the end of the year	(831)	(899)	**(1,730)**	(1,551)

	Pension benefits US$m	*Other benefits US$m*	**2019 Total US$m**	2018 Total US$m
Change in present value of obligation				
Present value of obligation at the start of the year	(13,883)	(871)	**(14,754)**	(17,645)
Current employer service costs	(119)	(6)	**(125)**	(165)
Past service cost	—	—	**—**	(36)
Curtailments	—	—	**—**	2
Settlements	638	—	**638**	299
Interest on obligation	(440)	(36)	**(476)**	(503)
Contributions by plan participants	(23)	—	**(23)**	(24)
Benefits paid	828	34	**862**	915
Experience gains	48	63	**111**	32
Changes in financial assumptions (loss)/gain	(1,355)	(92)	**(1,447)**	1,349
Changes in demographic assumptions gain	15	26	**41**	1
Arrangements (added)/divested	(5)	—	**(5)**	94
Currency exchange rate (loss)/gain	(458)	(17)	**(475)**	927
Present value of obligation at the end of the year	(14,754)	(899)	**(15,653)**	(14,754)

Notes to the 2019 financial statements continued

44 Post-retirement benefits continued

	Pension benefits US$m	Other benefits US$m	2019 Total US$m	2018 Total US$m
Change in plan assets				
Fair value of plan assets at the start of the year	13,203	—	**13,203**	15,257
Settlements	(587)	—	**(587)**	(294)
Interest on assets	418	—	**418**	434
Contributions by plan participants	23	—	**23**	24
Contributions by employer	223	34	**257**	248
Benefits paid	(828)	(34)	**(862)**	(915)
Non-investment expenses	(14)	—	**(14)**	(15)
Return on plan assets (net of interest on assets)	1,033	—	**1,033**	(527)
Arrangements divested	—	—	**—**	(161)
Assets transferred to defined contribution section	(3)	—	**(3)**	—
Currency exchange rate gain/(loss)	455	—	**455**	(848)
Fair value of plan assets at the end of the year	13,923	—	**13,923**	13,203

	Pension benefits US$m	Other benefits US$m	2019 Total US$m	2018 Total US$m
Change in the effect of the asset ceiling				
Effect of the asset ceiling at the start of the year	—	—	—	(111)
Interest on the effect of the asset ceiling	—	—	—	(10)
Movement in the effect of the asset ceiling	—	—	—	52
Arrangements divested and other transfers	—	—	—	57
Currency exchange rate gain	—	—	—	12
Effect of the asset ceiling at the end of the year	—	—	—	—

Most of the settlement amounts shown above relate to the US, where assets and obligations for some pensions in payment were transferred to insurance companies. Obligations were also settled through a lump sum window exercise being offered to members with a deferred pension in the US.

In determining the extent to which the asset ceiling has an effect, the Group considers the funding legislation in each country and the rules specific to each pension plan. The calculation takes into account any minimum funding requirements that may be applicable to the plan, whether any reduction in future Group contributions is available, and whether a refund of surplus may be available. In considering whether any refund of surplus is available the Group considers the powers of trustee boards and similar bodies to augment benefits or wind up a plan. Where such powers are unilateral, the Group does not consider a refund to be available at the end of the life of a plan. Where the plan rules and legislation both permit the employer to take a refund of surplus, the asset ceiling may have no effect, although it may be the case that a refund will only be available many years in the future.

Main assumptions (rates per annum)

The main assumptions for the valuations of the plans under IAS 19 are set out below.

	Canada	UK	US	Switzerland
At 31 December 2019				
Discount rate	**3.1%**	**2.0%**	**3.1%**	**0.2%**
Inflation[a]	**1.6%**	**2.9%**	**2.0%**	**1.1%**
Rate of increase in pensions	**0.1%**	**2.5%**	**0.0%**	**0.2%**
Rate of increase in salaries	**2.8%**	**3.5%**	**3.5%**	**2.1%**
At 31 December 2018				
Discount rate	3.9%	2.8%	4.2%	0.7%
Inflation[a]	1.6%	3.3%	2.0%	1.2%
Rate of increase in pensions	0.2%	2.9%	0.0%	0.0%
Rate of increase in salaries	2.9%	3.7%	3.5%	2.2%

(a) The inflation assumption shown for the UK is for the Retail Price Index. The assumption for the Consumer Price Index at 31 December 2019 was 2.0% (2018: 2.2%).

The main financial assumptions used for the healthcare plans, which are predominantly in the US and Canada, were: discount rate: 3.3% (2018: 4.2%); medical trend rate: 6.1% reducing to 4.6% by the year 2029 broadly on a straight line basis (2018: 7.6%, reducing to 4.6% by the year 2029); claims costs based on individual company experience.

For both the pension and healthcare arrangements the post-retirement mortality assumptions allow for future improvements in longevity. The mortality tables used imply that a man aged 60 at the balance sheet date has a weighted average expected future lifetime of 27 years (2018: 27 years) and that a man aged 60 in 2039 would have a weighted average expected future lifetime of 28 years (2018: 28 years).

Sensitivity

The values reported for the defined benefit obligations are sensitive to the actuarial assumptions used for projecting future benefit payments and discounting those payments. In order to estimate the sensitivity of the obligations to changes in assumptions, we calculate what the obligations would be if we were to make changes to each of the key assumptions in isolation. The difference between this figure and the figure calculated using our stated assumptions is an indication of the sensitivity to changes in each assumption. The results of this sensitivity analysis are summarised in the table below. Note that this approach is valid for small changes in the assumptions but will be less accurate for larger changes in the assumptions. The sensitivity to inflation includes the impact on pension increases, which are generally linked to inflation where they are granted.

		2019		2018	
		Approximate (increase)/ decrease in obligations		Approximate (increase)/ decrease in obligations	
Assumption	Change in assumption	Pensions US$m	Other US$m	Pensions US$m	Other US$m
Discount rate	Increase of 0.5 percentage points	**894**	**56**	782	51
	Decrease of 0.5 percentage points	**(1,057)**	**(60)**	(832)	(55)
Inflation	Increase of 0.5 percentage points	**(447)**	**(17)**	(389)	(17)
	Decrease of 0.5 percentage points	**422**	**15**	369	15
Salary increases	Increase of 0.5 percentage points	**(55)**	**(1)**	(46)	(1)
	Decrease of 0.5 percentage points	**54**	**1**	45	1
Demographic – allowance for future improvements in longevity	Participants assumed to have the mortality rates of individuals who are one year older	**443**	**18**	381	18
	Participants assumed to have the mortality rates of individuals who are one year younger	**(465)**	**(18)**	(381)	(18)

45 New standards and interpretations adopted in the current year

This note explains the impact of the adoption of IFRS 16 "Leases" and IFRIC 23 "Uncertainty over Income Tax Treatments" on the Group's financial statements. The new accounting policies applied from 1 January 2019 are set out in note 1. Our previous accounting policy on current tax is included below. In addition, the Group early adopted "Amendments to IFRS 9, IAS 39 and IFRS 7 - Interest rate benchmark reform" and applied it retrospectively; an explanation of our adoption of these amendments is given below. The adoption of "Amendments to IAS 19 - Plan Amendment, Curtailment or Settlement" and other minor changes to IFRS applicable to 2019 did not have a significant impact on the Group's financial statements.

The impact on Equity attributable to owners of Rio Tinto as at 1 January 2019 from the adoption of IFRS 16 and IFRIC 23 is as follows:

	US$m
Equity attributable to owners of Rio Tinto at 31 December 2018	**43,686**
IFRS 16 net impact from recognising lease liabilities, right of use assets and other items after tax	(69)
IFRIC 23 recognition of provisions for uncertain tax positions on a weighted average basis	(44)
Restated equity attributable to owners of Rio Tinto as at 1 January 2019	**43,573**

IFRS 16 "Leases"

The Group implemented the standard as at 1 January 2019. For contracts in place at this date, the Group continued to apply its existing definition of leases under the previous standards, IAS 17 "Leases" and IFRIC 4 "Determining Whether an Arrangement Contains a Lease" ("grandfathering"), instead of reassessing whether existing contracts were or contained a lease at the date of application of the new standard.

For transition, as permitted by IFRS 16, the Group applied the modified retrospective approach to existing operating leases which are capitalised under the new standard (i.e. retrospectively, with the cumulative effect recognised at the date of initial application as an adjustment to the opening balance of retained earnings with no restatement of comparative information in the financial statements). For existing finance leases, the carrying amounts before transition represented the 31 December 2018 values assigned to the right of use asset and lease liability.

Notes to the 2019 financial statements continued

45 New standards and interpretations adopted in the current year continued

The Group made the following additional choices, as permitted by IFRS 16, for existing operating leases:

- not to bring leases with 12 months or fewer remaining to run as at 1 January 2019 (including reasonably certain options to extend) on balance sheet. Costs for these items continue to be expensed directly to the income statement.
- for all leases, the lease liability was measured at 1 January 2019 as the present value of any future lease payments discounted using the appropriate incremental borrowing rate. The carrying value of the right of use asset for property, vessels and certain other leases was generally measured as if the lease had been in place since commencement date. For all other leases the right of use asset was measured as equal to the lease liability and adjusted for any accruals or prepayments already on the balance sheet. The Group also excluded any initial direct costs (eg legal fees) from the measurement of the right of use assets at transition.
- an impairment review was required on right of use assets at initial application of the standard. The Group elected to rely on its onerous lease assessments under IAS 37 "Provisions, Contingent Liabilities and Contingent Assets", as at 31 December 2018 as permitted by IFRS 16. Any existing onerous lease provisions were adjusted against the right of use asset carrying value upon transition.
- to apply the use of hindsight when reviewing the lease arrangements for determination of the measurement or term of the lease under the retrospective option.
- to separate non-lease components from lease components for vessels and properties for the first time as part of the transition adjustment.
- in some cases, to apply a single discount rate to a portfolio of leases with reasonably similar characteristics.

The impact of transition to IFRS 16 on the Group's balance sheet at 1 January 2019 is an increase in lease liabilities (debt) of US$1,248 million, an increase in right of use assets and net investments in leases of US$1,067 million, net adjustments to other assets and liabilities of US$110 million, and a charge of US$69 million to retained earnings.

The weighted average incremental borrowing rate applied to the Group's lease liabilities recognised on the balance sheet at 1 January 2019 is 4.7%.

The most significant differences between the Group's undiscounted non-cancellable operating lease commitments of US$1,717 million at 31 December 2018 and lease liabilities upon transition of US$1,292 million are set out below:

	US$m
Operating lease commitments reported as at 31 December 2018 under IAS 17	**1,717**
Exclude/deduct	
Leases expiring in 12 months or fewer	(130)
Committed leases not commenced (undiscounted)	(133)
Components excluded from the lease liability (undiscounted)	(169)
Include/add	
Cost of reasonably certain extensions (undiscounted)	324
Other	103
Sub total	**1,712**
Effect of discounting on payments included in the calculation of the lease liability (excluding finance lease balances)	(420)
Lease liability opening balance reported as at 1 January 2019 under IFRS 16	**1,292**

The Group's activities as a lessor are not material and hence there is not a significant impact on the financial statements on adoption of IFRS 16. As the Group has some property sub lease arrangements, these were reassessed for classification purposes as operating or finance leases at transition.

The Group has implemented a lease accounting system which is used for the majority of the Group's leases. A separate contract-linked system is in use for the Group's shipping leases.

Contracts signed, or amended, after 1 January 2019 are assessed against the lease identification criteria under IFRS 16. To date, this has not had a significant impact on the number of contracts deemed to be leases compared with assessments of similar arrangements under IAS 17. Practical application of IFRS 16 continues to develop and the Group continues to monitor this.

EBITDA, as disclosed in the Financial Information by Business Unit on page 252, increased as the operating lease cost previously charged against EBITDA under IAS 17 has been replaced under IFRS 16 with charges for depreciation and interest which are excluded from EBITDA (although included in earnings). Short-term, low value and variable leasing costs and non-lease components associated with vessels and property continue to be charged against EBITDA.

Operating cash flows increased under IFRS 16 as the element of cash paid attributable to the repayment of principal is included in financing cash flow. The net increase/decrease in cash and cash equivalents remains unchanged.

IFRIC 23 "Uncertainty over Income Tax Treatments"
IFRIC 23 changed the method of calculating provisions for uncertain tax positions. The Group previously recognised provisions based on the most likely amount of the liability, if any, for each separate uncertain tax position. The interpretation requires a probability weighted average approach to be taken in situations where there is a wide range of possible outcomes. For tax issues with a binary outcome, the most likely amount method remains in use.

The Group has implemented the interpretation retrospectively, with the cumulative impact of application recognised at 1 January 2019 without restatement of comparatives. The effect of this was an increase to provision for uncertain tax positions of US$44 million. Upon implementation of IFRIC 23, the Group changed its accounting policy for current tax to reflect adoption of the probability weighted approach. The current year policy is shown in note 1(n) of the principal accounting policies section. The prior period accounting policy is set out below:

Current tax is the tax expected to be payable on the taxable income for the year calculated using rates that have been enacted or substantively enacted at the balance sheet date. It includes adjustments for tax expected to be payable or recoverable in respect of previous periods. Where the amount of tax payable or recoverable is uncertain, Rio Tinto establishes provisions based on the Group's judgment of the most likely amount of the liability, or recovery.

Implementation of the interpretation did not result in any changes to the Group's accounting policy for deferred tax.

Amendments to IFRS 9, IAS 30 and IFRS 7 - Interest rate benchmark reform
These amendments allow temporary relief from applying specific hedge accounting requirements to hedging arrangements directly impacted by reform of the London Interbank Offered Rate (LIBOR) and other benchmark interest rates (collectively "IBOR reform").

Financial authorities have asked market participants to complete the transition to alternative Risk Free Rates (RFR) by the end of 2021. The Group has established a multidisciplinary working group to prepare and implement Rio Tinto's IBOR transition plan. This working group is currently assessing the potential impact of IBOR reform by reviewing contracts which reference IBOR; the transition plan includes the updating of policies, systems and processes in order to manage changes required to contracts impacted by IBOR reform within the specified time frame.

Based on our initial assessment we expect that the most significant impact on the Group's hedging arrangements will arise from reform of US LIBOR. It is anticipated that the Secured Overnight Financing Rate (SOFR) benchmark rate, recommended by the Alternative Reference Rates Committee, will be widely adopted by market participants and in practice will replace US LIBOR by the end of 2021.

The main differences between LIBOR and SOFR at present are that:
- LIBOR is an unsecured rate at which banks borrow from one another, adjusted for bank counterparty credit risk, whereas SOFR is a secured risk free rate based on the repo financing of US treasury securities and,
- LIBOR has multiple maturities whereas SOFR is an overnight rate. Currently SOFR does not have a term reference rate.

The amendments to IFRS were applied retrospectively to hedging arrangements in place at the start of the reporting period or designated as hedges during the period. Application of the temporary reliefs mean that IBOR reform does not result in termination of hedging relationships referencing an IBOR during the anticipated period of IBOR-related uncertainty.

The principal relief which the Group has applied to its hedging portfolio is in the assumption that:
- US LIBOR remains a separately identifiable component for the duration of the hedge; and
- the US LIBOR rates referenced by fixed-to-floating rate swaps in fair value hedge relationships do not change as the result of IBOR reform, preserving the economic relationship and allowing the related hedges to remain effective.

Post 2019, termination of the reliefs may be triggered by a number of factors but is, in the Group's view, most likely to result from the removal of uncertainty attributable to the reform, namely upon industry and / or regulatory acceptance of an alternative RFR.

The Group's interest rate risk exposure and hedging strategy, including notional values of fixed-rate borrowings swapped to US dollar rates in fair value hedge relationships, are described further in note 30 B (v); hedge ineffectiveness continues to be recorded in the income statement.

At 31 December 2019, the Group does not have any derivative arrangements designated as cash flow hedges, which are expected to be impacted by IBOR reform.

In addition to the above, the Group has a number of arrangements not in hedge relationships, which reference IBOR benchmarks and extend beyond 2021; these include third party borrowings relating to the Oyu Tolgoi LLC project finance facility and other secured loans (refer to note 22), a number of intragroup balances, and certain commercial contracts. Other arrangements which currently reference IBOR benchmarks include accessible revolving lines of credit (refer to note 30 A (b)), and shareholder loan facilities.

Formal IFRS guidance on accounting for the potential impact of IBOR reform is expected to develop further during 2020 and the Group will continue to monitor this.

Adoption of new standards in 2018 - IFRS 9 "Financial Instruments" and IFRS 15 "Revenue from contracts with customers"
At 1 January 2018 the Group implemented IFRS 9 "Financial Instruments" and IFRS 15 "Revenue from contracts with customers" which impacted the opening balances of the Group's financial statements as at 1 January 2018. Comparative information for the year ended 31 December 2017 has been prepared in accordance with the provisions of IAS 39 "Financial Instruments: Recognition and Measurement" that related to the recognition, classification and measurement of financial assets and financial liabilities; de-recognition of financial instruments; impairment of financial assets; and hedge accounting, and IAS 18 "Revenue", which IFRS 9 and IFRS 16 respectively replaced.

Notes to the 2019 financial statements continued

46 Rio Tinto Limited parent company disclosures
As at 31 December

	2019 A$m	2018 A$m
Assets		
Current assets	**8,338**	8,948
Non-current assets	**7,332**	6,962
Total assets	**15,670**	15,910
Liabilities		
Current liabilities	**(2,541)**	(3,063)
Non-current liabilities	**(411)**	(330)
Total liabilities	**(2,952)**	(3,393)
Net assets	**12,718**	12,517
Shareholders' equity		
Share capital	**3,504**	3,504
Other reserves	**370**	362
Retained earnings	**8,844**	8,651
Total equity	**12,718**	12,517
Profit of the parent company	**11,026**	10,707
Total comprehensive income of the parent company	**11,026**	10,707

Prepared under Australian Accounting Standards (AAS) and in accordance with Australian Corporations Act (see page 255). In relation to Rio Tinto Limited there are no significant measurement differences between AAS and IFRS as defined in note 1.

Rio Tinto Limited guarantees
Rio Tinto Limited provides a number of guarantees in respect of Group companies.

Rio Tinto plc and Rio Tinto Limited have jointly guaranteed the Group's external listed debt under the US Shelf Programme, European Debt Issuance Programme and Commercial Paper Programme which totalled A$8.5 billion at 31 December 2019 (31 December 2018: A$8.4 billion); in addition these entities also jointly guarantee the Group's undrawn credit facility which was A$10.7 billion at 31 December 2019 (31 December 2018: A$10.6 billion).

Rio Tinto Limited has guaranteed other external debt held by Rio Tinto Group entities which totalled A$0.1 billion at 31 December 2019 (31 December 2018:A$0.1 billion).

In addition, Rio Tinto Limited has provided a guarantee of all third party obligations, including contingent obligations, of Rio Tinto Finance Limited, a wholly owned subsidiary.

Pursuant to the DLC Merger, both Rio Tinto plc and Rio Tinto Limited issued deed poll guarantees by which each company guaranteed contractual obligations incurred by the other or guaranteed by the other.

47 Related undertakings

In accordance with section 409 of the UK Companies Act 2006, disclosed below is a full list of related undertakings of the Group. Related undertakings include "subsidiaries", "associated undertakings", and "significant holdings in undertakings other than subsidiary companies". The registered office address, country of incorporation, classes of shares and the effective percentage of equity owned by the Group calculated by reference to voting rights, is disclosed as at 31 December 2019.

The definition of a subsidiary undertaking in accordance with the UK Companies Act 2006 is different from the definition under IFRS. As a result, the related undertakings included within this list may not be the same as the related undertakings consolidated in the Group IFRS financial statements. Unless otherwise disclosed, all undertakings with an effective equity holding of greater than 50% are considered subsidiary undertakings for the purpose of this note.

Refer to notes 33-36 for further information on accounting policies, basis of consolidation, principal subsidiaries, joint operations, joint ventures and associates.

An explanation of the dual listed companies structure of Rio Tinto plc and Rio Tinto Limited can be found on pages 292 to 293. For completeness, the effective ownership by the Group relates to effective holdings by both entities either together or individually.

Wholly owned subsidiary undertakings

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
10029734 Canada Inc.; Canada	CAD$1.00 Common shares	100	100	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
	CAD$1.00 Preferred shares	100		
1043802 Ontario Ltd.; Canada	CAD Ordinary shares	100	100	5300-66 Wellington Street West, Toronto ON M5K 1E6, Canada
10676276 Canada Inc.; Canada	CAD Common shares	100	100	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
10676284 Canada Inc.; Canada	CAD Common shares	100	100	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
11091905 Canada Inc.; Canada	CAD$1.00 Common shares	100	100	400-1190 Avenue des Canadiens-de-Montréal,Montréal QC H3B 0E3, Canada
	CAD$1.00 Preferred shares	100		
1109723 B.C. Ltd.; Canada	CAD Common shares	100	100	1800-510 West Georgia Street, Vancouver BC V6B 0M3, Canada
46106 Yukon Inc.; Canada	CAD Common shares	100	100	200-204 Lambert Street, Whitehorse YT Y1A 3T2, Canada
46117 Yukon Inc.; Canada	CAD Common shares	100	100	200-204 Lambert Street, Whitehorse YT Y1A 3T2, Canada
	CAD Preferred shares	100	100	
535630 Yukon Inc.; Canada	CAD Common shares	100	100	200-204 Lambert Street, Whitehorse YT Y1A 3T2, Canada
	CAD Preferred shares	100	100	
7999674 Canada Inc.; Canada	CAD Common shares	100	100	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
9539549 Canada Inc.; Canada	US$ Common shares	100	100	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
Alcan Alumina Ltda.; Brazil	BRL1.00 Quota shares	100	100	Avenida Engenheiro Emiliano Macieira, 1–km 18, Pedrinhas, São Luis, MA, 65095-603, Brazil
Alcan Asia Limited; Hong Kong	HKD Ordinary shares	100	100	6/F, Luk Kwok Centre, 72 Gloucester Road, Wan Chai, Hong Kong
Alcan Betriebs- und Verwaltungsgesellschaft GmbH; Germany	€51.13 Ordinary shares	100	100	Alusingenplatz 1, D-78221, Singen, Germany
Alcan Chemicals Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Alcan Composites Brasil Ltda; Brazil	BRL0.01 Ordinary shares	100	100	Avenida das Nações Unidas, 10.989, 14th floor, Suite 141, São Paulo, 04578-000, Brazil
Alcan Corporation; United States	US$0.01 Ordinary shares	100	100	CSC, 211 East 7th Street, Suite 620, Austin TX 78701-3218, United States

Notes to the 2019 financial statements continued

47 Related undertakings continued
Wholly owned subsidiary undertakings continued

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
Alcan Farms Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Alcan Finances USA LLC; United States	US$1,000.00 Ordinary shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Alcan Gove Development Pty Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Alcan Holdings Australia Pty Limited; Australia	AUD Class A shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
	AUD Ordinary shares	100	100	
Alcan Holdings Europe B.V.; Netherlands	€455.00 Ordinary shares	100	100	Welplaatweg 104, 3197 KS, Botlek-Rotterdam, Netherlands
Alcan Holdings Nederland B.V.; Netherlands	€4,555.00 Ordinary shares	100	100	Welplaatweg 104, 3197 KS, Botlek-Rotterdam, Netherlands
Alcan Holdings Switzerland AG (SA/Ltd.); Switzerland	CHF0.01 Registered shares	100	100	Badenerstrasse 549, CH-8048 , Zürich, Switzerland
Alcan International Network U.S.A. Inc.; United States	US$ Ordinary shares	100	100	CSC, 80 State Street, Albany NY 12207-2543, United States
Alcan Lebensmittelverpackungen GmbH; Germany	€51.13 Ordinary shares	100	100	Alusingenplatz 1, D-78221, Singen, Germany
Alcan Management Services (Shanghai) Co., Ltd.; China	US$1.00 Ordinary shares	100	100	Unit E, 40F Wheelock Square, No. 1717 West Nanjing Road, Jing'an District, Shanghai, 200040, China
Alcan Management Services Canada Limited; Canada	CAD Ordinary shares	100	100	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
Alcan Northern Territory Alumina Pty Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Alcan Packaging Canada Limited; Canada	CAD Ordinary shares	100	100	5300-66 Wellington Street West, Toronto ON M5K 1E6, Canada
Alcan Packaging Muhltal GmbH & Co. KG; Germany	€51.13 Ordinary shares	100	100	Alusingenplatz 1, D-78221, Singen, Germany
Alcan Primary Metal Australia Pty Ltd; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Alcan Primary Products Company LLC; United States	US$ Shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Alcan Primary Products Corporation; United States	US$0.01 Ordinary shares	100	100	CSC, 211 East 7th Street, Suite 620, Austin TX 78701-3218, United States
Alcan Realty Limited; Canada	CAD Ordinary shares	100	100	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
Alcan South Pacific Pty Ltd; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Alcan Trading AG (SA/Ltd.); Switzerland	CHF1000.00 Registered shares	100	100	Herostrasse 9, P.O. Box 1954, CH-8048 Zurich, Switzerland
Aluminium Pechiney; France	€16.00 Ordinary shares	100	100	725 rue Aristide Bergès, 38340, Voreppe, France
Aluminium Company of Canada Limited; Canada	CAD Ordinary shares	100	100	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
AML Properties Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Anglesey Aluminium Metal Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
AP Service; France	€15.00 Ordinary shares	100	100	725 rue Aristide Bergès, 38340, Voreppe, France
Argyle Diamond Mines Pty Limited; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Argyle Diamonds Limited; Australia[a]	AUD Class A shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
	AUD Class B shares	100	100	

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
Ashton Mining Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Ashton Nominees Pty Limited; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Australian Coal Holdings Pty. Limited; Australia[a]	AUD Class A shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
	AUD Ordinary shares	100	100	
Australian Mining & Smelting Pty Ltd; Australia[a]	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Beasley River Management Pty Limited; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Beasley River Mining Pty Limited; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Borax España, S.A.; Spain	€150.00 Ordinary shares	100	100	CN 340, Km 954, Apartado 197, 12520 NULES, Castellón, Spain
Borax Europe Limited; United Kingdom	£0.25 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Borax Français; France	€2.75 Ordinary shares	100	100	89 Route de Bourbourg, 59210, Coudekerque-Branche, France
Borax Malaysia Sdn Bhd; Malaysia	MYR1.00 Ordinary shares	100	100	Level 7, Menara Milenium, Jalan Damanlela, Pusat Bandar Damansara, Damansara Heights 50490 Kuala Lumpur, Malaysia
Borax Rotterdam N.V.; Netherlands	€453.78 Ordinary shares	100	100	Welplaatweg 104, 3197 KS, Botlek-Rotterdam, Netherlands
British Alcan Aluminium Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Canning Resources Pty Limited; Australia[a]	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Capricorn Diamonds Investments Pty Limited; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Cathjoh Holdings Pty Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Champlain Reinsurance Company Ltd.; Switzerland	CHF1.23 Registered shares	100	100	Badenerstrasse 549, CH-8048 , Zürich, Switzerland
Channar Management Services Pty Limited; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Channar Mining Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
CIA. Inmobiliaria e Inversiones Cosmos S.A.C.; Peru	PEN1,000.00 Ordinary shares	100	100	Calle Santa Maria No. 110 Urb. Miraflores - Miraflores-Lima, Peru
Compania de Transmision Sierraoriente S.A.C.; Peru	PEN1,000.00 Ordinary shares	100	100	Calle Santa Maria No. 110 Urb. Miraflores - Miraflores-Lima, Peru
CRA Investments Pty. Limited; Australia[a]	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
CRA Pty Ltd; Australia[a]	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Daybreak Development LLC; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Daybreak Property Holdings LLC; United States[c]	—	—	100	CSC, 15 West South Temple, Suite 1701, Salt Lake City UT 84101, United States
Daybreak Secondary Water Distribution Company; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Daybreak Water Holding LLC; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
DB Medical I LLC; United States	US$ Shares	100	100	CSC, 15 West South Temple, Suite 600, Salt Lake City UT 84101, United States

Notes to the 2019 financial statements continued

47 Related undertakings continued
Wholly owned subsidiary undertakings continued

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
DBVC1 LLC; United States[c]	—	—	100	CSC, 15 West South Temple, Suite 600, Salt Lake City UT 84101, United States
Diavik Diamond Mines (2012) Inc.; Canada	CAD Common shares	100	100	300-5201 50th Avenue, P.O. Box 2498, Yellowknife NT X1A 2P8, Canada
East Kalimantan Coal Pte. Ltd; Singapore[a][d]	SGD1.00 Ordinary share	100	100	12 Marina Boulevard, #20-01 Marina Bay Financial Centre Tower 3, 018982, Singapore
	US$1.00 Common shares	100		
Eastland Management Inc.; United States	US$1.00 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Electric Power Generation Limited; New Zealand[a]	NZD1.00 Ordinary shares	100	100	1530 Tiwai Road, Tiwai Point, Invercargill 9877, New Zealand
Empresa de Mineração Finesa Ltda.; Brazil	BRL Quotas shares	100	100	SIG, QUADRA 04, Lote 75, Sala 109 Parte C, Edifício Capital Financial Center, Brasília DF, CEP 71.610-440, Brazil
Falcon Insurance Ltd; Malta[a][d]	US$1.00 class A Ordinary shares	100	100	Vision Exchange Building, Territorials Street, Mriehel, BKR 3000, Malta
	US$1.00 Class B shares	100		
Flambeau Mining Company; United States	US$1.00 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Fundsprops Pty. Limited; Australia[a]	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Gladstone Infrastructure Pty Ltd; Australia	AUD Class G Redeemable Preference shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
	AUD Ordinary shares	100		
Gove Aluminium Ltd; Australia	AUD A Non-redeemable Preference shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
	AUD A redeemable Preference shares	100		
	AUD Ordinary shares	100		
GPS Energy Pty Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
GPS Nominee Pty Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
GPS Power Pty. Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Hamersley Exploration Pty Limited; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Hamersley HMS Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Hamersley Holdings Limited; Australia[a]	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Hamersley Iron – Yandi Pty Limited; Australia[a]	AUD Class B shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
	AUD Class C shares	100		
	AUD Ordinary shares	100		
Hamersley Iron Pty. Limited; Australia	AUD Ordinary shares		100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Hamersley Resources Limited; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
	AUD Z Class Ordinary shares	100		

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
Hamersley WA Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Henlopen Manufacturing Co., Inc.; United States	US$100.00 Ordinary shares	100	100	CSC, 80 State Street, Albany NY 12207-2543, United States
High Purity Iron Inc.; United States	US$1.00 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Hismelt Corporation Pty Limited; Australia[a][d]	AUD Class A shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Hunter Valley Resources Pty Ltd; Australia	AUD A Class shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
	AUD B Class shares	100		
IEA Coal Research Limited; United Kingdom	£1.00 Ordinary shares	100	100	Apsley House, Third Floor, 176 Upper Richmond Road, London, SW15 2SH, United Kingdom
IEA Environmental Projects Limited; United Kingdom	£1.00 Ordinary shares	100	100	IEAGHG, Pure Offices Cheltenham Office Park, Hatherley Lane, Cheltenham, GL51 6SH, United Kingdom
Industrias Metalicas Castello S.A.; Spain	€6.01 Ordinary shares	100	100	Calle Tuset 10, 08006, Barcelona, Catalonia, Spain
Integrity Land and Cattle LLC; United States	US$ Shares	100	100	CSC, 8825 N. 23rd Avenue, Suite 100, Phoenix AZ 85021, United States
IOC Sales Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Itallumina Srl; Italy[d]	€1.00 Quotas shares	100	100	Viale Castro Pretorio 122, 00185, Roma, Italy
Johcath Holdings Pty Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Juna Station Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Kalimantan Gold Pty Limited; Australia	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Kalteng Pty. Ltd; Australia[a]	AUD A Class Ordinary shares	100	100	37 Belmont Avenue, Belmont WA 6104, Australia
	AUD1.00 Class B (fully paid $1.00 13/01/2003)	100		
	AUD1.00 Class B (paid to $0.12 02/09/2005)	100		
	AUD Ordinary shares	100		
Kelian Pty. Limited; Australia[a]	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Kembla Coal & Coke Pty. Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Kennecott Barneys Canyon Mining Company; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Kennecott Exploration Company; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Kennecott Exploration Mexico, S.A. de C.V.; Mexico	MXN1,000.00 Ordinary shares	100	100	Felix Berenguer 125 - 4 Col. Lomas Virreyes, Distrito Federal, 11000, Mexico
Kennecott Holdings Corporation; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Kennecott Land Company; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Kennecott Land Investment Company LLC; United States[c]	—	—	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Kennecott Molybdenum Company; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Kennecott Nevada Copper Company; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Kennecott Ridgeway Mining Company; United States	US$1.00 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States

Notes to the 2019 financial statements continued

47 Related undertakings continued
Wholly owned subsidiary undertakings continued

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
Kennecott Royalty Company; United States	US$100.00 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Kennecott Services Company; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Kennecott Uranium Company; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Kennecott Utah Copper LLC; United States	US$ Shares	100	100	CSC, 15 West South Temple, Suite 600, Salt Lake City UT 84101, United States
Kennecott Water Distribution LLC; United States	US$ Ordinary shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Kutaibar Holdings Pty Ltd; Australia[a]	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Lawson Mardon Flexible Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Lawson Mardon Smith Brothers Ltd.; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Metallwerke Refonda AG; Switzerland	CHF 125.00 Bearer shares	100	100	Badenerstrasse 549, CH-8048 , Zürich, Switzerland
Metals & Minerals Insurance Pte. Limited; Singapore	SGD Redeemable Preference shares	100	100	2 Shenton Way, #2601, SGX Centre 1, 068804, Singapore
	SGD Ordinary shares	100		
Minera Kennecott, S.A. de C.V.; Mexico	MXN1.00 Series B shares	100	100	Florencia 57, Piso 3, Col. Juarez, Delegación Cuauhtemoc, Mexico, D.F., 06600, Mexico
Mineração Tabuleiro Ltda; Brazil	BRL Quotas shares	100	100	SIG, QUADRA 04, Lote 75, Sala 109 Parte D, Edifício Capital Financial Center, Brasília DF, CEP 71.610-440, Brazil
Mitchell Plateau Bauxite Co. Pty. Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane, QLD 4000, Australia
Mount Bruce Mining Pty Limited; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Mount Pleasant Pty Ltd; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Mutamba Mineral Sands S.A.; Mozambique	MZN100.00 Ordinary shares	100	100	Av. da Marginal N° 4985, 1° andar – Prédio ZEN, Maputo, Mozambique
NBH Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Nhulunbuy Corporation Limited; Australia[c]	—	—	100	19 Westal Street, Nhulunbuy NT 0880, Australia
Norgold Pty Limited; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
	AUD Redeemable Preference shares	100		
North Gold (W.A.) Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
	AUD Redeemable Preference shares	100		
North Insurances Pty. Ltd.; Australia	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
North IOC (Bermuda) Holdings Limited; Bermuda	US$1.00 Ordinary shares	100	100	Clarendon House, 2 Church Street, Hamilton, HM 11, Bermuda
North IOC (Bermuda) Limited; Bermuda	US$143.64 Class A Ordinary shares	100	100	Clarendon House, 2 Church Street, Hamilton, HM 11, Bermuda
	US$100,000.00 Preference shares	100		
	US$1.00 Ordinary shares	100		
North IOC Holdings Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
North Limited; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
North Mining Limited; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
	AUD Redeemable Preference shares	100		

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
Pacific Aluminium (New Zealand) Limited; New Zealand	NZD1.00 Ordinary shares	100	100	1530 Tiwai Road, Tiwai Point, Invercargill 9877, New Zealand
Pacific Aluminium Pty. Limited; Australia[a]	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Pacific Coast Mines, Inc.; United States	US$1.00 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Pechiney Aviatube Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Pechiney Bâtiment; France	€15.00 Ordinary shares	100	100	60 Avenue Charles de Gaulle, 92200, Neuilly-Sur-Seine, France
Pechiney Bécancour, Inc.; United States	US$1.00 Ordinary shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Pechiney Cast Plate, Inc.; United States	US$1.00 Ordinary shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Pechiney Consolidated Australia Pty Limited; Australia	US$1.00 Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
	US$1.00 preference shares	100		
Pechiney Holdings, Inc.; United States	US$1.00 Ordinary shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Pechiney Metals LLC; United States[c]	—	—	—	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Pechiney Plastic Packaging, Inc.; United States	US$ Ordinary shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Pechiney Sales Corporation; United States	US$1.00 Ordinary shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Peko Exploration Pty Ltd.; Australia	AUD Ordinary shares	100	100	37 Belmont Avenue, Belmont WA 6104, Australia
Peko-Wallsend Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Pilbara Iron Company (Services) Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Pilbara Iron Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Port d'Ehoala S.A.; Madagascar	US$100.00 Ordinary shares	100	100	Immeuble ASSIST, Ivandry, Lot N°35, 5ème étage, 101 Antananarivo, Madagascar
Project Generation Group Pty Ltd; Australia[a]	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
PSZ Pty Limited; Australia[d]	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
PT Alcan Packaging Flexipack; Indonesia[d]	IDR1,000,000.00 Ordinary shares	100	100	31st Floor, Menara BTPN, Jl. Dr. Ide Anak Agung Gde Agung Lot 5.5-5.6, Mega Kuningan, Jakarta, 12950, Indonesia
PT Rio Tinto Consultants; Indonesia[d]	US$1.00 Ordinary shares	100	100	31st Floor, Menara BTPN, Jl. Dr. Ide Anak Agung Gde Agung Lot 5.5-5.6, Mega Kuningan, Jakarta, 12950, Indonesia
QIT Madagascar Minerals Ltd; Bermuda	US$1.00 Ordinary shares	100	100	Victoria Place, 5th Floor, 31 Victoria Street, , Hamilton HM 10, Bermuda
Queensland Coal Pty. Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Química e Metalúrgica Mequital Ltda.; Brazil	BRL Ordinary shares	100	100	Av. das Nações Unidas, 12551 19o, andar, CJ 1911, 04578-000, São Paulo, SP, Brazil
Ranges Management Company Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Ranges Mining Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Resolution Copper Company; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Richards Bay Mining Holdings (Proprietary) Limited; South Africa	ZAR1.00 A Ordinary shares	100	100	The Farm RBM, Number 16317, KwaZulu-Natal, South Africa
	ZAR1.00 B Ordinary shares	100		
Richards Bay Titanium Holdings (Proprietary) Limited; South Africa	ZAR1.00 A Ordinary shares	100	100	The Farm RBM, Number 16317, KwaZulu-Natal, South Africa
	ZAR1.00 B Ordinary shares	100		

Notes to the 2019 financial statements continued

47 Related undertakings continued
Wholly owned subsidiary undertakings continued

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
Rio de Contas Desenvolvimentos Minerais Ltda; Brazil	BRL Quota shares	100	100	Rua Coronel Durval Matos, S/N: Centro, Municipio de Jaguaquara, Estado da Bahia, CEP45345-000, Brazil
Rio Santa Rita Empreenimentos e-Participações Ltda; Brazil	BRL Quota shares	100	100	SIG, QUADRA 04, Lote 75, Sala 109 Parte E, Edifício Capital Financial Center, Brasília DF, CEP 71.610-440, Brazil
Rio Sava Exploration DOO; Serbia[c]	—	—	—	Resavska 23, 11000 Beograd, 11000, Serbia
Rio Tinto (Commercial Paper) Limited; Australia[a]	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Rio Tinto (Hong Kong) Ltd; Hong Kong	HKD Ordinary shares	100	100	Level 54, Hopewell Centre, 183 Queen's Road East, Hong Kong
Rio Tinto Advisory Services Pty Limited; Australia	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Rio Tinto Alcan Fund Inc.; Canada	CAD Ordinary shares	100	100	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
Rio Tinto Alcan Inc.; Canada	CAD Common shares	100	100	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
Rio Tinto Alcan International Ltd.; Canada	CAD Common shares	100	100	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
Rio Tinto Alcan Middle East DMCC; United Arab Emirates	AED1,000.00 Ordinary shares	100	100	Gold Tower, Jlt Cluster I, 8th Floor, Unit E, Dubai, P.O. BOX 340801, United Arab Emirates
Rio Tinto Alcan Technology Pty Ltd; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Rio Tinto Aluminium (Bell Bay) Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Rio Tinto Aluminium (Holdings) Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Rio Tinto Aluminium Bell Bay Sales Pty Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Rio Tinto Aluminium Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Rio Tinto Aluminium Pechiney	€10.00 Ordinary shares	100	100	725 rue Aristide Bergès, 38340, Voreppe, France
Rio Tinto Aluminium Services Pty Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Rio Tinto America Holdings Inc.; United States	US$0.01 Class A Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
	US$100.00 Series A Preferred stock	100		
Rio Tinto America Inc.; United States	US$100.00 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Rio Tinto Asia Ltd; Hong Kong	HKD Ordinary shares	100	100	6/F, Luk Kwok Centre, 72 Gloucester Road, Wan Chai, Hong Kong
Rio Tinto Asia Pty. Limited; Australia[a]	AUD Class A shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
	AUD Ordinary shares	100	100	
Rio Tinto AuM Company; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Rio Tinto Australian Holdings Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
	US$1.00 Ordinary shares	100	100	
Rio Tinto Bahia Holdings Limited; United Kingdom	US$1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Base Metals Pty. Limited; Australia[a]	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Rio Tinto Brazilian Holdings Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
	US$1.00 Ordinary shares	100	100	

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
Rio Tinto Canada Diamond Operation Management Inc.; Canada	CAD Common shares	100	100	300-5201 50th Avenue, P.O. Box 2498, Yellowknife NT X1A 2P8, Canada
Rio Tinto Canada Inc.; Canada	CAD Class B shares	100	100	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
	CAD Class C shares	100		
	CAD Class D shares	100		
	CAD Class J shares	100		
	US$ Class K shares	100		
Rio Tinto Canada Management Inc.; Canada	CAD Common shares	100	100	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
	CAD Preferred shares	100		
Rio Tinto Canada Uranium Corporation; Canada	CAD Common shares	100	100	300 - 815 West Hastings Street, Vancouver BC V6C 1B4, Canada
Rio Tinto Coal (Clermont) Pty Ltd; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Rio Tinto Coal Australia Pty Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Rio Tinto Coal Investments Pty Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Rio Tinto Coal NSW Holdings Limited; Australia[a]	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Rio Tinto Commercial Americas Inc.; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Rio Tinto Commercial GmbH; Germany	€1.00 Common shares	100	100	Mergenthalerallee 77, 65760, Eschborn, Germany
Rio Tinto Commercial Pte. Ltd; Singapore	US$1.00 Ordinary shares	100	100	12 Marina Boulevard, #20-01 Marina Bay Financial Centre Tower 3, 018982, Singapore
Rio Tinto Desenvolvimentos Minerais Ltda.; Brazil	BRL Quotas shares	100	100	SIG Quadra 04, Lote 175, Torre A, Salas 106 a 109, Edifício Capital Financial Center, Brasília, CEP 70610-440, Brazil
Rio Tinto Diamonds and Minerals Canada Holding Inc.; Canada	CAD Class A (dividend rights) shares	100	100	300-5201 50th Avenue, P. O. Box 2498, Yellowknife NT X1A 2P8, Canada
	CAD Class B shares	100		
	CAD Class C (voting rights) shares	100		
	CAD Class P1 Preferred shares	100		
Rio Tinto Diamonds Limited; United Kingdom	US$1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Diamonds Netherlands B.V.; Netherlands	€500.00 Ordinary shares	100	100	Welplaatweg 104, 3197 KS, Botlek-Rotterdam, Netherlands
Rio Tinto Diamonds NV; Belgium	€ Ordinary shares	100	100	Hoveniersstraat 53, 2018 Antwerp, Belgium
Rio Tinto Eastern Investments B.V.; Netherlands	€12,510,234,217.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Energy America Inc.; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Rio Tinto Energy Limited; United Kingdom	US$1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Escondida Limited; Bermuda	US$1.00 Common shares	100	100	22 Canon's Court, Victoria Street, Hamilton, HM 12, Bermuda
Rio Tinto European Holdings Limited; United Kingdom[b]	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Exploration (Asia) Holdings Pte. Ltd.; Singapore	US$1.00 Ordinary shares	100	100	12 Marina Boulevard, #20-01 Marina Bay Financial Centre Tower 3, 018982, Singapore
Rio Tinto Exploration (PNG) Limited; Papua New Guinea[c]	PGK1.00 Ordinary shares	100	100	c/o BDO Accountants, Section 15, Lot 15, Bernal Street, National Capital District, Papua New Guinea
Rio Tinto Exploration and Mining (India) Private Limited; India[d]	INR10.00 Ordinary shares	100	100	21st Floor, DLF Building No.5, Tower A, DLF Cyber City, Phase -III, Gurgaon, Haryana, 122002, India

Notes to the 2019 financial statements continued

47 Related undertakings continued
Wholly owned subsidiary undertakings continued

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
Rio Tinto Exploration Canada Inc.; Canada	CAD Class A shares	100	100	300 - 815 West Hastings Street, Vancouver BC V6C 1B4, Canada
	CAD Class B shares	100		
	CAD Class C shares	100		
	CAD Class D shares	100		
	CAD Class E Preferred shares	100		
Rio Tinto Exploration Dunav d.o.o. Beograd-Vracar; Serbia[c]	—	—	100	Resavska 23, 11000 Beograd, 11000, Serbia
Rio Tinto Exploration India Private Limited; India	INR10.00 Ordinary shares	100	100	Apartment No.100 A/5, Ground Floor, The Capital Court, Olof Palme Marg, Munirka, New Delhi 110067, India
Rio Tinto Exploration Kazakhstan LLP; Kazakhstan[c]	—	—	100	Dostyk 310/G, Almaty, 050020, Kazakhstan
Rio Tinto Exploration Pty Limited; Australia[a]	AUD Class B shares	100	100	37 Belmont Avenue, Belmont WA 6104, Australia
	AUD Class C shares	100		
	AUD Ordinary shares	100		
Rio Tinto Exploration Zambia Limited; Zambia	ZMW1.00 Ordinary shares	100	100	Plot 3827, Parliament Road, Olympia, Lusaka, Zambia
Rio Tinto FalCon Diamonds Inc.; Canada	CAD1,000.00 Common shares	100	100	300 - 815 West Hastings Street, Vancouver BC V6C 1B4, Canada
Rio Tinto Fer et Titane Inc.; Canada	CAD Class B Preference shares	100	100	1625 Route Marie-Victorin, Sorel-Tracy QC J3R 1M6, Canada
	CAD Common shares	100		
	CAD$0.01 Preference shares	100		
Rio Tinto Finance (USA) Limited; Australia[a]	AUD Common shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Rio Tinto Finance (USA) plc; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Finance Limited; Australia[a]	AUD Common shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Rio Tinto Finance plc; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
	US$1.00 Ordinary shares	100		
Rio Tinto France S.A.S.; France	€15.25 Ordinary shares	100	100	60 Avenue Charles de Gaulle, 92200, Neuilly-Sur-Seine, France
Rio Tinto Global Employment Company Pte. Ltd.; Singapore	US$1.00 Ordinary shares	100	100	12 Marina Boulevard, #20-01 Marina Bay Financial Centre Tower 3, 018982, Singapore
Rio Tinto Guinée S.A.; Guinea	GNF100,000.00 Ordinary shares	100	100	Manquépas-Commune de Kaloum, République de Guinée, Guinea
Rio Tinto Holdings LLC; Mongolia	MNT20,000.00 Ordinary shares	100	100	Level 17, Shangri-La Centre, Olympic Street 19A, Sukhbaatar District, Ulaanbaatar, 14241, Mongolia
Rio Tinto Hydrogen Energy LLC; United States[c]	—	—	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Rio Tinto Iceland Ltd.; Iceland	ISK1.00 Registered shares	100	100	P.O. Box 244, IS-222, Hafnarfjördur, Iceland
Rio Tinto India Private Limited; India	INR10.00 Ordinary shares	100	100	21st Floor, DLF Building No.5, Tower A, DLF Cyber City, Phase–III, Gurgaon, Haryana, 122022, India
Rio Tinto Indonesian Holdings Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
	US$1.00 Ordinary shares	100		
Rio Tinto International Holdings Limited; United Kingdom[b]	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Investments One Pty Limited; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
Rio Tinto Investments Two Pty Limited; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Rio Tinto Iron & Titanium (Suzhou) Co., Ltd; China	US$1.00 Ordinary shares	100	100	418 Nanshi Street, Suzhou Industrial Park, Suzhou, 215021, China
Rio Tinto Iron & Titanium GmbH; Germany[c]	—	—	100	Mergenthalerallee 77, D-65760, Eschborn, (Frankfurt am Main), Germany
Rio Tinto Iron & Titanium Holdings GmbH; Germany[c]	—	—	100	Mergenthalerallee 77, D-65760, Eschborn, (Frankfurt am Main), Germany
Rio Tinto Iron & Titanium Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Iron and Titanium Canada Inc.; Canada	CAD Ordinary shares	100	100	1625 Route Marie - Victorin, Sorel - Tracy QC J3R 1M6, Canada
Rio Tinto Iron Ore Atlantic Limited; United Kingdom	US$1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Iron Ore Europe S.A.S.; France	€100.00 Ordinary shares	100	100	60 Avenue Charles de Gaulle, 92200, Neuilly-Sur-Seine, France
Rio Tinto Iron Ore Trading China Limited; United Kingdom	US$1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Japan Ltd; Japan	JPY500.00 Ordinary shares	100	100	8th Floor, Kojimachi Diamond Building, 1 Kojimachi 4-chome, Chiyoda-ku, Tokyo 102-0083, Japan
Rio Tinto Jersey Holdings 2010 Limited; Jersey	US$ Ordinary shares	100	100	22 Grenville Street, St Helier, JE4 8PX, Jersey
Rio Tinto Korea Ltd; Republic of Korea	KRW10,000.00 Ordinary shares	100	100	2nd Floor, JS Tower, 6 Teheran-ro 79-gil, Gangnam-Gu, Seoul, 135-877, Republic of Korea
Rio Tinto London Limited; United Kingdom	£1.00 Ordinary share	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Management Services South Africa (Proprietary) Ltd: South Africa	ZAR2.00 Ordinary share	100	100	1 Harries Road, Illovo, Sandton, 2196, South Africa
Rio Tinto Marketing Pte. Ltd.; Singapore	SGD$1.00 Ordinary share	100	100	12 Marina Boulevard, #20-01,Marina Bay Financial Center Tower 3,018982, Singapore
	US$1.00 Ordinary share	100		
Rio Tinto Marketing Services Limited; United Kingdom	£1.00 Ordinary share	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Medical Plan Trustees Limited; United Kingdom	£1.00 Ordinary share	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Metals Limited; United Kingdom	£1.00 Ordinary share	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
	US$1.00 Ordinary share	100	100	
Rio Tinto Minera Peru Limitada SAC; Peru	PEN100.00 Ordinary share	100	100	Av. La Paz 1049, Oficina 503, Miraflores, Lima 18 Peru
Rio Tinto Mineração do Brasil Ltda; Brazil	BRL1.00 Quotas shares	100	100	SIG Quadra 04, Lote 75, Torre A, Sala 109 Parte B, Edifício Capital Financial Center, Brasília, CEP 70610-440, Brazil
Rio Tinto Minerals Asia Pte Ltd; Singapore	SGD$1.00 Ordinary shares	100	100	12 Marina Boulevard, #20-01 Marina Bay Financial Centre Tower 3, 018982, Singapore
	US$1.00 Ordinary shares	100		
Rio Tinto Minerals Development Limited; United Kingdom	£0.25 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Minerals Exploration (Beijing) Co., Ltd;	US$1.00 Ordinary shares	100	100	Units 15-16, 18/F, China World Office Building 2, No. 1 Jianguomenwai Dajie, Chaoyang District, Beijing, China
Rio Tinto Minerals Inc.; United States	US$0.01 Common shares	100	100	CSC, 15 West South Temple, Suite 6000, Salt Lake City UT 84101, United States
Rio Tinto Mining and Exploration Inc.; United States	US$1.00 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Rio Tinto Mining and Exploration Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
	US$1.00 Ordinary shares	100		

Notes to the 2019 financial statements continued

47 Related undertakings continued
Wholly owned subsidiary undertakings continued

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
Rio Tinto Mining and Exploration S.A.C.; Peru	PEN0.50 Ordinary shares	100	100	Av, La Paz 1049, Oficina 503, Miraflores, Lima 18, Peru
Rio Tinto Mining Commercial (Shanghai) Co., Ltd.; China	CNY 1.00 Ordinary shares	100	100	Room 328, 3rd Floor, Unit 2, 231 Shibocun Road, China (Shanghai) Pilot Free Trade Zone, Shanghai, 200125, China
Rio Tinto Mongolia LLC; Mongolia	MNT1,240.00 Common shares	100	100	Level 17, Shangri-La Centre, Olympic Street 19A, Sukhbaatar District, Ulaanbaatar, 14241, Mongolia
Rio Tinto Nominees Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto OT Management Limited; United Kingdom	US$1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Overseas Holdings Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
	US$1.00 Ordinary shares	100		
Rio Tinto PACE Australia Pty Limited; Australia[a]	AUD Ordinary shares	100	100	Level 18 152-158 St. Georges Terrace, Perth WA 6000, Australia
Rio Tinto PACE Canada Inc.; Canada	CAD Ordinary shares	100	100	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
Rio Tinto Pension Investments Limited; United Kingdom[b]	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Peru Limited; United Kingdom	US$1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Potash Management Inc.; Canada	CAD Common shares	100	100	354-200 Granville Street, Vancouver BC V6C 1S4, Canada
Rio Tinto Procurement (Singapore) Pte Ltd; Singapore	US$1.00 Ordinary shares	100	100	12 Marina Boulevard, #20-01 Marina Bay Financial Centre Tower 3, 018982, Singapore
Rio Tinto Pte Ltd; Singapore	SGD$1.00 Ordinary shares	100	100	12 Marina Boulevard, #20-01 Marina Bay Financial Centre Tower 3, 018982, Singapore
	SGD$1.00 Preference shares	100		
Rio Tinto Saskatchewan Management Inc.; Canada	CAD Common shares	100	100	354-200 Granville Street, Vancouver BC V6C 1S4, Canada
Rio Tinto Saskatchewan Potash Holdings General Partner Inc.; Canada	CAD Common shares	100	100	5300-66 Wellington Street West, Toronto ON M5K 1E6, Canada
Rio Tinto Saskatchewan Potash Holdings Limited Partnership; Canada[c]	—	—	100	5300,-66 Wellington Street West, Toronto ON M5K 1E6, Canada
Rio Tinto Secretariat Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Services Inc.; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Rio Tinto Services Limited; Australia[a]	AUD Class Z shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
	AUD Ordinary shares	100		
Rio Tinto Shared Services Pty Limited; Australia	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Rio Tinto Shipping (Asia) Pte. Ltd.; Singapore	US$1.00 Ordinary shares	100	100	12 Marina Boulevard, #20-01 Marina Bay Financial Centre Tower 3, 018982, Singapore
Rio Tinto Shipping Pty. Limited; Australia[a]	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Rio Tinto Simfer UK Limited; United Kingdom	US$1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Singapore Holdings Pte Ltd; Singapore	SGD$1.00 Ordinary shares	100	100	12 Marina Boulevard, #20-01 Marina Bay Financial Centre Tower 3, 018982, Singapore
	US$ Ordinary shares	100		
Rio Tinto South East Asia Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
	US$1.00 Ordinary shares	100		
Rio Tinto Staff Fund (Retired) Pty Limited; Australia[a]	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
Rio Tinto Sulawesi Holdings Limited; United Kingdom	US$1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Technological Resources Inc.; United States	USD$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Rio Tinto Technological Resources UK Limited; United Kingdom	US$1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Trading (Shanghai) Co., Ltd.; China	US$1.00 Ordinary shares	100	100	41/F Wheelock Square, No. 1717 West Nanjing Road, Jing'an District, Shanghai, 200040, China
Rio Tinto Uranium Limited; United Kingdom	US$1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Rio Tinto Western Holdings Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
	US$1.00 Ordinary shares	100		
Rio Tinto Winu Pty Limited; Australia[a]	AUD Ordinary shares	100	100	Level 18, Central Park, 152-158 St Georges Terrace, Perth WA 6000, Australia
Riversdale Connections (Proprietary) Ltd; South Africa	ZAR1.00 Ordinary shares	100	100	Ground Floor - Cypress Place North, Woodmead Business Park 140/142 Western Service Road, Woodmead, 2191, South Africa
Robe River Limited; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Rocklea Station Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
RTA AAL Australia Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
RTA Boyne Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
RTA Gove Pty Limited; Australia	AUD Class A shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
	AUD Class B shares	100		
RTA Holdco 1 Limited; United Kingdom	US$0.0001 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
RTA Holdco 4 Limited; United Kingdom	US$1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
	US$0.73 Ordinary shares	100		
RTA Holdco 7 Limited; United Kingdom	US$1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
	US$0.001 Class A Preference shares	100		
RTA Holdco 8 Limited; United Kingdom	US$1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
	US$0.001 Class A Preference shares	100		
RTA Holdco Australia 1 Pty Ltd; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
RTA Holdco Australia 3 Pty Ltd; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
RTA Holdco Australia 5 Pty Ltd; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
RTA Holdco Australia 6 Pty Ltd; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
RTA Holdco France 1 S.A.S; France	€10.00 Ordinary Shares	100	100	60 Avenue Charles de Gaulle, 92200, Neuilly-Sur-Seine, France
RTA Holdco France 2 S.A.S; France	€10.00 Ordinary Shares	100	100	60 Avenue Charles de Gaulle, 92200, Neuilly-Sur-Seine, France
RTA Pacific Pty Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
RTA Sales Pty Ltd; Australia	AUD Class A shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
	AUD Class B shares	100		
RTA Smelter Development Pty Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia

Notes to the 2019 financial statements continued

47 Related undertakings continued
Wholly owned subsidiary undertakings continued

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
RTA Weipa Pty Ltd; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
RTA Yarwun Pty Ltd; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
RTAlcan 1 LLC; United States	US$ Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
	US$ Class A Preferred shares	100		
RTAlcan 2 LLC; United States	US$ Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
RTAlcan 3 LLC; United States	US$ Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
RTLDS Aus Pty. Ltd; Australia[a]	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
RTLDS UK Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
RTPDS Aus Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Scheuch Unterstuetzungskasse GmbH; Germany	€51.13 Ordinary shares	100	100	Alusingenplatz 1, D-78221, Singen, Germany
Skymont Corporation; United States	US$ Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Société De Financement Des Risques Industriels; Luxembourg	€ Ordinary shares	100	100	534, rue de Neudorf, B.P. 593, L-2015, Luxembourg
Sohio Western Mining Company; United States	US$100.00 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Solutions Strategiques Funding LLC; United States	US$100.00 Common shares	100	100	200 Bellevue Parkway, Suite 210, Wilmington DE 19809, United States
Southern Copper Pty. Limited; Australia	AUD A shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
	AUD B shares	100		
	AUD Non-cumulative Redeemable Preference shares	100		
	AUD Ordinary shares	100		
Swift Current Land & Cattle LLC; United States[c]	—	—	100	CSC, 8825 N. 23rd Avenue, Suite 100, Phoenix AZ 85021
Swiss Aluminium Australia Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
	AUD Stock Unit A	100		
	AUD Stock Unit B	100		
	AUD Stock Unit C	100		
TBAC Limited; United Kingdom	£1.00 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Technological Resources Pty. Limited; Australia[a]	AUD A Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
	AUD B Ordinary shares	100		
The Barrier Corporation (Vic.) Pty. Limited; Australia[a]	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
The Kelian Community and Forest Protection Trust; Singapore[c]	—	—	100	10 Collyer Quay, #10-01 Ocean Financial Centre, 049315, Singapore
The Pyrites Company, Inc.; United States	US$1.00 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
The Roberval and Saguenay Railway Company; Canada	CAD$100.00 Ordinary shares	100	100	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
	CAD$100.00 Preference shares 6% non-cumulative	100		
The Zinc Corporation Pty Ltd; Australia	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
	AUD Z Class Ordinary shares	100		
Thos. W. Ward Limited; United Kingdom	£0.25 Ordinary shares	100	100	6 St James's Square, London, SW1Y 4AD, United Kingdom
Three Crowns Insurance Company Limited; Bermuda	£1.00 Common shares	100	100	Canon's Court, 22 Victoria Street, Hamilton, HM 12, Bermuda
Tinto Holdings Australia Pty. Limited; Australia	AUD A shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
	AUD Ordinary shares	100		
Trans Territory Pipeline Pty Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
U.S. Borax Inc.; United States	US$0.10 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States.
Victoria Technology Inc.; United States[a]	US$1.00 Ordinary shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Waste Solutions and Recycling LLC; United States	US$ shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
West Kutai Foundation Limited; Singapore[c]	—	—	100	10 Collyer Quay, #10-01 Ocean Financial Centre, 049315, Singapore
Wimmera Industrial Minerals Pty. Limited; Australia[a]	AUD Ordinary shares	100	100	Level 7, 360 Collins Street, Melbourne VIC 3000, Australia
Winchester South Development Company Proprietary Limited; Australia	AUD Ordinary shares	100	100	123 Albert Street, Brisbane QLD 4000, Australia
Wyoming Coal Resources Company; United States	US$0.01 Common shares	100	100	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States

Notes to the 2019 financial statements continued

47 Related undertakings continued

Other Group entities including subsidiaries where the effective ownership is less than 100%, associated undertakings and significant holdings in undertakings other than subsidiary companies

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
201 Logistics Center, LLC; United States[c]	—	—	50	Corporation Trust Center, 1209 Orange Street, Wilmington DE 19801, United States
AGM Holding Company Pte Ltd; Singapore	US$ Ordinary shares	100	50.8	77 Robinson Road, #13-00, Robinson 77, 068896, Singapore
Alufluor AB; Sweden	SEK1,000.00 Ordinary shares	50	50	Industrigatan 70, Box 902, S-25109, Helsingborg, Sweden
Aluminerie Alouette Inc.; Canada	CAD Ordinary shares	40	40	400, Chemin de la Pointe-Noire, C.P. 1650, Sept-Îles QC G4R 5M9, Canada
Aluminerie De Bécancour, Inc.; Canada	CAD1.00 Ordinary shares	50.1	25.2	5555 Pierre Thibault Street, PO 30, Bécancour, Québec G0X 1B, Canada
Aluminium & Chemie Rotterdam B.V.; Netherlands	€4,555.00 Ordinary shares	65.8	65.8	Oude Maasweg 80, 3197 KJ, Botlek, Rotterdam, Netherlands
Asia Gold Mongolia LLC; Mongolia	MNT1,250.00 Common shares	100	50.7	Level 17, Shangri-La Centre, Olympic Street 19A, Sukhbaatar District, Ulaanbaatar, 14241 Mongolia
Asia Naran Bulag LLC; Mongolia	MNT1,000.00 Common shares	100	50.7	Level 17, Shangri-La Centre, Olympic Street 19A, Sukhbaatar District, Ulaanbaatar, 14241 Mongolia
Balkhash Saryshagan LLP; Kazakhstan[c]	—	—	75	Dostyk 310/G, Almaty, 050020, Kazakhstan
Beasley River Marketing Pty Ltd; Australia	AUD A class shares	100	53	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Bektau B.V.; Netherlands	€200.00 Ordinary shares	75	75	Welplaatweg 104, 3197 KS, Botlek-Rotterdam, Netherlands
Boyne Smelters Limited; Australia	AUD A1 Class shares	100	59.4	123 Albert Street, Brisbane QLD 4000, Australia
	AUD A2 Class shares	100		
	AUD B1 Class shares	100		
CanPacific Potash Inc.; Canada[c]	—	—	32	374 Third Avenue South, Saskatoon SK S7K 1M5, Canada
Carol Lake Company Ltd.; Canada	CAD$100.00 Ordinary shares	100	58.7	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
Chinalco Rio Tinto Exploration Co. Ltd; China[d]	CNY1.00 Capital Contribution (Ordinary shares)	49	49	Unit 402, China Resources Building, No. 8 Jianguomenbei Avenue, Dong Cheng District, Beijing, 100005 P.R., China
Chlor Alkali Unit Pte Ltd; Singapore	SGD$1.00 Ordinary	100	68.4	12 Marina Boulevard, #20-01 Marina Bay Financial Centre Tower 3, 018982, Singapore
	US$1.00 Ordinary (USD)	68.4		
Dampier Salt Limited; Australia	AUD Ordinary ($1.00257) shares	68.4	68.4	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
	AUD Ordinary ($1.88 on 31/01/2013) shares	68.4		
ELYSIS Limited Partnership/ELYSIS Société en Commandite; Canada	US$1,000.00 Class B shares	100	48.2	2323-1 Place Ville Marie, Montréal QC H3B 5M5, Canada
Enarotali Gold Project Limited; Jersey	£0.001 Ordinary shares	25	25	IFC 5, St Helier, JE1 1ST, Jersey
Energy Resources of Australia Ltd; Australia	AUD A Class Ordinary shares	68.4	68.4	c/o Mallesons Stephen Jacques, Level 5 NICTA Building, B 7 London Circuit, Canberra City ACT 2601, Australia
Fabrica De Plasticos Mycsa, S.A.; Bolivarian Republic of Venezuela[d]	VEF1.00 Common shares	49	49	Urbanización Industrial San Ignacio, parcela 2-A, vía San Pedro, Los Teques, Estado Miranda, Bolivarian Republic of Venezuela
Global Hubco B.V.; Netherlands	€1.00 Ordinary shares	33.3	33.3	c/o TMF Netherlands B.V., Luna Arena, Herikerbergweg 238, 1101, CM Amsterdam Zuidoost, Netherlands
Gulf Power Company; Canada	CAD$100.00 Ordinary shares	100	58.7	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
Halco (Mining) Inc.; United States	US$100.00 Ordinary shares	45	45	30 Isabella Street, 3rd Floor, Pittsburgh, Pennsylvania, 15212, United States
Heruga Exploration LLC; Mongolia	MNT12,500.00 Common Shares	100	50.8	Level 17, Shangri-La Centre, Olympic Street 19A, Sukhbaatar District, Ulaanbaatar, 14241 Mongolia
Hope Downs Marketing Company Pty Ltd; Australia	AUD A Class shares	100	50	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
IAL Holdings Singapore Pte Ltd; Singapore	US$ Ordinary shares	100	50.8	77 Robinson Road, #13-00, Robinson 77, 068896, Singapore
Iron Ore Company of Canada; United States	US$1,000.00 Series A shares	91.4	58.7	1209 Orange Street, Wilmington, Delaware 19801, United States
	US$1,000.00 Series E shares	100		
	US$1,000.00 Series F shares	100		
Korgantas LLP; Kazakhstan[c]	—	—	75	Dostyk 310/G, Almaty, 050020, Kazakhstan
Lao Sanxai Minerals Company Limited; Lao People's Democratic Republic	US$1.00 Ordinary shares	70	70	5th Floor, ANZ Bank Building, 33 Lane Xang Avenue, Hatsady Village, Chanthaboury District, Vientiane Capital, Lao People's Democratic Republic
Magma Arizona Railroad Company; United States	US$100.00 Common shares	99.9	54.9	CSC, 8825 N. 23rd Avenue, Suite 100, Phoenix AZ 85021
Minera Escondida Ltda; Chile[c]	—	—	30	Av. Cerro Plomo, Piso 18, Las Condes, Santiago, 7580154, Chile
Minmetals Rio Tinto Exploration Company Limited; China	CNY1.00 Ordinary shares	50.0	50.0	Section C239, Level 3, Phase II, Standard Workshop, Innovative Industrial Park, Sanya City, Hainan Province, China
Movele; Luxembourg	US$1.00 Ordinary shares	100	50.8	22 rue Jean-Pierre Brasseur, L-1258, Luxembourg
	US$1.00 Common shares	100		
New Zealand Aluminium Smelters Ltd; New Zealand	NZD1.00 Class A Ordinary shares	100	79.4	1530 Tiwai Road, Tiwai Point Invercargill, 9877 New Zealand
Northern Land Company Ltd; Canada	CAD$1.00 Ordinary shares	100	58.7	2 Avalon Drive, Labrador City NL A2V 2V6, Canada
Nozalela Mineral Sands (Pty) Ltd; South Africa	ZAR1.00 Ordinary shares	100	74	The Farm RBM, Number 16317, KwaZulu-Natal, South Africa
NZAS Retirement Fund Trustee Limited; New Zealand	NZD Ordinary shares	100	79.4	Mercer (N.Z.) Limited, Level 2, 20 Customhouse Quay, Wellington, 6011, New Zealand
Oyu Tolgoi LLC; Mongolia[e]	MNT10,000.00 Common shares	66	36.5	Level 12 Monnis Tower, Chinggis Avenue-15, 1st khoroo, Sukhbaatar District, Ulaanbaatar, 14240, Mongolia
Oyu Tolgoi Netherlands B.V.; Netherlands	€100.00 Ordinary shares	100	50.8	Prins Bernhardplein 200, 1097 JB, Amsterdam, Netherlands
Pechiney Philippines Inc.; Philippines	PHP10.00 Ordinary shares	99.9	99.9	Room 306, ITC Building, 337 Sen Gil Puyat Avenue, Makati, Metro Manila, Philippines
Pechiney Reynolds Quebec, Inc.; United States	US$10.00 Common shares	50	50.2	CSC, 233 South 13th Street, Suite 1900, Lincoln NE 68508, United States
	US$100.00 Preferred shares	100		
Procivis Savoie; France	€19.00 Ordinary shares	22.1	22.1	116 Quai Charles Roissard, 73000, Chambéry, France
PT Hutan Lindung Kelian Lestari; Indonesia	IDR9,803.00 Ordinary shares	99	99	Kelian Mine Site, West Kutai, East Kalimantan, Indonesia
PT Kelian Equatorial Mining; Indonesia	IDR1,080.00 Ordinary shares	90	90	Sampoerna Strategic Square, South Tower, Level 30, Jl. Jenderal Sudirman Kav. 45-46, Jakarta, 12930, Indonesia
QIT Madagascar Minerals SA; Madagascar	US$10.00 Certificats d'investissement	100	80	Immeuble ASSIST, Ivandry, Lot N°35, 5ème étage, 101 Antananarivo, Madagascar
	US$10.00 Common shares	80		
Quebec North Shore and Labrador Railway Company; Canada	CAD$27.59 Ordinary shares	100	58.7	400-1190 Avenue des Canadiens-de-Montréal, Montréal QC H3B 0E3, Canada
Queensland Alumina Limited; Australia	AUD Class B shares	100	80	Plant Operations Building, Parsons Point, Gladstone QLD 4680, Australia
	AUD Class C shares	100		
	AUD Class D shares	100		
Resolution Copper Mining LLC; United States[c]	—	—	55	CSC, 251 Little Falls Drive, Wilmington DE 19808, United States
Richards Bay Mining (Proprietary) Limited; South Africa	ZAR0.01 B Ordinary shares	100	73.9	The Farm RBM, Number 16317, KwaZulu-Natal, South Africa
	ZAR0.01 B Preference shares	100		
	ZAR 0.01 BHP Billiton Preference shares	100		
Richards Bay Prefco (Pty) Ltd; South Africa	ZAR0.01 Preference shares	100	99.9	The Farm RBM, Number 16317, KwaZulu-Natal, South Africa

Notes to the 2019 financial statements continued

47 Related undertakings continued

Other Group entities including subsidiaries where the effective ownership is less than 100%, associated undertakings and significant holdings in undertakings other than subsidiary companies continued

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
Richards Bay Titanium (Proprietary) Limited; South Africa	ZAR0.01 B Preference shares	100	73.9	The Farm RBM, Number 16317, KwaZulu-Natal, South Africa
	ZAR0.01 BHP Billiton Preference shares	100		
	ZAR0.01 B Ordinary shares	100		
Rightship Pty Ltd; Australia	AUD Ordinary shares	33.3	33.3	Level 20, 500 Collins Street, Melbourne VIC 3000, Australia
Rio Tinto Orissa Mining Private Ltd; India	INR100.00 Ordinary shares	51	51	GA-539, Sailashree Vihar, Chandrasekharpur Bhubaneswar, Khordha, Orissa, 751021, India
Rio Tinto Sohar Logistics LLC; Oman	OMR1.00 Ordinary shares	70	70	P.O. Box 686, Ruwi, 112, Sultanate of Oman
Robe River Mining Co. Pty. Ltd.; Australia	AUD A shares	40	73.6	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
	AUD B shares	76.4		
Robe River Ore Sales Pty. Ltd.; Australia	AUD Ordinary shares	65	57.1	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia
Saryarka B.V.; Netherlands	€200.00 Ordinary shares	75	75	Welplaatweg 104, 3197 KS, Botlek-Rotterdam, Netherlands
SGLS LLC; Mongolia	MNT10,000.00 Common shares	100	50.8	Level 17, Shangri-La Centre, Olympic Street 19A, Sukhbaatar District, Ulaanbaatar, 14241 Mongolia
Sharp Strategic Funding Pte. Ltd.; Singapore	US$100.00 Common shares	100	50.8	77 Robinson Road, #13-00, Robinson 77, 068896, Singapore
Simfer Jersey Finance 1 Ltd; Jersey	US$ Ordinary shares	100	53	PO Box 536, 13-14 Esplanade, St Helier, JE4 5UR, Jersey
Simfer Jersey Finance 2 Ltd; Jersey	US$ Ordinary shares	100	53	PO Box 536, 13-14 Esplanade, St Helier, JE4 5UR, Jersey
Simfer Jersey Limited; Jersey	US$ Ordinary shares	100	53	PO Box 536, 13-14 Esplanade, St Helier, JE4 5UR, Jersey
Simfer Jersey Nominee Limited; United Kingdom	£1.00 Ordinary shares	100	53	6 St James's Square, London, SW1Y 4AD, United Kingdom
SIMFER S.A.; Guinea[e]	GNF100,000.00 Ordinary shares	85	45	Résidence Dolphine1-Coleah Corniche Sud, Commune de Matam, Conakry, BP 848, Guinea
Singapore Metals Pte. Ltd.; Singapore	US$ Ordinary shares	100	50.8	77 Robinson Road, #13-00, Robinson 77, 068896, Singapore
Société Minière Et De Participations Guinée Alusuisse; Guinea[c]	—	—	50.0	Tougue, Guinea
Sohar Aluminium Co. L.L.C.; Oman	OMR1.00 Ordinary shares	20	20.0	Sohar Industrial Estate, P.O. Box 80, PC 327, Sohar, Sultanate of Oman
THR Aruba Holdings LLC A.V.V.; Aruba	US$1.00 Common shares	100	50.8	IMC International Management Trust Company N.V., L.G. Smith Blvd. 62, Miramar Building, Oranjestad, Aruba
THR Delaware Holdings, LLC; United States[c]	—	—	50.8	National Corporate Research, Ltd., 850 New Burton Road, Suite 201, Dover DE 19904, United States
THR Kharmagtai Pte Ltd.; Singapore	US$ Ordinary shares	100	50.8	77 Robinson Road, #13-00, Robinson 77, 068896, Singapore
THR MINES (BC) LTD.; Canada	CAD Common shares	100	50.8	1800 - 510 West Georgia Street, Vancouver BC V6B 0M3, Canada
	US$ Common shares	100		
THR Mines Services Co. Ltd.; Canada	CAD Common shares	100	50.8	Lackowicz Shier & Hoffman Barristers & Solicitors, 300-204 Black Street, Whitehorse YT Y1A 2M9, Canada
THR OYU TOLGOI LTD.; British Virgin Islands	US$1.00 Ordinary shares	100	50.8	Craigmuir Chambers, Road Town, Tortola, VG1110 British Virgin Islands
THR Ulaan Pte. Ltd.; Singapore	US$ Ordinary shares	100	50.8	77 Robinson Road, #13-00, Robinson 77, 068896, Singapore

Name of undertaking and country of incorporation	Share class	% of share class held by Group companies	Effective Group % ownership	Registered office address
Tisand (Proprietary) Limited; South Africa	ZAR1.00 A Ordinary shares	100	74	The Farm RBM, Number 16317, KwaZulu-Natal, South Africa
	ZAR1.00 B Ordinary shares	100		
	ZAR1,000.00 Cumulative Preference shares	100		
Tomago Aluminium Company Pty Limited; Australia	AUD Ordinary shares	100	51.6	638 Tomago Road, Tomago, NSW 2322, Australia
TRQ Australia Pty. Ltd; Australia	AUD Ordinary shares	50.8	50.8	c/o Intertrust Australia Pty. Ltd., Level 25, Suite 2, 100 Miller Street, North Sydney NSW 2060, Australia
Turquoise Hill (Beijing) Services Company Ltd; China[c]	—	—	50.8	07-119 Inner Room 101, 7th Floor, No.219 Wangfujing Street, Dongcheng District, Beijing, China
Turquoise Hill Netherlands Cooperatief U.A.; Netherlands	US$ COOP shares	100	50.8	Prins Bernhardplein 200, 1097 JB, Amsterdam, Netherlands
Turquoise Hill Resources Ltd.; Canada	CAD Common shares	50.8	50.8	300-204 Black Street, Whitehorse YT Y1A 2M9, Canada
Turquoise Hill Resources Philippines Inc.; Philippines[d]	PHP100.00 Common shares	99.9	50.8	Romulo Mabanta Buenaventura Sayoc & De Los Angeles, 21st Floor, Philamlife Tower, 8767 Paseo Roxas, Makati City, 1226, Philippines
Turquoise Hill Resources Singapore Pte Ltd.; Singapore	SGD1.00 Common shares	100	50.8	2 Venture Drive, #24-01 Vision Exchange, Singapore 608526
Twin Falls Power Corporation Ltd; Canada	CAD Class B shares	74.4	14.6	Hydro Place, P.O. Box 12500, St-John's NL A1B 3T5, Canada
Wright Mgmt Services Pte. Ltd.; Singapore	US$100.00 Common shares	100	50.8	77 Robinson Road, #13-00, Robinson 77, 068896, Singapore
Yalleen Pastoral Co Pty Ltd: Australia	AUD Ordinary shares	65.7	57.4	Level 18 Central Park, 152-158 St.Georges Terrace, Perth WA 6000, Australia
Zululand Titanium (Pty) Ltd; South Africa	ZAR1.00 Ordinary shares	100	74	The Farm RBM, Number 16317, KwaZulu-Natal, South Africa

Notes to the 2019 financial statements continued

47 Related undertakings continued

Other Group entities including subsidiaries where the effective ownership is less than 100%, associated undertakings and significant holdings in undertakings other than subsidiary companies continued

In addition, the Group participates in the following unincorporated arrangements:

Name of undertaking and country of incorporation	Address or principal place of business	Interest % owned by the Group
Bao-HI Ranges Joint Venture; Australia	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia	54
Beasley River Joint Venture; Australia	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia	53
Cape Bougainville Joint Venture; Australia	123 Albert Street, Brisbane QLD 4000, Australia	67.5
Channar Mining Joint Venture; Australia	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia	60
Diavik Joint Venture; Canada	300-5201 50th Avenue, Yellowknife NT X1A 2P9, Canada	60
Gladstone Power Station Joint Venture; Australia	NRG Gladstone Operating Service, Gladstone Power Station, Gladstone QLD 4680, Australia	42.1
Green Mountain Mining Venture; United States	CSC 251 Little Falls Drive, Wilmington DE 19808, United States	100
Hope Downs Joint Venture; Australia	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia	50
Mitchell Plateau Joint Venture; Australia	123 Albert Street, Brisbane QLD 4000, Australia	65.6
Rhodes Ridge Joint Venture; Australia	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia	50
Robe River Iron Associates Joint Venture; Australia	Level 18, Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia	57.1
Tomago Aluminium Joint Venture; Australia	638 Tomago Road, NSW 2322, Tomago, Australia	51.6
Winter Road Joint Venture; Canada	300-5201 50th Avenue, Yellowknife NT X1A 2P9, Canada	33.3
Yarraloola Pastoral Co.; Australia	Level 18 Central Park, 152-158 St. Georges Terrace, Perth WA 6000, Australia	57.1

(a) Directly held by Rio Tinto Limited.
(b) Directly held by Rio Tinto plc.
(c) Group ownership is held through an interest in capital. The entity has no classes of shares.
(d) In liquidation or application for dissolution filed.
(e) Classed as a subsidiary in accordance with section 1162(4)(a) of the UK Companies Act 2006 on the grounds of dominant influence.

Rio Tinto plc
Company balance sheet

As at 31 December	Note	2019 US$m	2018 US$m
Non-current assets			
Investments	B	**36,250**	36,159
Trade and other receivables		**263**	301
		36,513	36,460
Current assets			
Trade and other receivables	C	**6,439**	10,751
Cash at bank and in hand		**5**	4
		6,444	10,755
Total assets		**42,957**	47,215
Current liabilities			
Trade and other payables	D	**(13,018)**	(12,697)
Dividends payable		**(18)**	(17)
Other financial liabilities	G	**(278)**	(706)
		(13,314)	(13,420)
Non-current liabilities			
Other financial liabilities	G	**(223)**	(277)
Total liabilities		**(13,537)**	(13,697)
Net assets		**29,420**	33,518
Capital and reserves			
Share capital	E	**207**	211
Share premium account		**4,312**	4,311
Other reserves	F	**12,005**	12,001
Retained earnings		**12,896**	16,995
Total equity		**29,420**	33,518

The Rio Tinto plc company balance sheet has been prepared in accordance with Financial Reporting Standard 101 "Reduced Disclosure Framework" (FRS 101). Note A explains the principal accounting policies.

Profit after tax and total comprehensive income for the year amounted to US$4,959 million (2018: US$8,538 million). As permitted by section 408 of the UK Companies Act 2006, no statement of comprehensive income for the Rio Tinto plc parent company is shown.

The Rio Tinto plc company balance sheet, statement of comprehensive income and the related notes were approved by the directors on 26 February 2020 and the balance sheet is signed on their behalf by

Simon Thompson
Chairman

Jean-Sébastien Jacques
Chief executive

Jakob Stausholm
Chief financial officer

Rio Tinto plc

Registered number: 719885

Rio Tinto plc (the "Company") is incorporated in the United Kingdom, registered in England and Wales, and domiciled in the United Kingdom

Rio Tinto plc
Company statement of changes in equity

Year ended 31 December 2019	Share capital US$m	Share premium account US$m	Other reserves US$m	Retained earnings US$m	Total equity US$m
Opening balance	211	4,311	12,001	16,995	33,518
Profit for the financial year (comprehensive income)	—	—	—	4,959	4,959
Dividends	—	—	—	(7,987)	(7,987)
Proceeds from issue of shares	—	1	—	—	1
Share buy-back	(4)	—	4	(1,135)	(1,135)
Share-based payments	—	—	—	64	64
Total	**207**	**4,312**	**12,005**	**12,896**	**29,420**

Year ended 31 December 2018	Share capital US$m	Share premium account US$m	Other reserves US$m	Retained earnings US$m	Total equity US$m
Opening balance	220	4,306	11,992	16,124	32,642
Profit for the financial year (comprehensive income)	—	—	—	8,538	8,538
Dividends	—	—	—	(4,113)	(4,113)
Proceeds from issue of shares	—	5	—	—	5
Share buy-back	(9)	—	9	(3,624)	(3,624)
Share-based payments	—	—	—	70	70
Total	211	4,311	12,001	16,995	33,518

Notes to the Rio Tinto plc financial statements

A Principal accounting policies

a. Basis of preparation

The Rio Tinto plc company financial statements have been prepared using the historical cost convention, as modified by the revaluation of certain financial liabilities and in accordance with the UK Companies Act 2006 and FRS 101. The financial statements have been prepared on a going concern basis.

The accounting policies set out below have been applied consistently to all periods presented in these financial statements. The following exemptions available under FRS 101 have been applied:

- Paragraphs 45(b) and 46 to 52 of IFRS 2, "Share-based payment" (details of the number and weighted average exercise prices of share options and how the fair value of goods and services received was determined).
- Paragraphs 91-99 of IFRS 13 "Fair value measurement" (disclosure of valuation techniques and inputs used for fair value measurement of assets and liabilities).
- IFRS 7 "Financial Instruments: Disclosures".
- Paragraph 38 of IAS 1 "Presentation of financial statements", comparative information requirements in respect of Paragraph 79(a) (iv) of IAS 1.
- The following paragraphs of IAS 1 "Presentation of financial statements":
  - 10 (d) (statement of cash flows);
  - 16 (statement of compliance with all IFRS);
  - 38A (requirement for minimum of two primary statements, including cash flow statements);
  - 38B-D (additional comparative information);
  - 111 (cash flow statement information); and
  - 134-136 (capital management disclosures).
- IAS 7 "Statement of cash flows"
- Paragraph 30 and 31 of IAS 8 "Accounting policies, changes in accounting estimates and errors" (requirement for the disclosure of information when an entity has not applied a new IFRS that has been issued and is not yet effective).
- Paragraph 17 of IAS 24 "Related party disclosures" (key management compensation).
- The requirements of IAS 24, "Related party disclosures" to disclose related party transactions entered into between two or more members of a group.

b. Judgments in applying accounting policies and key sources of estimation uncertainty

The preparation of the financial statements requires management to make assumptions, judgments and estimates and to use judgment in applying accounting policies and making critical accounting estimates. These judgments, estimates and assumptions are based on *management's best knowledge of the relevant facts and circumstances*, having regard to previous experience, but actual results may differ materially from the amounts included in the financial statements.

The key area of judgment that has the most significant effect on the amounts recognised in the financial statements is the review for impairment of investment carrying values.

c. Currency translation

Items included in the financial statements are measured using the currency of the primary economic environment in which the Company operates (the functional currency). The financial statements are presented in US dollars, which is the Company's functional and presentation currency. Transactions denominated in other currencies, including the issue of shares, are translated into the functional currency using the exchange rates prevailing at the date of the transaction.

Foreign exchange gains and losses resulting from the settlement of such transactions, and from the translation at year-end exchange rates of monetary assets and liabilities denominated in foreign currencies, are recognised in the profit and loss account.

Exchange rates used are consistent with the rates used by the Group as disclosed in the consolidated financial statements (note 41).

d. Investments

Investments in Group companies are valued at cost less accumulated impairment losses. Investments are reviewed for impairment if events or changes in circumstances indicate that the carrying amount may not be recoverable.

e. Financial guarantees

Financial guarantees are recognised initially at fair value. Subsequently, the liability is measured at the higher of the best estimate of the expenditure required to settle the present obligation and the amount initially recognised less cumulative amortisation.

f. Share-based payments

The Company operates a number of share-based payment plans for Group employees, the details of which are included in the consolidated financial statements (note 43). The fair value of the Company's share plans is recognised as an addition to the cost of the investment in the subsidiary in which the relevant employees work over the expected vesting period, with a corresponding entry to retained earnings. Payments received from the Company's subsidiaries in respect of these share-based payments are recognised as a reduction in the cost of the investment. The Company uses fair values provided by independent actuaries calculated using either a lattice-based option valuation model or a Monte Carlo simulation model. The fair value of the share plans is determined at the date of grant, taking into account any market-based vesting conditions attached to the award.

Non-market based vesting conditions (eg relative EBIT margin performance targets) are taken into account in estimating the number of awards likely to vest. The estimate of the number of awards likely to vest is reviewed at each balance sheet date up to the vesting date, at which point the estimate is adjusted to reflect the actual awards issued. No adjustment is made after the vesting date even if the awards are forfeited or not exercised.

g. Dividend income

Dividend income is recognised when the right to receive payment is established.

h. Treasury shares

The consideration paid for shares repurchased by the Company and held as treasury shares is recognised as a reduction in shareholders' funds through retained earnings.

Notes to the Rio Tinto plc financial statements
continued

B Investments

	2019 US$m	2018 US$m
Investments in Group companies:		
At 1 January	**36,159**	36,093
Additions	**91**	66
At 31 December	**36,250**	36,159

At 31 December 2019 the Company had the following principal subsidiaries:

Company	Principal activity	Country of incorporation	Percentage shareholding
Rio Tinto International Holdings Limited	Holding company	UK	100%
Rio Tinto European Holdings Limited	Holding company	UK	100%

In accordance with section 409 of the UK Companies Act 2006, a full list of related undertakings is disclosed in the consolidated financial statements (note 47).

C Trade and other receivables
Trade and other receivables includes US$6,256 million (31 December 2018: US$10,603 million), which is subject to interest based on LIBOR, is unsecured and repayable on demand.

D Trade and other payables
Trade and other payables include US$12,968 million (31 December 2018: US$12,568 million) which is subject to interest rates based on LIBOR, is unsecured and repayable on demand.

E Share capital

	2019 US$m	2018 US$m
Issued and fully paid up share capital of 10p each[a]		
At 1 January	**211**	220
Ordinary shares purchased and cancelled[b]	**(4)**	(9)
At 31 December	**207**	211

(a) 40,974 new shares (2018: 35,380 new shares) were issued during the year and 23,659 shares (2018: 106,045 shares) were reissued from Treasury during the year resulting from the vesting of awards and the exercise of options under Rio Tinto plc employee share-based payment plans, with exercise prices and market values between £36.33 and £49.74 per share.
(b) The authority for the company to buy back its ordinary shares was renewed at the 2019 annual general meeting. 28,356,034 shares (2018: 63,984,287 shares) were bought back and cancelled in 2019 under the on-market buy-back programme.

F Other reserves
Other reserves include US$11,936 million (2018: US$11,936 million) which represents the difference between the nominal value and issue price of the shares issued arising from Rio Tinto plc's rights issue completed in July 2009.

G Rio Tinto plc guarantees
Rio Tinto plc provides a number of guarantees in respect of Group companies.

Rio Tinto plc and Rio Tinto Limited have jointly guaranteed the Group's external listed debt under the US Shelf Programme, European Debt Issuance Programme and Commercial Paper Programme which totalled US$5.9 billion at 31 December 2019 (31 December 2018: US$5.9 billion). In addition, these entities also jointly guarantee the Group's undrawn credit facility which was US$7.5 billion at 31 December 2019 (31 December 2018: US$7.5 billion). Rio Tinto plc has provided guarantees in respect of certain derivative contracts that are in a liability position of US$290 million at 31 December 2019 (31 December 2018: US$374 million).

Rio Tinto plc has provided a guarantee, known as the completion support undertaking (CSU), in favour of the Oyu Tolgoi LLC project finance lenders. At 31 December 2019, US$4.3 billion of project finance debt was outstanding under this facility (31 December 2018: US$4.3 billion). Oyu Tolgoi LLC is owned by Erdenes Oyu Tolgoi LLC (34%), which is controlled by the Government of Mongolia, and Turquoise Hill Resources Ltd (66%, of which Rio Tinto owns 51%). The project finance has been raised for development of the underground mine and the CSU will terminate on the completion of the underground mine according to a set of completion tests set out in the project finance facility.

G Rio Tinto plc guarantees *continued*
The Rio Tinto guarantee applies to the extent that Turquoise Hill Resources Ltd cannot satisfy Oyu Tolgoi LLC's project finance debt servicing obligations under its own guarantee to the lenders, called the sponsor debt service undertaking (DSU). Both the CSU and DSU contain a carve-out for certain political risk events.

During 2019, fees of US$157 million (2018: US$40 million) were received from Oyu Tolgoi LLC and Turquoise Hill Resources Ltd as consideration for the provision of the CSU. Of the amount received, US$83 million related to fees received in advance and recorded in Current liabilities - Trade and other payables (31 December 2018: US$5 million was due and recorded in Current assets – Trade and other receivables).

Rio Tinto plc has provided a number of guarantees in relation to various pension funds. Subject to certain conditions, Rio Tinto plc would pay any contributions due from Group companies participating in these funds in the event that the companies fail to meet their contribution requirements. The guarantees were not called upon in 2019. The aggregate of company contributions to these plans in 2019 was US$37 million (2018: US$11 million).

Other guarantees issued by Rio Tinto plc in relation to Rio Tinto Group entities as at 31 December 2019 amount to US$353 million (31 December 2018: US$360 million). Included within this balance is US$32 million (31 December 2018: US$32 million) in relation to non-wholly owned subsidiaries.

Pursuant to the DLC Merger, both Rio Tinto plc and Rio Tinto Limited issued deed poll guarantees by which each company guaranteed contractual obligations incurred by the other or guaranteed by the other.

The liability recognised for financial guarantees is US$294 million (31 December 2018: US$359 million).

H Contingent liabilities
Details of contingent liabilities are included in note 31 to the Group financial statements.

I Events after the balance sheet date
There were no significant events after the balance sheet date that are required to be disclosed.

Rio Tinto financial information by business unit

	Rio Tinto interest %	Gross revenue[a] for the year ended 31 December 2019 US$m	2018 US$m	2017 US$m	EBITDA[b] for the year ended 31 December 2019 US$m	2018 US$m	2017 US$m	Net earnings[c] for the year ended 31 December 2019 US$m	2018 US$m	2017 US$m
Iron Ore										
Pilbara	(d)	**23,681**	18,359	18,143	**15,936**	11,267	11,383	**9,619**	6,460	6,576
Dampier Salt	68.4	**271**	246	215	**75**	56	27	**27**	18	3
Evaluation projects/other		**123**	126	108	**87**	55	137	**(8)**	53	116
Total Iron Ore		**24,075**	18,731	18,466	**16,098**	11,378	11,547	**9,638**	6,531	6,695
Aluminium	(e)									
Bauxite		**2,459**	2,324	2,019	**969**	790	804	**441**	412	463
Alumina		**2,657**	3,340	2,661	**628**	1,137	454	**301**	634	180
Intrasegment		**(825)**	(861)	(790)	**(10)**	(7)	(25)	**(7)**	(5)	(17)
Bauxite & Alumina		**4,291**	4,803	3,890	**1,587**	1,920	1,233	**735**	1,041	626
Primary Metal		**4,940**	6,468	5,808	**755**	1,418	1,762	**40**	595	778
Pacific Aluminium		**2,204**	2,541	2,305	**(22)**	148	453	**(137)**	—	176
Inter-segment and other		**(2,256)**	(3,226)	(2,321)	**36**	(88)	(19)	**26**	(67)	(12)
Integrated operations		**9,179**	10,586	9,682	**2,356**	3,398	3,429	**664**	1,569	1,568
Other product group items		**1,065**	1,479	1,214	**(202)**	(440)	(132)	**(161)**	(344)	(100)
Product group operations		**10,244**	12,065	10,896	**2,154**	2,958	3,297	**503**	1,225	1,468
Evaluation projects/other		**96**	126	109	**131**	137	126	**96**	122	115
Total Aluminium		**10,340**	12,191	11,005	**2,285**	3,095	3,423	**599**	1,347	1,583
Copper & Diamonds										
Rio Tinto Kennecott	100.0	**1,879**	1,862	1,352	**843**	785	539	**397**	293	78
Escondida	30.0	**2,136**	2,274	1,811	**1,034**	1,301	1,030	**325**	506	325
Grasberg joint venture	(g)	**—**	457	33	**—**	281	(3)	**—**	217	(169)
Oyu Tolgoi and Turquoise Hill	(h)	**1,166**	1,180	940	**357**	375	256	**25**	69	36
Diamonds	(i)	**619**	695	706	**151**	301	287	**(21)**	118	92
Product group operations		**5,800**	6,468	4,842	**2,385**	3,043	2,109	**726**	1,203	362
Evaluation projects/other		**15**	—	—	**(312)**	(267)	(205)	**(172)**	(149)	(99)
Total Copper & Diamonds		**5,815**	6,468	4,842	**2,073**	2,776	1,904	**554**	1,054	263
Energy & Minerals										
Rio Tinto Coal Australia	(j)	**—**	989	2,829	**—**	893	1,223	**—**	591	716
Iron Ore Company of Canada	58.7	**2,189**	1,583	1,867	**1,024**	586	770	**332**	166	235
Rio Tinto Iron & Titanium	(k)	**1,938**	1,782	1,763	**611**	510	546	**254**	174	201
Rio Tinto Borates	100.0	**593**	622	630	**180**	197	244	**96**	111	126
Uranium	(l)	**375**	415	417	**55**	18	15	**25**	(4)	(26)
Product group operations		**5,095**	5,391	7,506	**1,870**	2,204	2,798	**707**	1,038	1,252
Simandou iron ore project	(m)	**—**	—	—	**(12)**	(15)	(13)	**(5)**	(7)	(6)
Evaluation projects/other		**55**	60	43	**(96)**	(49)	(9)	**(91)**	(36)	(7)
Total Energy & Minerals		**5,150**	5,451	7,549	**1,762**	2,140	2,776	**611**	995	1,239
Other operations	(n)	**18**	9	10	**(77)**	(70)	(116)	**(89)**	(102)	(138)
Inter-segment transactions		**(31)**	(15)	(15)	**(9)**	—	—	**(3)**	—	—
Product group total		**45,367**	42,835	41,857	**22,132**	19,319	19,534	**11,310**	9,825	9,642
Central pension costs, share-based payments and insurance					**59**	(128)	(68)	**60**	(90)	(48)
Restructuring, project and one-off costs					**(183)**	(272)	(177)	**(94)**	(190)	(124)
Central costs					**(496)**	(552)	(491)	**(550)**	(410)	(311)
Exploration and evaluation					**(315)**	(231)	(218)	**(231)**	(193)	(178)
Net interest								**(122)**	(134)	(354)
Underlying EBITDA/earnings					**21,197**	18,136	18,580	**10,373**	8,808	8,627
Items excluded from underlying EBITDA/earnings		**—**	—	10	**(722)**	5,127	1,912	**(2,363)**	4,830	135
EBITDA/net earnings					**20,475**	23,263	20,492	**8,010**	13,638	8,762
Reconciliation to Group income statement										
Share of equity accounted unit sales and intra-subsidiary/equity accounted unit sales		**(2,202)**	(2,313)	(1,837)						
Depreciation and amortisation in subsidiaries excluding capitalised depreciation					**(4,272)**	(3,909)	(4,302)			
Impairment charges					**(3,487)**	(132)	(796)			
Depreciation and amortisation in equity accounted units					**(653)**	(650)	(648)			
Taxation and finance items in equity accounted units					**(296)**	(372)	(272)			
Consolidated sales revenue/profit on ordinary activities before finance items and taxation		**43,165**	40,522	40,030	**11,767**	18,200	14,474			

Rio Tinto financial information by business unit continued

		Capital expenditure[o] for the year ended 31 December			Depreciation and amortisation for the year ended 31 December			Operating assets[p] as at 31 December			Employees for the year ended 31 December		
	Rio Tinto interest %	2019 US$m	2018 US$m	2017 US$m	2019 US$m	2018 US$m	2017 US$m	2019 US$m	2018 US$m	2017 US$m	2019	2018	2017
Iron Ore													
Pilbara	(d)	**1,720**	1,288	1,201	**1,704**	1,682	1,645	**13,865**	14,486	16,535	**10,634**	10,422	10,159
Dampier Salt	68.4	**21**	14	13	**19**	20	22	**152**	165	150	**347**	239	232
Evaluation projects/other		**—**	—	—	**—**	—	—	**2**	2	2	**—**	—	—
Total Iron Ore		**1,741**	1,302	1,214	**1,723**	1,702	1,667	**14,019**	14,653	16,687	**10,981**	10,661	10,391
Aluminium	*(e)*												
Bauxite		**387**	953	825	**286**	165	123	**2,597**	2,494	1,897	**2,940**	2,676	2,534
Alumina		**282**	218	108	**187**	194	209	**2,009**	2,721	2,733	**2,269**	2,009	2,012
Intrasegment		**—**	—	—	**—**	—	—	**(27)**	(20)	(18)	**—**	—	—
Bauxite & alumina		**669**	1,171	933	**473**	359	332	**4,579**	5,195	4,612	**5,209**	4,685	4,546
Primary Metal		**658**	595	389	**682**	615	665	**9,674**	9,306	9,946	**6,357**	6,497	6,404
Pacific Aluminium		**129**	115	109	**154**	149	196	**970**	1,156	1,016	**2,356**	2,278	2,173
Inter-segment and other		**—**	—	5	**—**	(1)	6	**807**	789	772	**127**	180	222
Integrated operations		**1,456**	1,881	1,436	**1,309**	1,122	1,199	**16,030**	16,446	16,346	**14,049**	13,640	13,345
Other product group items	(f)	**—**	(508)	—	**—**	—	—	**—**	—	—	**—**	—	—
Product group operations		**1,456**	1,373	1,436	**1,309**	1,122	1,199	**16,030**	16,446	16,346	**14,049**	13,640	13,345
Evaluation projects/other		**—**	—	—	**3**	—	—	**—**	—	—	**—**	—	—
Total Aluminium		**1,456**	1,373	1,436	**1,312**	1,122	1,199	**16,030**	16,446	16,346	**14,049**	13,640	13,345
Copper & Diamonds													
Rio Tinto Kennecott	100.0	**444**	318	249	**457**	427	422	**2,012**	1,864	1,936	**2,066**	1,993	1,734
Escondida	30.0	**315**	302	248	**508**	518	507	**2,871**	3,057	3,369	**1,068**	1,087	1,079
Grasberg joint venture	(g)	**—**	171	138	**—**	30	42	**—**	—	1,137	**—**	1,615	1,642
Oyu Tolgoi and Turquoise Hill	(h)	**1,289**	1,284	901	**208**	219	344	**6,780**	6,072	4,725	**3,152**	2,863	2,835
Diamonds	(i)	**38**	64	85	**144**	118	132	**195**	267	441	**940**	967	922
Product group operations		**2,086**	2,139	1,621	**1,317**	1,312	1,447	**11,858**	11,260	11,608	**7,226**	8,525	8,212
Evaluation projects/other		**1**	11	1	**3**	5	5	**152**	129	135	**150**	146	142
Total Copper & Diamonds		**2,087**	2,150	1,622	**1,320**	1,317	1,452	**12,010**	11,389	11,743	**7,376**	8,671	8,354
Energy & Minerals													
Rio Tinto Coal Australia	(j)	**—**	32	84	**—**	34	152	**—**	(837)	1,040	**—**	1,005	1,924
Iron Ore Company of Canada	58.7	**255**	189	202	**172**	154	157	**803**	975	988	**2,617**	2,397	2,382
Rio Tinto Iron & Titanium	(k)	**249**	169	119	**193**	201	219	**3,507**	3,390	3,881	**4,115**	4,058	4,048
Rio Tinto Borates	100.0	**43**	44	28	**60**	62	65	**525**	518	523	**924**	980	936
Uranium	(l)	**5**	8	21	**3**	4	37	**(363)**	(406)	(327)	**857**	1,324	1,307
Product group operations		**552**	442	454	**428**	455	630	**4,472**	3,640	6,105	**8,513**	9,764	10,597
Simandou iron ore project	(m)	**(1)**	—	—	**—**	—	—	**20**	15	17	**74**	70	10
Evaluation projects/other		**—**	—	—	**—**	—	—	**37**	41	41	**53**	33	25
Total Energy & Minerals		**551**	442	454	**428**	455	630	**4,529**	3,696	6,163	**8,640**	9,867	10,632
Other operations	(n)	**(4)**	12	(35)	**177**	26	32	**(83)**	(442)	(328)	**159**	187	203
Product group total		**5,831**	5,279	4,691	**4,960**	4,622	4,980	**46,505**	45,742	50,611	**41,205**	43,026	42,925
Inter-segment transactions								**127**	129	206			
Net assets of disposal groups held for sale	(q)							**—**	440	370			
Other items		**64**	65	70	**77**	43	42	**(2,449)**	(2,880)	(2,631)	**4,802**	4,432	3,882
Less: equity accounted units		**(456)**	(500)	(417)	**(653)**	(650)	(647)	**—**	—	—	**—**	—	—
Total		**5,439**	4,844	4,344	**4,384**	4,015	4,375	**44,183**	43,431	48,556	**46,007**	47,458	46,807
Add back: Proceeds from disposal of property, plant and equipment		**49**	586	138									
Total capital expenditure per cash flow statement		**5,488**	5,430	4,482									
Less: Net (debt)/cash								**(3,651)**	255	(3,845)			
Less: EAU funded balances excluded from net debt								**—**	—	—			
Equity attributable to owners of Rio Tinto								**40,532**	43,686	44,711			

Notes to financial information by business unit

Business units are classified according to the Group's management structure. We have adjusted certain comparative amounts to represent changes in management responsibility. Effective from the first half of 2019, Dampier Salt has moved from the Energy & Minerals Product Group to the Iron Ore Product Group.

(a) Gross sales revenue includes the sales revenue of equity accounted units on a proportionately consolidated basis (after adjusting for sales to subsidiaries) in addition to consolidated sales. Consolidated sales revenue includes subsidiary sales to equity accounted units which are not included in gross sales revenue.

(b) EBITDA of subsidiaries and the Group's share of EBITDA relating to equity accounted units represents profit before: tax, net finance items, depreciation and amortisation charged to the income statement in the period. Underlying EBITDA excludes the EBITDA impact of the same items that are excluded from underlying earnings.

(c) Represents profit after tax for the period attributable to the owners of the Rio Tinto Group. Business unit earnings are stated before finance items but after the amortisation of discount related to provisions. Earnings attributed to business units do not include amounts that are excluded in arriving at underlying earnings.

(d) Pilbara represents the Group's 100% holding in Hamersley, 50% holding in Hope Downs Joint Venture and 65% holding in Robe River Iron Associates. The Group's net beneficial interest in Robe River Iron Associates is 53%, as 30% is held through a 60% owned subsidiary and 35% is held through a 100% owned subsidiary.

(e) Presented on an integrated operations basis, splitting activities between Bauxite & Alumina, Primary Metal, Pacific Aluminium and other integrated operations (which reflect the results of the integrated production of aluminium) and other product group items which relate to other commercial activities.

(f) In 2018, Aluminium capital expenditure was reported net of US$508 million proceeds received from the sale of surplus land at Kitimat. These proceeds were not included in Aluminium's free cash flow and the associated gain was excluded from business unit earnings and EBITDA.

(g) Through a joint venture agreement with Freeport-McMoRan Inc. (Freeport), we were entitled to 40% of material mined above an agreed threshold as a consequence of expansions and developments of the Grasberg facilities since 1998 (until 21 December 2018). On 21 December 2018, we sold our entire interest in the Grasberg mine to PT Indonesia Asahan Aluminium (Persero) (Inalum).

(h) Our interest in Oyu Tolgoi is held indirectly through our 50.8% investment in Turquoise Hill Resources Ltd (TRQ), where TRQ's principal asset is its 66% investment in Oyu Tolgoi LLC, which owns the Oyu Tolgoi copper-gold mine.

(i) Includes our interests in Argyle (100%) and Diavik (60%).

(j) Includes our 82% interest in the Hail Creek coal mine (until 1 August 2018), our 80% interest in the Kestrel underground coal mine (until 1 August 2018) and interests in the Winchester South (until 1 June 2018) and Valeria development projects (until 1 August 2018).

On 1 June 2018, we sold our entire 75% interest in the Winchester South coal development project in Queensland, Australia, to Whitehaven Coal Limited for US$200 million.

On 1 August 2018, we sold our entire 82% interest in the Hail Creek coal mine and 71.2% interest in the Valeria coal development project in Queensland, Australia, to Glencore for US$1.7 billion.

On 1 August 2018, we sold our entire 80% interest in the Kestrel underground coal mine in Queensland, Australia, to a consortium comprising private equity manager EMR Capital (EMR) and PT Adaro Energy Tbk (Adaro), an Indonesian listed coal company, for US$2.25 billion.

On 1 September 2017, we sold our 100% shareholding in Coal & Allied Industries Limited to Yancoal Australia Limited for US$2.69 billion (before working capital adjustments).

Rio Tinto Coal Australia's operating assets of US$(837) million at 31 December 2018 included provisions for onerous contracts in relation to rail infrastructure capacity and capital gains tax payable on the divestments announced in the year, partly offset by financial assets and receivables relating to contingent royalties and disposal proceeds. Following a change in management responsibility, at 31 December 2019, these amounts are now reported within Other operations, with no restatement of comparative amounts.

(k) Includes our interests in Rio Tinto Fer et Titane (100%), QIT Madagascar Minerals (QMM, 80%) and Richards Bay Minerals (attributable interest of 74%).

(l) Includes our interests in Energy Resources of Australia (68.4%) and, until 16 July 2019, Rössing Uranium Limited (Rössing) (68.6%). On 16 July 2019, we sold our entire 68.6% interest in Rössing to China National Uranium Corporation Limited (CNUC).

(m) Simfer Jersey Limited, in which the Group has a 53% interest, has an 85% interest in Simfer S.A., the company that manages the Simandou project in Guinea. The Group therefore has a 45.05% indirect interest in Simfer S.A.. These entities are consolidated as subsidiaries and together referred to as the Simandou iron ore project.

(n) Other operations include our 100% interest in the Gove alumina refinery, Rio Tinto Marine and, with effect from the first half of 2019, the remaining operating assets of Rio Tinto Coal Australia. As at 31 December 2019, these include provisions for onerous contracts in relation to rail infrastructure capacity, partly offset by deferred tax assets and financial assets and receivables relating to contingent royalties and disposal proceeds. Refer to note (j).

(o) Capital expenditure is the net cash outflow on purchases less sales of property, plant and equipment, capitalised evaluation costs and purchases less sales of other intangible assets. The details provided include 100% of subsidiaries' capital expenditure and Rio Tinto's share of the capital expenditure of joint operations and equity accounted units.

(p) Operating assets of subsidiaries is comprised of net assets excluding post-retirement assets and liabilities, net of tax, and before deducting net debt. Operating assets are stated after the deduction of non-controlling interests – these are calculated by reference to the net assets of the relevant companies (ie inclusive of such companies' debt and amounts due to or from Rio Tinto Group companies).

(q) Assets and liabilities held for sale at 31 December 2018 included our interest in Rössing Uranium Limited, the ISAL smelter, the Aluchemie anode plant, and the Alufluor aluminium fluoride plant. At 31 December 2017 it included our interest in the Dunkerque aluminium smelter and certain other separate assets.

Australian Corporations Act – summary of ASIC relief

Pursuant to section 340 of the Australian Corporations Act 2001 (Corporations Act), the Australian Securities and Investments Commission issued an order dated 14 December 2015 that granted relief to Rio Tinto Limited from certain requirements of the Corporations Act in relation to its financial statements and associated reports. The order essentially continues the relief that has applied to Rio Tinto Limited since the formation of the Group's dual listed companies (DLC) structure in 1995. *The order applies to Rio Tinto Limited's financial reporting obligations for* the financial years and half-years ending between 31 December 2015 and 30 June 2020 inclusive.

In essence, instead of being required under the Corporations Act to prepare consolidated financial statements covering only itself and its controlled entities, the order allows Rio Tinto Limited to prepare consolidated financial statements in which it, Rio Tinto plc and their respective controlled entities are treated as a single economic entity. In addition, those consolidated financial statements are to be prepared:

- in accordance with the principles and requirements of International Financial Reporting Standards as adopted by the European Union (EU IFRS) rather than the Australian Accounting Standards (AAS) (except for one limited instance in the case of any concise report), and in accordance with UK financial reporting obligations generally;
- on the basis that the transitional provisions of International Financial Reporting Standard 1, First-time Adoption of International Financial Reporting Standards, should be applied using the combined financial statements previously prepared for Rio Tinto Limited, Rio Tinto plc and their respective controlled entities under Generally Accepted Accounting Principles in the United Kingdom, under which the DLC Merger between Rio Tinto Limited and Rio Tinto plc was accounted for using "merger", rather than "acquisition", accounting (reflecting that neither Rio Tinto Limited nor Rio Tinto plc was acquired by, or is controlled by, the other; *and meaning that the existing carrying amounts, rather than fair values,* of assets and liabilities at the time of the DLC Merger were used to measure those assets and liabilities at formation);
- on the basis that Rio Tinto Limited and Rio Tinto plc are a single company (with their respective shareholders being the shareholders in that single company); and
- with a reconciliation, from EU IFRS to AAS, of the following amounts: consolidated loss/profit for the financial year, total consolidated comprehensive loss/income for the financial year and total consolidated equity at the end of the financial year (see page 151).

Those consolidated financial statements must also be audited in relation to their compliance with relevant Australian and UK requirements.
Rio Tinto Limited must also prepare a Directors' report which satisfies the content requirements of the Corporations Act (applied on the basis that for these purposes the consolidated entity is the Group, and the consolidated financial statements cover the Group). This includes a Remuneration report (see pages 110 to 138) prepared in accordance with the requirements of the Corporations Act.

Rio Tinto Limited is also required to comply generally with the lodgement and distribution requirements of the Corporations Act (including timing requirements) in relation to those consolidated financial statements (including any concise financial statements), the Auditors' report and the Directors' report. The Corporations Act also requires that a non-binding resolution to adopt the Remuneration report be voted on by shareholders at Rio Tinto Limited's annual general meeting.

Rio Tinto Limited is not required to prepare separate consolidated financial statements solely for it and its controlled entities. Rio Tinto Limited is also not required to prepare and lodge parent entity financial statements for itself in respect of each relevant financial year.

Rio Tinto Limited must, however, in accordance with the Corporations Act include in the consolidated financial statements for the Group, as a note, various parent entity information regarding Rio Tinto Limited (including in relation to assets, liabilities, shareholders' equity, profit and loss, income, guarantees, contingent liabilities, and contractual commitments) prepared in accordance with AAS (see page 226).

Directors' declaration

Directors' statement of responsibilities in relation to the Group financial statements, Rio Tinto plc financial statements and Rio Tinto Limited financial statements

The directors are responsible for preparing the Annual report, the Remuneration report and the financial statements in accordance with applicable law and regulations.

UK and Australian company law requires the directors to prepare financial statements for each financial year. Under UK law the directors have elected to prepare the Group financial statements in accordance with International Financial Reporting Standards (IFRSs) as adopted by the European Union (EU) and the Rio Tinto plc financial statements in accordance with United Kingdom Generally Accepted Accounting Practice (United Kingdom Accounting Standards and applicable law), including FRS 101 "Reduced disclosure framework".

Under Australian law, the directors are also required to prepare certain Rio Tinto Limited parent company financial statements in accordance with Australian Accounting Standards (AAS). In preparing the Group financial statements, the directors have also elected to comply with IFRSs, issued by the International Accounting Standards Board (IASB).

Under UK and Australian company law the directors must not approve the financial statements unless they are satisfied that they give a true and fair view of the state of affairs of the Group and the companies as at the end of the financial year, and of the profit or loss of the companies and Group for the period (as applicable).

In preparing these financial statements, the directors are required to:

- select suitable accounting policies and apply them consistently;
- make judgments and estimates that are reasonable and prudent;
- state whether IFRSs as adopted by the EU, applicable UK Accounting Standards and AAS have been followed, subject to any material departures disclosed and explained in the Group and parent company financial statements respectively; and
- prepare the financial statements on the going concern basis unless it is inappropriate to presume that the Group and the companies will continue in business.

The directors are responsible for keeping adequate accounting records that are sufficient to show and explain the transactions of the companies and the Group and disclose with reasonable accuracy at any time the financial position of the companies and the Group and enable them to ensure that:

- the Group financial statements comply with the UK Companies Act 2006, the Australian Corporations Act 2001 as amended by the Australian Securities and Investments Commission Order dated 14 December 2015 and Article 4 of the IAS Regulation;
- the Rio Tinto plc financial statements comply with the UK Companies Act 2006;
- the Rio Tinto Limited parent company disclosures comply with the Corporations Act as amended by the Australian Securities and Investments Commission Order dated 14 December 2015; and
- the Remuneration report complies with the UK Companies Act 2006 and the Australian Corporations Act 2001 as amended by the Australian Securities and Investments Commission Order dated 14 December 2015.

The directors are also responsible for safeguarding the assets of the Companies and the Group and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities.

The directors are responsible for the maintenance and integrity of the Group's website. Legislation governing the preparation and dissemination of financial statements may differ between jurisdictions in which the Group reports.

Each of the current directors, whose names and function are listed on pages 84 to 85 in the Governance section, confirm that, to the best of their knowledge:

- the Rio Tinto Group financial statements and notes, which have been prepared in accordance with IFRS as adopted by the EU, the Australian Corporations Act 2001 as amended by the Australian Securities and Investments Commission Order dated 14 December 2015, the UK Companies Act 2006 and Article 4 of the IAS Regulation, give a true and fair view of the assets, liabilities, financial position and profit of the Group;
- the Rio Tinto plc financial statements and notes, which have been prepared in accordance with United Kingdom Generally Accepted Accounting Practice, give a true and fair view of the assets, liabilities, financial position and profit of the company;
- the Rio Tinto Limited parent company disclosures, which have been prepared in accordance with the AAS and Australian Corporations Act 2001 as amended by the Australian Securities and Investments Commission Order dated 14 December 2015, give a true and fair view of the assets, liabilities, financial position and profit of the company;
- the Strategic report section of the Annual report include a fair review of the development and performance of the business and the position of the Group, together with a description of the principal risks and uncertainties that it faces; and
- there are reasonable grounds to believe that each of the Rio Tinto Group, Rio Tinto plc and Rio Tinto Limited will be able to pay its debts as and when they become due and payable.

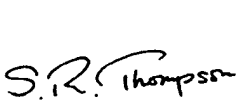
The directors have been given the declarations by the chief executive and chief financial officer required by section 295A of the Australian Corporations Act 2001 as amended by the Australian Securities and Investments Commission Order dated 14 December 2015.

Disclosure of information to auditors

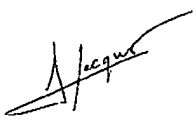
The directors in office at the date of this report have each confirmed that:

- so far as they are aware, there is no relevant audit information of which the Group's auditors are unaware; and
- they have taken all the steps that they ought to have taken as a director to make themselves aware of any relevant audit information and to establish that the Group's auditors are aware of that information.

This declaration is made in accordance with a resolution of the board.



Simon Thompson
Chairman



Jean-Sébastien Jacques
Chief executive

Jakob Stausholm
Chief financial officer

Auditor's independence declaration

As lead auditor for the audit of Rio Tinto Limited for the year ended 31 December 2019, I declare that to the best of my knowledge and belief, there have been:

(a) no contraventions of the auditor independence requirements of the Corporations Act 2001 in relation to the audit; and

(b) no contraventions of any applicable code of professional conduct in relation to the audit.

This declaration is in respect of Rio Tinto Limited and the entities it controlled during the period.

Debbie Smith
Partner
PricewaterhouseCoopers
Brisbane
26 February 2020

Liability limited by a scheme approved under Professional Standards Legislation

Independent auditors' report

of PricewaterhouseCoopers LLP to the members of Rio Tinto plc and of PricewaterhouseCoopers to the members of Rio Tinto Limited

For the purpose of this report, the terms "we" and "our" denote PricewaterhouseCoopers LLP in relation to UK legal, professional and regulatory responsibilities and reporting obligations to the members of Rio Tinto plc and PricewaterhouseCoopers in relation to Australian legal, professional and regulatory responsibilities and reporting obligations to the members of Rio Tinto Limited. For the purposes of the table on pages 260 to 261 that sets out the key audit matters and how our audit addressed the key audit matters, the terms "we" and "our" refer to PricewaterhouseCoopers LLP and/or PricewaterhouseCoopers and/or our component teams. The Group financial statements, as defined below, consolidate the accounts of Rio Tinto plc and Rio Tinto Limited and their respective subsidiaries (the "Group") and include the Group's share of joint arrangements and associates. The "Parent Companies" are defined as Rio Tinto plc and Rio Tinto Limited.

The relevant legislation governing the Parent Companies is the United Kingdom Companies Act 2006 ("Companies Act 2006") for Rio Tinto plc and the Australian Corporations Act 2001 ("Corporations Act 2001") as amended by the ASIC order dated 14 December 2015 (the "ASIC Order") for Rio Tinto Limited.

Report on the audit of the financial statements and the financial report

Opinion

Opinion of PricewaterhouseCoopers LLP on the financial statements to the members of Rio Tinto plc

In our opinion:

- the financial statements, defined below, give a true and fair view of the state of the Group's and of Rio Tinto plc's affairs as at 31 December 2019 and of the Group's profit and cash flows for the year then ended;
- the Group financial statements have been properly prepared in accordance with International Financial Reporting Standards ("IFRSs") as adopted by the European Union;
- the Rio Tinto plc financial statements have been properly prepared in accordance with United Kingdom Generally Accepted Accounting Practice (United Kingdom Accounting Standards, comprising FRS 101 "Reduced Disclosure Framework", and applicable law); and
- the financial statements have been prepared in accordance with the requirements of the Companies Act 2006 and, as regards the Group financial statements, Article 4 of the IAS Regulation.

PricewaterhouseCoopers LLP's opinion is consistent with our reporting to the Audit Committee.

Separate opinion of PricewaterhouseCoopers LLP in relation to financial statements prepared in accordance with IFRSs as issued by the International Accounting Standards Board (IASB)

As explained in note 1 to the financial statements, the Group, in addition to applying IFRSs as adopted by the European Union, has also applied IFRSs as issued by the IASB.

In our opinion, the Group financial statements have been properly prepared in accordance with IFRSs as issued by the IASB.

Opinion of PricewaterhouseCoopers on the financial report to the members of Rio Tinto Limited

In our opinion:

The accompanying financial report, defined below, is in accordance with the Corporations Act 2001 as amended by the ASIC Order, including:

- giving a true and fair view of the Group's financial position as at 31 December 2019 and of its financial performance for the year then ended; and
- complying with Australian Accounting Standards and the Corporations Regulations 2001.

What we have audited

The Group financial statements (as defined below) and the Rio Tinto plc financial statements (as defined below) are referred to in this report as the "financial statements". The Group financial statements, note 46 "Rio Tinto Limited parent company disclosures" and the Directors' declaration on page 256 are collectively referred to in this report as the "financial report".

PricewaterhouseCoopers LLP has audited the financial statements for the year ended 31 December 2019.

PricewaterhouseCoopers has audited the Reconciliation with Australian Accounting Standards, the Remuneration report included in the Directors' report and the financial report for the year ended 31 December 2019.

The Group financial statements, included within the Annual report and Accounts (the "Annual report"), comprise: the Group balance sheet as at 31 December 2019; the Group income statement and Group statement of comprehensive income for the year then ended; the Group cash flow statement for the year then ended; the Group statement of changes in equity for the year then ended; notes 1 - 45 and 47 to the Group financial statements, which include a description of the significant accounting policies and other explanatory information; the outline of dual listed companies structure and basis of financial statements; and the Rio Tinto financial information by business unit.

The Rio Tinto plc financial statements, included within the Annual report, comprise: the Rio Tinto plc Company balance sheet as at 31 December 2019; the Rio Tinto plc Company statement of changes in equity for the year then ended; and notes A - I to the Rio Tinto plc financial statements, which include a description of the significant accounting policies and other explanatory information.

Basis for opinion

We conducted our audit in accordance with International Standards on Auditing (UK) ("ISAs (UK)"), Australian Auditing Standards ("ASAs") and applicable law. Our responsibilities under those standards are further described in the Auditors' responsibilities for the audit of the financial statements and financial report section of our report. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Independence

PricewaterhouseCoopers LLP remained independent of the Group in accordance with the ethical requirements that are relevant to our audit of the financial statements in the UK, which includes the FRC's Ethical Standard, as applicable to listed public interest entities, and we have fulfilled our other ethical responsibilities in accordance with these requirements. To the best of our knowledge and belief, we declare that non-audit services prohibited by the FRC's Ethical Standard were not provided to the Group or Rio Tinto plc. Other than those disclosed in note 39 to the financial statements, we have provided no non-audit services to the Group or Rio Tinto plc in the period from 1 January 2019 to 31 December 2019.

PricewaterhouseCoopers remained independent of the Group in accordance with the auditor independence requirements of the Corporations Act 2001 and the ethical requirements of the Accounting Professional and Ethical Standards Board's APES 110 Code of Ethics for Professional Accountants (including Independence Standards) ("APES 110") that are relevant to our audit of the financial report in Australia. We have also fulfilled our other ethical responsibilities in accordance with APES 110.

Independent auditors' report

of PricewaterhouseCoopers LLP to the members of Rio Tinto plc and of PricewaterhouseCoopers to the members of Rio Tinto Limited continued

Our audit approach

The Group's principal activities are minerals and metals exploration, development, production and processing. The Group operates through four product groups which are supported by the Growth & Innovation group and other centralised functions. Together these comprise 44 business units containing multiple reporting units.

Overview	
Materiality	Overall Group materiality: US$350 million (2018: US$350 million). Overall Rio Tinto plc materiality: US$325 million (2018: US$325 million).
Scope	We identified the Pilbara business unit as a significant component which required an audit of its complete financial information due to its financial significance to the Group. We obtained full scope reporting from a further 20 reporting units (2018: 21). Specific audit procedures on certain balances and transactions were performed at a further 19 reporting units (2018: 20), which comprised 12 (2018: 11) operating reporting units and seven (2018: nine) central reporting units, such as treasury entities.
Key audit matters	We assessed the risks of material misstatement in the financial statements and the financial report and determined the following key audit matters for 2019: – assessment of indicators of impairment/reversal of impairment of finite-lived intangible assets and property, plant and equipment, and the assessment of the recoverable amount of the Oyu Tolgoi and Yarwun cash-generating units; – provisions for close-down, restoration and environmental obligations; and – provisions for uncertain tax positions, with a particular focus on transfer pricing of certain transactions with the Group's commercial centre in Singapore.

The scope of our audit and our key audit matters

As part of designing our audit, we determined materiality and assessed the risks of material misstatement in the financial statements and the financial report. In particular, we looked at where the directors made subjective judgements, for example in respect of significant accounting estimates that involved making assumptions and considering future events that are inherently uncertain.

Capabilities of the audit in detecting irregularities, including fraud

Based on our understanding of the Group and industry, we identified that the principal risks of non-compliance with laws and regulations related to breaches of safety and environmental regulations and unethical and prohibited business practices, and we considered the extent to which non-compliance may have a material effect on the financial statements and the financial report. We also considered those laws and regulations that have a direct impact on the preparation of the financial statements and financial report such as the Companies Act 2006, the Corporations Act 2001, the UK Listing Rules and the Listing Rules of the Australian Stock Exchange.

We evaluated management's incentives and opportunities for fraudulent manipulation of the financial statements and the financial report (including the risk of override of controls), and determined that the principal risks were related to posting inappropriate journal entries to overstate revenue or understate expenditure, and management bias in accounting estimates. The Group engagement team shared this risk assessment with the component auditors referred to in the scoping section of our report below, so that they could include appropriate audit procedures in response to such risks in their work. Audit procedures performed by the Group engagement team and/or component auditors included:

- discussions with management, Group Internal Audit, Ethics & Integrity and the Group's legal advisers, including consideration of known or suspected instances of non-compliance with laws and regulations and fraud;
- evaluation and testing of the operating effectiveness of management's controls designed to prevent and detect irregularities;
- assessment of matters reported through the Group's whistleblowing programme and the results of management's investigation of such matters;
- challenging assumptions and judgements made by management in its significant accounting estimates;
- identifying and testing journal entries, in particular any journal entries posted with unusual account combinations.

There are inherent limitations in the audit procedures described above. We are less likely to become aware of instances of non-compliance with laws and regulations that are not closely related to events and transactions reflected in the financial statements and financial report. Also, the risk of not detecting a material misstatement due to fraud is higher than the risk of not detecting one resulting from error, as fraud may involve deliberate concealment by, for example, forgery or intentional misrepresentations, or through collusion.

Key audit matters

Key audit matters are those matters that, in the auditors' professional judgement, were of most significance in the audit of the financial statements and financial report of the current period and include the most significant assessed risks of material misstatement (whether or not due to fraud) identified by the auditors, including those which had the greatest effect on: the overall audit strategy; the allocation of resources in the audit; and directing the efforts of the engagement team. These matters, and any comments we make on the results of our procedures thereon, were addressed in the context of our audit of the financial statements and the financial report as a whole, and in forming our opinions thereon, and we do not provide a separate opinion on these matters. This is not a complete list of all risks identified by our audit. We note that there are no key audit matters specifically applicable to Rio Tinto plc.

Independent auditors' report

of PricewaterhouseCoopers LLP to the members of Rio Tinto plc and of PricewaterhouseCoopers to the members of Rio Tinto Limited

Key audit matter	How our audit addressed the key audit matter
Assessment of indicators of impairment/reversal of impairment of finite-lived intangible assets and property, plant and equipment, and the assessment of the recoverable amount of the Oyu Tolgoi and Yarwun cash-generating units The Group has finite-lived intangible assets totalling US$878 million and property, plant and equipment of US$57,372 million as at 31 December 2019. Impairment charges to both of these asset categories have been recognised in previous years. The determination of whether an impairment or impairment reversal trigger exists can be judgemental. Management must determine the recoverable amount for finite-lived intangible assets and property, plant and equipment when impairment indicators or indicators of impairment reversal are identified. The determination of recoverable amount, being the higher of value-in-use ("VIU") and fair value less costs of disposal ("FVLCD"), requires judgement and estimation on the part of management in identifying and then determining the recoverable amounts for the relevant cash-generating units ("CGUs"). Recoverable amounts are based on management's view of key internal value driver inputs and external market conditions such as future commodity prices, the timing and approval of future capital and operating expenditure, and the most appropriate discount rate. The CGUs where we focussed our procedures were Oyu Tolgoi and Yarwun. Management identified impairment triggers in respect of these CGUs and therefore prepared an assessment of the recoverable amounts. It determined impairment losses had occurred, being US$2,240 million at Oyu Tolgoi and US$1,138 million at Yarwun. Refer to note 6 for management's conclusions and the Audit Committee's views set out on page 101.	For material property, plant and equipment and finite-lived intangible assets we undertook the following to test management's assessment for indicators of impairment/impairment reversal: – satisfied ourselves as to the appropriateness of management's identification of the Group's CGUs and the continued satisfactory operation of the Group's key controls over the impairment assessment process; and – evaluated management's assessment of impairment indicators, as well as indicators of impairment reversal, including the conclusions reached. In addition, specifically for the Oyu Tolgoi CGU, we: – tested management's determination of the recoverable amount of the Oyu Tolgoi CGU, prepared using the FVLCD methodology, which included the assessment of the reasonableness of key inputs into the valuation such as the discount rate and future copper prices. For the discount rate, this included our valuations experts independently calculating a discount rate and comparing it with management's own calculation; – understood the impact of the latest life of mine plan assumptions and assessed the competence and objectivity of management's internal technical experts in preparing this plan; – verified the integrity of formulae and mathematical accuracy of management's valuation model; – considered the current project status and the length of time remaining to complete the underground mine and related uncertainties; and – satisfied ourselves that management's determination of the impairment loss which had occurred was correctly calculated and validated the appropriateness of the related disclosures in note 6 to the financial statements. Specifically, for the Yarwun CGU, we: – tested management's determination of the recoverable amount of the Yarwun CGU, prepared using the FVLCD methodology, which included the assessment of the reasonableness of key inputs into the valuation such as the discount rate and future alumina prices; – assessed the basis of the allocation of certain commercial contracts and central costs in the valuation; – verified the integrity of formulae and mathematical accuracy of management's valuation model; and – satisfied ourselves that management's determination of the impairment loss which had occurred was correctly calculated and validated the appropriateness of the related disclosures in note 6 to the financial statements. Based on the procedures performed, we noted no material issues from our work.

Independent auditors' report

of PricewaterhouseCoopers LLP to the members of Rio Tinto plc and of PricewaterhouseCoopers to the members of Rio Tinto Limited continued

Key audit matter	How our audit addressed the key audit matter
Provisions for close-down, restoration and environmental obligations The Group has provisions for close-down, restoration and environmental obligations of US$11,090 million as at 31 December 2019. The calculation of these provisions requires management to estimate the quantum and timing of future costs, particularly given the unique nature of each site, the long timescales involved and the potential associated obligations. These calculations also require management to determine an appropriate rate to discount future costs to their net present value. There is limited restoration and rehabilitation activity and historical precedent against which to benchmark estimates of future costs. Management reviews the close-down, restoration and environmental obligations on an annual basis, using experts to provide support in its assessment where appropriate. This review incorporates the effects of any changes in local regulations and management's anticipated approach to restoration and rehabilitation. As at 31 December 2019, the total provision held on the balance sheet has increased from US$9,975 million to US$11,090 million. Refer to notes 1(iv) and 26, and the Audit Committee's views set out on page 101.	We assessed management's process for the review of closure provisions, and performed detailed testing for reporting units that recorded a movement in their closure provision in the year, or a closure provision as at 31 December 2019, that was above the respective individual component's materiality level. As part of our detailed testing of the cost estimates prepared by management, we validated the existence of legal and/or constructive obligations with respect to the closure provision and considered the intended method of restoration and rehabilitation and associated cost estimate. We also considered the competence and objectivity of management's experts, whether internal or external to the Group, who produced the cost estimates and, where we considered it appropriate, engaged our own internal expert to assess the work performed by management's experts. We checked the mathematical accuracy of management's calculations and assessed the appropriateness of the discount rate using our valuations experts. In respect of the largest increases in obligations during the year, at Rio Tinto Kennecott and in the Pilbara, we performed the following additional procedures: – read the latest available technical studies and assessed the appropriateness of the scope of work performed by management and the various third party experts; and – considered whether the updates in provisions reflect changes to previous estimates or the correction of prior period errors. For the reporting units in scope that did not have a movement in the year, or a closure provision as at 31 December 2019, that was above the respective individual component's materiality level we considered whether the provision relating to close-down, restoration and environmental obligations was consistent with our understanding of the obligations associated with the operation and the remediation plans. We considered the appropriateness of the related disclosures in notes 1 and 26 to the financial statements. Based on the procedures performed, we noted no material issues from our work.
Provisions for uncertain tax positions, with a particular focus on transfer pricing of certain transactions with the Group's commercial centre in Singapore The Group operates across a large number of jurisdictions and is subject to periodic challenges by local tax authorities on a range of tax matters during the normal course of business, including transfer pricing, indirect taxes and transaction related tax matters. As at 31 December 2019, the Group has current and non-current taxes payable of US$2,250 million. Where the amount of tax payable is uncertain, the Group establishes provisions based on either: the Group's judgment of the most likely amount of the liability; or, when there is a wide range of possible outcomes, a probability weighted average approach. In relation to specific uncertain tax positions, we focussed on matters relating to the transfer pricing of certain transactions between the Group's entities based in Australia and the Group's commercial centre in Singapore. Over the past financial year, the Group has been in continued discussions with the Australian Taxation Office on these matters. Refer to notes 1(vi) and 9, and the Audit Committee's views set out on page 101.	We assessed management's process for identifying uncertain tax positions and the related accounting policy of providing for tax exposures. We engaged our tax specialists to understand the current status of tax assessments and investigations and to assess developments in ongoing disputes. We read recent rulings and correspondence with local tax authorities, as well as external advice received by the Group where relevant, to satisfy ourselves that the tax provisions had been appropriately recorded or adjusted to reflect the latest external developments. In addition to our overall response to the risk described above, we performed procedures in respect of the Group's Singapore commercial centre as follows: – read the latest available correspondence between management and the relevant tax authorities and expert reports to assess the continued appropriateness of the provision recognised by management; – checked the mathematical accuracy of management's provision calculations and agreed relevant input data to supporting records; and – engaged our experts in the field of transfer pricing to evaluate the basis on which the provision has been determined. We considered the appropriateness of the related disclosures in notes 1 and 9 to the financial statements. Based on the procedures performed, we noted no material issues arising from our work.

Independent auditors' report

of PricewaterhouseCoopers LLP to the members of Rio Tinto plc and of PricewaterhouseCoopers to the members of Rio Tinto Limited

How we tailored the audit scope

As the Group engagement team, we tailored the scope of our audit to ensure that we performed enough work to be able to give opinions on the financial statements and the financial report as a whole, taking into account the geographical structure of the Group, the accounting processes and controls, and the industry in which the Group operates.

The Group is organised into four product groups - Aluminium, Copper & Diamonds, Energy & Minerals and Iron Ore, all of which are supported by the Growth & Innovation group and other centralised functions. Each product group is made up of a number of operating businesses which represent separate business units. Each business unit is comprised of individual reporting units which align to discrete operations. The Group financial statements are a consolidation of reporting units, comprising the Group's operating businesses and centralised functions. We determined the appropriate reporting units to perform work on based on factors such as the size of the balances, the key audit matters as noted above and known accounting matters, and to include unpredictability in our audit procedures.

In establishing the overall approach to the Group audit, we determined the type of work that needed to be performed at reporting units by us, as the Group engagement team, or component auditors from either other PwC network firms or non-PwC firms operating under our instruction.

We identified the Pilbara reporting unit as a significant component (as defined within ISAs (UK) and ASAs) which, in our view, required an audit of its complete financial information, due to its financial significance to the Group. We obtained full scope reporting from a further 20 reporting units (2018: 21). Specific audit procedures on certain balances and transactions were performed at a further 19 reporting units (2018: 20), which comprised 12 (2018: 11) operating reporting units and seven (2018: nine) central reporting units, such as treasury entities, primarily to ensure appropriate audit coverage.

As we seek to vary our audit procedures each year to ensure an element of unpredictability, two different smaller reporting units (2018: three) were included in our Group audit scope for 2019. We also performed work centrally on IT general controls, journals, taxation and pensions.

Where work was performed by component auditors, we determined the level of involvement we needed to have in the audit work at those reporting units to be able to conclude whether sufficient appropriate audit evidence had been obtained as a basis for our opinions on the Group financial statements and financial report as a whole.

We issued formal written instructions to all component auditors setting out the audit work to be performed by each of them and maintained regular communication with the component auditors throughout the audit cycle. These interactions included attending certain component clearance meetings and holding regular conference calls, as well as reviewing and assessing any matters reported. The Group engagement team also reviewed selected audit working papers for certain component teams.

In addition, senior members of the Group engagement team visited component teams across all four product groups in Australia, Canada, Chile, Mongolia, Singapore, South Africa and the United States of America. These visits included meetings with local management and with the component auditors, and typically operating site tours.

Materiality

The scope of our audit was influenced by our application of materiality. We set certain quantitative thresholds for materiality. These, together with qualitative considerations, helped us to determine the scope of our audit and the nature, timing and extent of our audit procedures on the individual financial statement line items and disclosures and to evaluate the effect of misstatements, both individually and in aggregate, on the financial statements and the financial report as a whole.

Based on our professional judgement, we determined materiality for the financial statements and the financial report as a whole as follows:

Overall materiality	Overall Group materiality: US$350 million (2018: US$350 million). Overall Rio Tinto plc materiality: US$325 million (2018: US$325 million).
How we determined it	For overall Group materiality we used an average of underlying earnings before tax (as defined in note 2 to the financial statements) of the current and previous three years (2018: average underlying earnings before tax of the then current year and previous three years). For overall Rio Tinto plc materiality we used total assets as a basis for determining materiality.
Rationale for benchmark applied	For overall Group materiality, we chose to use an underlying earnings measure as the benchmark because an underlying measure removes the impact of material items which do not recur from year to year or otherwise significantly affect the underlying trend of performance from continuing operations. This is the metric against which the performance of the Group is most commonly assessed by management and reported to members. Our approach to determine materiality is based on a four year average of profit before tax adjusted for items excluded from underlying earnings. The adoption of a multi-year average benchmark for materiality responds to longer-term trends in commodity markets and reduces volatility in the measure year-on-year. Using our professional judgement, we determined materiality for this year at US$350 million, which equates to approximately 2.3% of the current year's underlying earnings before tax. For overall Rio Tinto plc materiality we determined our materiality based on total assets, which is more applicable than a performance-related measure as the company is an investment holding company for the Group. Using our professional judgement, we determined materiality for this year at US$325 million, which equates to approximately 0.8% of the current year's total assets.
Component materiality	For each reporting unit ("component") in our audit scope, we allocated a materiality that was less than our overall Group materiality. The materiality allocated to each component was between US$15 million and US$320 million (2018: US$15 million and US$320 million).

We agreed with the Audit Committee that we would report to them misstatements identified during our audit above US$25 million (2018: US$25 million) as well as misstatements below those amounts that, in our view, warranted reporting for qualitative reasons.

Independent auditors' report

of PricewaterhouseCoopers LLP to the members of Rio Tinto plc and of PricewaterhouseCoopers to the members of Rio Tinto Limited continued

Going concern

Reporting obligation

In accordance with ISAs (UK) we report as follows:

We are required to report to you if we have anything material to add or to draw attention to in respect of the directors' statement about whether they considered it appropriate to adopt the going concern basis of accounting in preparing the financial statements and the directors' identification of any material uncertainties to the Group's and Rio Tinto plc's ability to continue as a going concern over a period of at least twelve months from the date of the approval of the financial statements. We have nothing material to add or draw attention to. However, because not all future events or conditions can be predicted, this statement is not a guarantee as to the Group's and Rio Tinto plc's ability to continue as a going concern. For example, the terms of the United Kingdom's withdrawal from the European Union are not clear, and it is difficult to evaluate all of the potential implications on the Group's and Rio Tinto plc's trade, customers, suppliers and the wider economy.

We are also required to report if the directors' statement relating to going concern in accordance with Listing Rule 9.8.6R(3) is materially inconsistent with our knowledge obtained in the audit. We have nothing to report.

In accordance with ASAs:

We are required to conclude on the appropriateness of the directors' use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Group's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial report or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Group to cease to continue as a going concern.

Reporting on other information – PricewaterhouseCoopers LLP

The other information comprises all of the information in the Annual report other than the financial statements and our auditors' report thereon. The directors are responsible for the other information. Our opinion on the financial statements does not cover the other information and, accordingly, we do not express an audit opinion or, except to the extent otherwise explicitly stated in this report, any form of assurance thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit, or otherwise appears to be materially misstated. If we identify an apparent material inconsistency or material misstatement, we are required to perform procedures to conclude whether there is a material misstatement of the financial statements or a material misstatement of the other information. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report based on these responsibilities.

With respect to the Strategic Report and the Directors' Report, we also considered whether the disclosures required by the Companies Act 2006 have been included.

Based on the responsibilities described above and our work undertaken in the course of the audit, the Companies Act 2006 (CA06), ISAs (UK) and the Listing Rules of the Financial Conduct Authority (FCA) require us also to report certain opinions and matters as described below (required by ISAs (UK) unless otherwise stated).

Strategic report and Directors' report

In our opinion, based on the work undertaken in the course of the audit, the information given in the Strategic Report and the Directors' Report for the year ended 31 December 2019 is consistent with the financial statements and has been prepared in accordance with applicable legal requirements. (CA06)

In light of the knowledge and understanding of the Group and Rio Tinto plc and their environment obtained in the course of the audit, we did not identify any material misstatement in the Strategic Report and Directors' Report. (CA06)

The directors' assessment of the prospects of the Group and of the principal risks that would threaten the solvency or liquidity of the Group

We have nothing material to add or draw attention to regarding:

- The directors' confirmation on page 71 of the Annual report that they have carried out a robust assessment of the principal risks facing the Group, including those that would threaten its business model, future performance, solvency or liquidity.
- The disclosures in the Annual report that describe those risks and explain how they are being managed or mitigated.
- The directors' explanation on page 72 of the Annual report as to how they have assessed the prospects of the Group, over what period they have done so and why they consider that period to be appropriate, and their statement as to whether they have a reasonable expectation that the Group will be able to continue in operation and meet its liabilities as they fall due over the period of their assessment, including any related disclosures drawing attention to any necessary qualifications or assumptions.

We have nothing to report having performed a review of the directors' statement that they have carried out a robust assessment of the principal risks facing the Group and statement in relation to the longer-term viability of the Group. Our review was substantially less in scope than an audit and only consisted of making inquiries and considering the directors' process supporting their statements; checking that the statements are in alignment with the relevant provisions of the UK Corporate Governance Code (the "Code"); and considering whether the statements are consistent with the knowledge and understanding of the Group and Rio Tinto plc and their environment obtained in the course of the audit. (Listing Rules)

Independent auditors' report

of PricewaterhouseCoopers LLP to the members of Rio Tinto plc and of PricewaterhouseCoopers to the members of Rio Tinto Limited

Other Code provisions

We have nothing to report in respect of our responsibility to report when:
- The statement given by the directors, on page 142, that they consider the Annual report taken as a whole to be fair, balanced and understandable, and provides the information necessary for members to assess the Group's and Rio Tinto plc's position and performance, business model and strategy, is materially inconsistent with our knowledge of the Group and Rio Tinto plc acquired in the course of performing our audit.
- The section of the Annual report on page 100 describing the work of the Audit Committee does not appropriately address matters communicated by us to the Audit Committee.
- The directors' statement relating to Rio Tinto plc's compliance with the Code does not properly disclose a departure from a relevant provision of the Code specified, under the Listing Rules, for review by the auditors.

Directors' remuneration

In our opinion, the part of the Remuneration report to be audited has been properly prepared in accordance with the Companies Act 2006. (CA06)

Reporting on other information - PricewaterhouseCoopers

The directors are responsible for the other information. The other information comprises the information included in the Annual report for the year ended 31 December 2019, but does not include the financial report and our auditor's report thereon.

Our opinion on the financial report does not cover the other information and accordingly we do not express any form of assurance conclusion thereon.

In connection with our audit of the financial report, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial report or our knowledge obtained in the audit, or otherwise appears to be materially misstated.

If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

Report on the Remuneration report - PricewaterhouseCoopers

Remuneration report - Corporations Act 2001 opinion

Under the Corporations Act 2001 (in respect of Rio Tinto Limited) we are required to express an opinion on the Remuneration report based on our audit conducted in accordance with ASAs.

Opinion on the Remuneration report

We have audited the Remuneration report included on pages 116 to 138 of the Directors' report for the year ended 31 December 2019.

In our opinion, the Remuneration report of Rio Tinto Limited for the year ended 31 December 2019 complies with section 300A of the Corporations Act 2001 as amended by the ASIC Order.

Responsibilities

The directors of Rio Tinto Limited are responsible for the preparation and presentation of the Remuneration report in accordance with section 300A of the Corporations Act 2001 as amended by the ASIC Order.

Our responsibility is to express an opinion on the Remuneration report, based on our audit conducted in accordance with ASAs.

Responsibilities for the financial statements, the financial report and the audit

Responsibilities of the directors for the financial statements and financial report

As explained more fully in the Directors' statement of responsibilities set out on page 256, the directors are responsible for the preparation of the financial statements and the financial report in accordance with the applicable financial reporting frameworks and for being satisfied that they give a true and fair view. The directors are also responsible for such internal control as they determine is necessary to enable the preparation of financial statements and the financial report that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements and financial report, the directors are responsible for assessing the Group's and Parent Companies' ability to continue as a going concern, disclosing as applicable matters related to going concern and using the going concern basis of accounting unless the directors either intend to liquidate the Group or the Parent Companies or to cease operations, or have no realistic alternative but to do so.

Auditors' responsibilities for the audit of the financial statements and financial report

Our objectives are to obtain reasonable assurance about whether the financial statements and financial report as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditors' report that includes our opinions. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with ISAs (UK) and ASAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements or financial report.

A further description of PricewaterhouseCoopers LLP's responsibilities for the audit of the financial statements is located on the FRC's website at: www.frc.org.uk/auditors. A further description of PricewaterhouseCoopers' responsibilities for the audit of the financial report is located on the Auditing and Assurance Standards Board website at: www.auasb.gov.au/auditors_responsibilities/ar1.pdf. The descriptions on these websites form part of the auditors' report for PricewaterhouseCoopers LLP and PricewaterhouseCoopers respectively.

Use of this report

This report, including the opinions, has been prepared for and only for the members of Rio Tinto plc and Rio Tinto Limited as a body in accordance with Chapter 3 of Part 16 of the Companies Act 2006 (in respect of Rio Tinto plc) and the Corporations Act 2001 as amended by the ASIC Order (in respect of Rio Tinto Limited) and for no other purpose. We do not, in giving these opinions, accept or assume responsibility for any other purpose or to any other person to whom this report is shown or into whose hands it may come save where expressly agreed by our prior consent in writing.

Independent auditors' report

of PricewaterhouseCoopers LLP to the members of Rio Tinto plc and of PricewaterhouseCoopers to the members of Rio Tinto Limited continued

Other required reporting – PricewaterhouseCoopers LLP
Companies Act 2006 exception reporting
Under the Companies Act 2006 we are required to report to you if, in our opinion:

- we have not received all the information and explanations we require for our audit; or
- adequate accounting records have not been kept by Rio Tinto plc, or returns adequate for our audit have not been received from branches not visited by us; or
- certain disclosures of directors' remuneration specified by law are not made; or
- the Rio Tinto plc financial statements and the part of the Remuneration report to be audited are not in agreement with the accounting records and returns.

We have no exceptions to report arising from this responsibility.

Appointment – PricewaterhouseCoopers LLP and PricewaterhouseCoopers
PricewaterhouseCoopers LLP and PricewaterhouseCoopers have acted as auditors of Rio Tinto since its formation under a dual listed company structure in 1995.

A predecessor firm of PricewaterhouseCoopers LLP was appointed by the members of a predecessor company of Rio Tinto plc on 8 May 1958 to audit the financial statements for the year ended 31 May 1958 and subsequent financial periods. The period of total uninterrupted engagement is 62 years, covering the years ended 31 May 1958 to 31 December 2019.

A predecessor firm of PricewaterhouseCoopers was appointed by the members of a predecessor company of Rio Tinto Limited on 31 December 1959 to audit the financial statements for the year ended 31 December 1959 and subsequent financial periods. The period of total uninterrupted engagement is 61 years, covering the years ended 31 December 1959 to 31 December 2019.

Paul Barkus
Senior Statutory Auditor
for and on behalf of
PricewaterhouseCoopers LLP
Chartered Accountants and
Statutory Auditors

London, United Kingdom
26 February 2020

Debbie Smith
Partner
for and on behalf of
PricewaterhouseCoopers

Brisbane, Australia
26 February 2020

Financial summary 2010-2019

US$m	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Gross sales revenue[a]	59,008	65,298	55,597	54,575	50,041	36,784	35,336	41,867	42,835	**45,367**
Share of equity accounted units' sales revenue and items excluded from underlying earnings	(3,837)	(4,769)	(4,655)	(3,404)	(2,377)	(1,955)	(1,555)	(1,837)	(2,313)	**(2,202)**
Consolidated sales revenue	55,171	60,529	50,942	51,171	47,664	34,829	33,781	40,030	40,522	**43,165**
Underlying profit before interest and tax (PBIT)	21,128	23,662	13,467	16,039	13,851	7,310	8,053	13,363	13,208	**15,979**
Finance costs[b]	(909)	(759)	(616)	(794)	(967)	(1,076)	(1,360)	(1,090)	(680)	**(638)**
Exchange differences and derivatives[c]	529	2	695	(3,362)	(2,021)	(3,458)	622	(1,078)	923	**(273)**
Other exclusions from underlying earnings	(257)	(9,633)	(15,977)	(8,378)	(1,311)	(3,502)	(972)	1,621	4,716	**(3,949)**
Profit/(loss) before tax (PBT)	20,491	13,272	(2,431)	3,505	9,552	(726)	6,343	12,816	18,167	**11,119**
Tax on exclusions	42	135	2,896	2,642	423	567	(155)	(596)	(801)	**391**
Tax on underlying PBT	(5,338)	(6,607)	(3,485)	(5,068)	(3,476)	(1,560)	(1,412)	(3,369)	(3,441)	**(4,538)**
Loss after tax from discontinued operations	(97)	(10)	(7)	—	—	—	—	—	—	**—**
Attributable to non-controlling interests	(860)	(955)	(1)	2,586	28	853	(159)	(89)	(287)	**1,038**
Net earnings/(loss)[d]	14,238	5,835	(3,028)	3,665	6,527	(866)	4,617	8,762	13,638	**8,010**
Underlying EBITDA	25,978	28,640	19,245	21,509	19,665	12,621	13,510	18,580	18,136	**21,197**
Underlying earnings	13,987	15,572	9,269	10,217	9,305	4,540	5,100	8,627	8,808	**10,373**
Earnings/(loss) per share (basic) – continuing operations	731.0c	303.9c	(163.4)c	198.4c	353.1c	(47.5)c	256.9c	490.4c	793.2c	**491.4c**
Underlying earnings per share (basic) – continuing operations	713.3c	809.7c	501.3c	553.1c	503.4c	248.8c	283.8c	482.8c	512.3c	**636.3c**
Dividends per share: declared for year[e]										
Rio Tinto shareholders (US cents)	108.00c	145.00c	167.00c	192.00c	215.00c	215.00c	170.00c	290.00c	307.00c	**231.00c**
Rio Tinto plc (pence)	67.35p	90.47p	106.77p	120.10p	134.88p	143.13p	134.36p	212.56p	232.78p	**177.47p**
Rio Tinto Limited (Aus. cents)	111.21c	134.01c	160.18c	213.14c	256.07c	296.80c	222.75c	366.25c	421.73c	**349.74c**
Net assets										
Fixed assets[f]	83,895	91,529	90,580	81,554	80,669	70,226	68,104	70,735	64,351	**64,902**
Other assets less liabilities	4,394	1,632	8,478	8,224	4,596	4,037	4,128	2,495	2,498	**2,314**
Provisions (including deferred tax liabilities)	(19,706)	(25,935)	(22,126)	(18,221)	(18,176)	(16,352)	(16,915)	(18,270)	(17,281)	**(18,323)**
Net (debt)/cash	(4,071)	(8,342)	(19,192)	(18,055)	(12,495)	(13,783)	(9,587)	(3,845)	255	**(3,651)**
Non-controlling interests	(6,265)	(6,685)	(11,187)	(7,616)	(8,309)	(6,779)	(6,440)	(6,404)	(6,137)	**(4,710)**
Equity attributable to owners of Rio Tinto	58,247	52,199	46,553	45,886	46,285	37,349	39,290	44,711	43,686	**40,532**
Capital expenditure[g]	(4,591)	(12,573)	(17,615)	(13,001)	(8,162)	(4,685)	(3,012)	(4,482)	(5,430)	**(5,488)**
Acquisitions	(907)	(4,156)	(1,335)	4	—	(3)	—	—	(5)	**—**
Disposals	3,800	386	251	1,896	887	(38)	761	2,675	7,733	**(80)**
Net cash generated from operating activities[h]	18,277	20,235	9,430	15,078	14,286	9,383	8,465	13,884	11,821	**14,912**
Cash flows before financing activities[i]	16,566	3,245	(8,813)	4,132	7,783	4,783	6,361	11,511	13,142	**9,411**
Ratios										
Operating margin[j]	37%	37%	25%	30%	28%	20%	23%	32%	31%	**36%**
Net (debt)/cash to total capital[k]	-6%	-12%	-25%	-25%	-19%	-24%	-17%	-7%	1%	**7%**
Underlying earnings: owners' equity[l]	27%	28%	19%	22%	20%	11%	13%	21%	20%	**25%**
Interest cover[m]	27	27	13	13	13	7	7	14	22	**28**

(a) Gross sales revenue includes 100% of subsidiaries' sales revenue and the Group's share of the sales revenue of equity accounted units (after adjusting for sales to subsidiaries).
(b) Finance costs include net interest and amortisation of discount. From 1 January 2019, it also includes the impact of adopting IFRS 16 "Leases". See note 45.
(c) Under IFRS, as defined in note 1, certain gains and losses on currency exchange and on revaluation of derivatives are included in the Group's net earnings/(loss). These items are excluded from underlying earnings.
(d) Underlying earnings is an additional measure of earnings, which is reported by Rio Tinto with its IFRS (as defined in note 1) results to provide greater understanding of the underlying business performance of its operations. It is defined in note 2 to the financial statements. Underlying profit before interest and tax (PBIT) is similar to underlying earnings except that it is stated before interest and tax.
(e) Dividends per share are the amounts declared in respect of each financial year. These usually include an interim dividend paid in the year, and a final dividend paid after the end of the year. The special dividend of 243 US cents per share paid out based on the 2018 results is not included above.
(f) Fixed assets include: property, plant and equipment, intangible assets, goodwill, and investments in, and long-term loans to, equity accounted units. From 1 January 2019, it also includes the impact of adopting IFRS 16 "Leases". See note 45.
(g) Capital expenditure is presented gross, before taking into account any disposals of property, plant and equipment or intangible assets.
(h) Net cash generated from operating activities represents the cash generated by the Group's consolidated operations, after payment of interest, taxes, and dividends to non-controlling interests in subsidiaries.
(i) Cash flow before financing activities is stated before deducting dividends payable to owners of Rio Tinto.
(j) Operating margin is the percentage of underlying PBIT, after excluding tax on equity accounted units, to gross sales revenue.
(k) Total capital comprises equity attributable to owners of Rio Tinto plus net debt and non-controlling interests.
(l) Underlying earnings: owners' equity represents underlying earnings expressed as a percentage of the mean of opening and closing equity attributable to owners of Rio Tinto.
(m) Interest cover represents the number of times interest payable less receivable (excluding the amortisation of discount but including capitalised interest) is covered by underlying operating profit, less amortisation of discount, plus dividends from equity accounted units. Underlying operating profit is similar to underlying earnings but is stated before tax, interest and share of profit after tax of equity accounted units.

Summary financial data in Australian dollars, sterling and US dollars

2019 A$m	2018 A$m	2019 £m	2018 £m		2019 US$m	2018 US$m
64,810	57,113	**35,443**	31,966	Gross sales revenue	**45,367**	42,835
61,664	54,029	**33,723**	30,240	Consolidated sales revenue	**43,165**	40,522
15,884	24,223	**8,687**	13,557	Profit before tax from continuing operations	**11,119**	18,167
9,960	18,567	**5,447**	10,392	Profit for the year from continuing operations	**6,972**	13,925
11,443	18,184	**6,258**	10,178	Net earnings attributable to Rio Tinto shareholders	**8,010**	13,638
30,281	24,181	**16,560**	13,534	Underlying EBITDA	**21,197**	18,136
14,819	11,744	**8,104**	6,573	Underlying earnings[a]	**10,373**	8,808
702.0c	1057.6c	**383.9p**	592.0p	Basic earnings per ordinary share[b]	**491.4p**	793.2p
909.1c	683.1c	**497.1p**	382.3p	Basic underlying earnings per ordinary share[a][b]	**636.3p**	512.3p
				Dividends per share to Rio Tinto shareholders[c]		
469.97c	399.37c	**259.28p**	226.25p	- paid – ordinary dividend	**331.0c**	307.0c
427.20c	—	**233.37p**	—	- paid – special dividend	**304.0c**	—
349.74c	250.89c	**177.47p**	135.96p	- proposed – ordinary dividend	**231.0c**	180.0c
—	338.70c	**—**	183.55p	- *proposed – special dividend*	**—**	243.0c
13,444	17,523	**7,352**	9,807	Cash flow before financing activities	**9,411**	13,142
(5,216)	364	**(2,787)**	201	Net (debt)/cash	**(3,651)**	255
57,903	62,409	**30,940**	34,398	Equity attributable to Rio Tinto shareholders	**40,532**	43,686

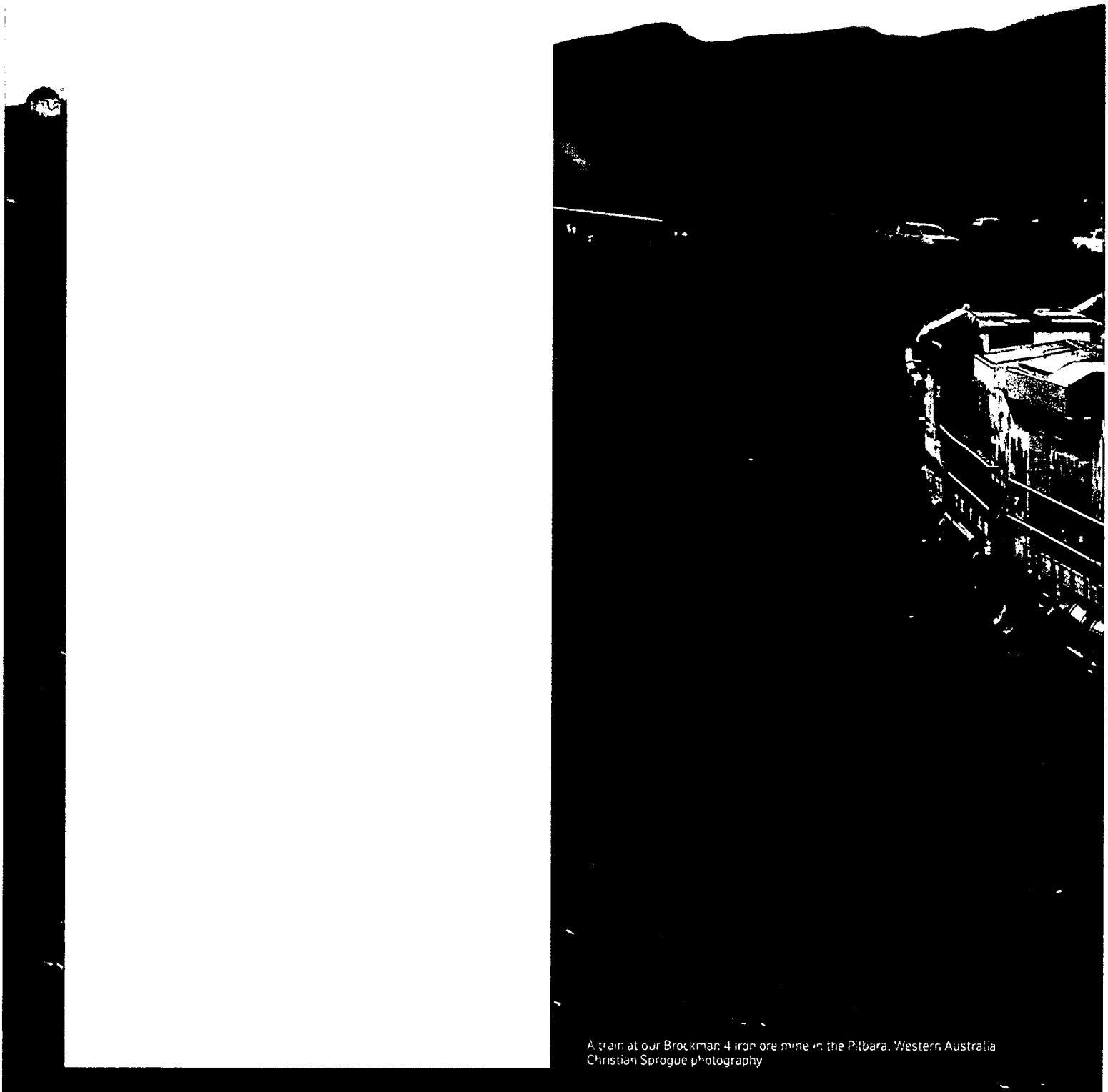
(a) Underlying earnings exclude impairments, net losses on disposal of business and other charges of US$2,363 million (2018: net gains on disposal of business and other income of US$4,830 million), *which are analysed on page 170.*

(b) Basic earnings per ordinary share and basic underlying earnings per ordinary share do not recognise the dilution resulting from share options on issue.

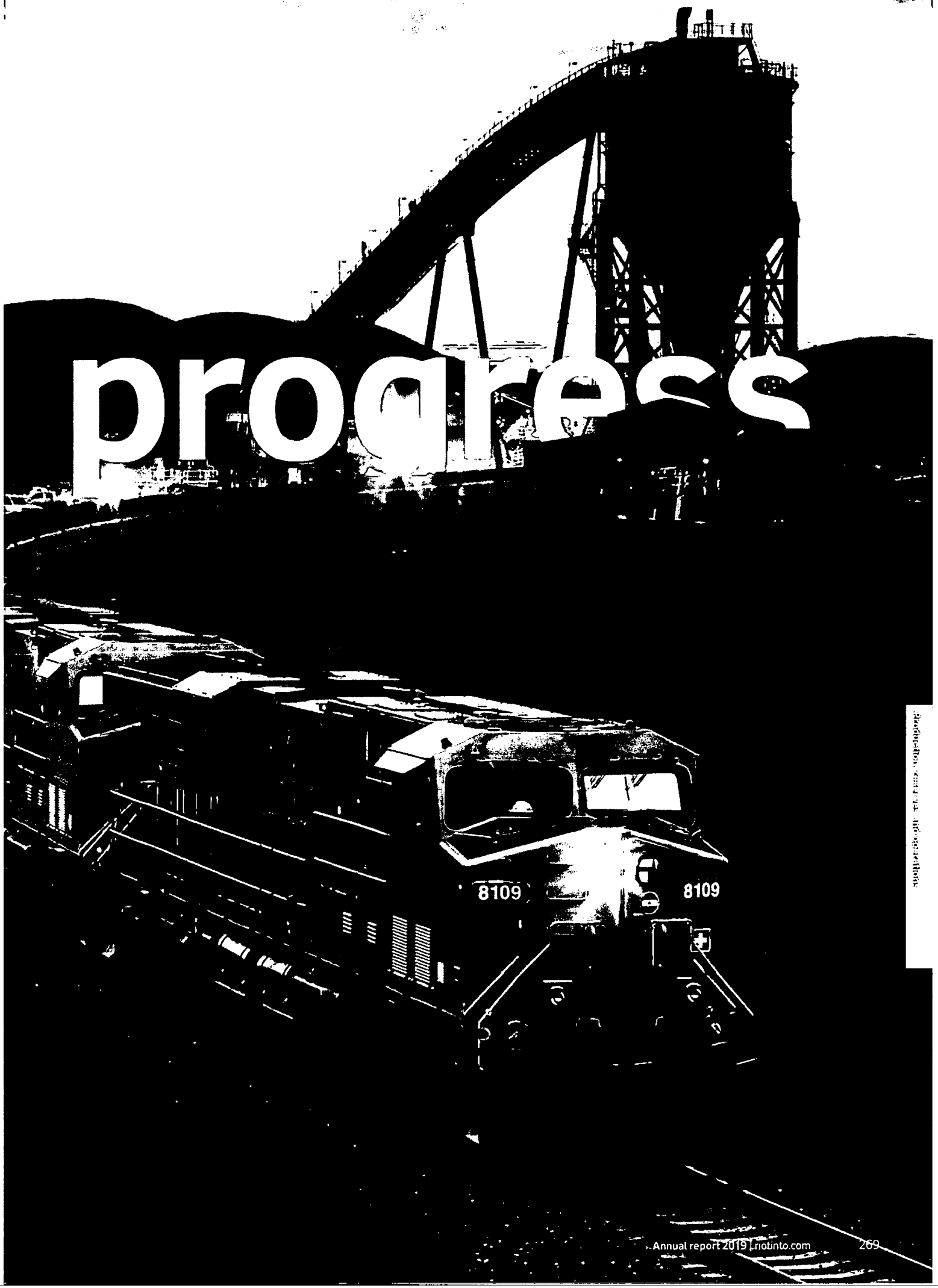
(c) The Australian dollar and sterling amounts are based on the US dollar amounts, retranslated at average or closing rates as appropriate, except for the dividends which are the actual amounts.

The financial data above has been extracted from the financial information set out on pages 144 to 246.

Production, reserves and operations



A train at our Brockman 4 iron ore mine in the Pilbara, Western Australia
Christian Sprogue photography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Metals and minerals production

		2019 Production		2018 Production		2017 Production	
	Rio Tinto % share[a]	Total	Rio Tinto share	Total	Rio Tinto share	Total	Rio Tinto share
Alumina ('000 tonnes)							
Jonquière (Vaudreuil) (Canada)[b]	100.0%	1,413	1,413	1,444	1,444	1,448	1,448
Jonquière (Vaudreuil) specialty plant (Canada)	100.0%	109	109	124	124	122	122
Queensland Alumina (Australia)	80.0%	3,454	2,763	3,697	2,958	3,735	2,988
São Luis (Alumar) (Brazil)	10.0%	3,679	368	3,509	351	3,697	370
Yarwun (Australia)	100.0%	3,091	3,091	3,103	3,103	3,203	3,203
Rio Tinto total			7,744		7,980		8,131
Aluminium ('000 tonnes)							
Alma (Canada)	100.0%	472	472	465	465	457	457
Alouette (Sept-Îles) (Canada)	40.0%	602	241	584	234	598	239
Arvida (Canada)	100.0%	175	175	173	173	171	171
Arvida AP60 (Canada)	100.0%	60	60	52	52	57	57
Bécancour (Canada)	25.1%	77	19	136	34	438	110
Bell Bay (Australia)	100.0%	189	189	189	189	187	187
Boyne Island (Australia)	59.4%	499	296	497	295	508	302
Dunkerque (France)[c]	–	–	–	227	227	284	284
Grande-Baie (Canada)	100.0%	233	233	233	233	229	229
ISAL (Reykjavik) (Iceland)	100.0%	184	184	212	212	212	212
Kitimat (Canada)	100.0%	385	385	436	436	433	433
Laterrière (Canada)	100.0%	257	257	257	257	249	249
Sohar (Oman)	20.0%	391	78	380	76	253	51
Tiwai Point (New Zealand)	79.4%	351	279	341	270	337	267
Tomago (Australia)	51.6%	588	303	592	305	590	304
Rio Tinto total			3,171		3,458		3,551
Bauxite ('000 tonnes)							
Gove (Australia)	100.0%	12,201	12,201	12,540	12,540	11,201	11,201
Porto Trombetas (MRN) (Brazil)	12.0%	11,060	1,327	13,134	1,576	14,698	1,764
Sangaredi (Guinea)	23.0[d]	13,701	6,165	13,039	5,868	15,409	6,934
Weipa (Australia)	100.0%	35,411	35,411	30,437	30,437	30,898	30,898
Rio Tinto total			55,105		50,421		50,796
Borates ('000 tonnes)[e]							
Rio Tinto Borates – Boron (US)	100.0%	520	520	512	512	517	517
Coal (hard coking) ('000 tonnes)							
Rio Tinto Coal Australia							
Hail Creek Coal (Australia)[f][g]	–	–	–	2,700	2,214	5,247	4,303
Kestrel Coal (Australia)[f][g]	–	–	–	2,217	1,774	4,252	3,402
Rio Tinto total hard coking coal			–		3,988		7,704
Coal (semi-soft coking) ('000 tonnes)							
Rio Tinto Coal Australia							
Hunter Valley (Australia)[h]	–	–	–	–	–	1,529	1,034
Mount Thorley (Australia)[h]	–	–	–	–	–	876	700
Warkworth (Australia)[h]	–	–	–	–	–	514	286
Rio Tinto total semi-soft coking coal			–		–		2,020

Please see note on page 272.

		2019 Production		2018 Production		2017 Production	
	Rio Tinto % share[a]	Total	Rio Tinto share	Total	Rio Tinto share	Total	Rio Tinto share
Coal (thermal) ('000 tonnes)							
Rio Tinto Coal Australia							
Hail Creek Coal (Australia)[f][g]	–	–	–	2,760	2,264	4,134	3,390
Hunter Valley (Australia)[h]	–	–	–	–	–	8,502	5,747
Kestrel Coal (Australia)[f][g]	–	–	–	329	263	843	674
Mount Thorley (Australia)[h]	–	–	–	–	–	2,011	1,609
Warkworth (Australia)[h]	–	–	–	–	–	4,521	2,512
Rio Tinto total thermal coal			–		2,527		13,933
Copper (mined) ('000 tonnes)							
Bingham Canyon (US)	100.0%	**186.8**	**186.8**	203.9	203.9	148.9	148.9
Escondida (Chile)	30.0%	**1,138.6**	**341.6**	1,167.9	350.4	902.7	270.8
Grasberg – Joint Venture (Indonesia)[i]	–	–	–	64.8	25.9	14.3	5.7
Oyu Tolgoi (Mongolia)[j]	33.5%	**146.3**	**49.1**	159.1	53.3	157.4	52.8
Rio Tinto total			**577.4**		633.5		478.1
Copper (refined) ('000 tonnes)							
Escondida (Chile)	30.0%	**250.2**	**75.0**	266.8	80.0	238.0	71.4
Rio Tinto Kennecott (US)	100.0%	**184.6**	**184.6**	194.7	194.7	125.8	125.8
Rio Tinto total			**259.6**		274.8		197.2
Diamonds ('000 carats)							
Argyle (Australia)	100.0%	**12,999**	**12,999**	14,069	14,069	17,135	17,135
Diavik (Canada)	60.0%	**6,719**	**4,031**	7,264	4,358	7,486	4,492
Rio Tinto total			**17,030**		18,427		21,627
Gold (mined) ('000 ounces)							
Bingham Canyon (US)	100.0%	**234.7**	**234.7**	196.7	196.7	177.9	177.9
Escondida (Chile)	30.0%	**246.7**	**74.0**	265.6	79.7	146.2	43.9
Grasberg – Joint Venture (Indonesia)[i]	–	–	–	666.8	266.7	–	–
Oyu Tolgoi (Mongolia)[j]	33.5%	**241.8**	**81.1**	285.4	95.7	114.3	38.3
Rio Tinto total			**389.7**		638.8		260.1
Gold (refined) ('000 ounces)							
Rio Tinto Kennecott (US)	100.0%	**218.7**	**218.7**	198.0	198.0	203.7	203.7
Iron Ore ('000 tonnes)							
Hamersley mines (Australia)	[k]	**209,392**	**209,392**	220,612	220,612	206,760	206,760
Hamersley – Channar (Australia)	60.0%	**7,970**	**4,782**	7,173	4,304	10,798	6,479
Hope Downs (Australia)	50.0%	**48,264**	**24,132**	45,368	22,684	46,941	23,470
Iron Ore Company of Canada (Canada)	58.7%	**17,943**	**10,536**	15,245	8,952	19,016	11,166
Robe River – Robe Valley (Australia)	53.0%	**26,951**	**14,284**	31,947	16,932	31,182	16,526
Robe River – West Angelas (Australia)	53.0%	**34,086**	**18,066**	32,672	17,316	34,116	18,082
Rio Tinto total			**281,192**		290,800		282,484

Please see note on page 272.

Metals and minerals production continued

		2019 Production		2018 Production		2017 Production	
	Rio Tinto % share[a]	Total	Rio Tinto share	Total	Rio Tinto share	Total	Rio Tinto share
Molybdenum ('000 tonnes)							
Bingham Canyon (US)	100%	**11.2**	**11.2**	5.8	5.8	5.0	5.0
Salt ('000 tonnes)							
Dampier Salt (Australia)	68.4%	**7,931**	**5,422**	9,001	6,153	7,446	5,090
Silver (mined) ('000 ounces)							
Bingham Canyon (US)	100.0%	**2,815**	**2,815**	2,520	2,520	2,156	2,156
Escondida (Chile)	30.0%	**7,687**	**2,306**	9,433	2,830	5,707	1,712
Grasberg – Joint Venture (Indonesia)[i]	–	–	–	634	253	–	–
Oyu Tolgoi (Mongolia)[j]	33.5%	**867**	**290**	914	306	974	326
Rio Tinto total			**5,412**		5,910		4,194
Silver (refined) ('000 ounces)							
Rio Tinto Kennecott (US)	100.0%	**2,853**	**2,853**	2,865	2,865	2,378	2,378
Titanium Dioxide Slag ('000 tonnes)							
Rio Tinto Iron & Titanium (Canada/South Africa)[l]	100.0%	**1,206**	**1,206**	1,116	1,116	1,315	1,315
Uranium ('000 lbs U3O8)							
Energy Resources of Australia (Australia)[m]	68.4%	**3,860**	**2,640**	4,407	3,014	5,056	3,458
Rössing (Namibia)[m][n]	–	**3,080**	**2,114**	5,465	3,750	4,652	3,192
Rio Tinto total			**4,754**		6,764		6,650

Production data notes:

Mine production figures for metals refer to the total quantity of metal produced in concentrates, leach liquor or doré bullion irrespective of whether these products are then refined onsite, except for the data for bauxite and iron ore which can represent production of marketable quantities of ore plus concentrates and pellets. Production figures are sometimes more precise than the rounded numbers shown, hence small differences may result from calculation of Rio Tinto share of production.

(a) Rio Tinto percentage share, shown above, is as at the end of 2019. The footnotes below include all ownership changes over the three years.
(b) Jonquière's (Vaudreuil's) production shows smelter grade alumina only and excludes hydrate produced and used for specialty alumina.
(c) Rio Tinto sold its 100 per cent interest in the Dunkerque aluminium smelter with an effective date of 14 December 2018. Production data are shown up to that date.
(d) Rio Tinto has a 22.95 per cent shareholding in the Sangaredi mine but benefits from 45.0 per cent of production.
(e) Borate quantities are expressed as B_2O_3.
(f) Kestrel and Hail Creek produced hard coking coal and thermal coal through their mining operations. Both mines blended coal types at ports.
(g) On 1 August 2018, Rio Tinto completed the sale of its entire interest in the Hail Creek and Kestrel mines. Production is reported up to the date of completion.
(h) On 1 September 2017, Rio Tinto completed the sale of Coal & Allied, a wholly owned subsidiary of Rio Tinto Coal Australia (RTCA) and production from these assets is included to this date. This included Coal & Allied's 67.6 per cent interest in the Hunter Valley Operations mine, 80 per cent interest in the Mount Thorley mine and 55.6 per cent interest in the Warkworth mine. In an earlier restructuring of the Coal & Allied group completed on 3 February 2016, Rio Tinto had obtained 100 per cent of Coal & Allied and retained a 67.6 per cent interest in the newly created Hunter Valley Operations joint venture. Prior to restructuring, Rio Tinto's interest in the Hunter Valley Operations, Mount Thorley and Warkworth mines was 80 per cent, 64 per cent and 44.46 per cent respectively.
(i) On 21 December 2018, Rio Tinto completed the sale of its entire interest in the Grasberg mine in Indonesia to PT Indonesia Asahan Aluminium (Persero) (Inalum). Production is reported up to 30 November 2018. Through a joint venture agreement with Freeport-McMoRan (FCX), Rio Tinto was entitled to 40 per cent of additional material mined as a consequence of expansions and developments of the Grasberg facilities since 1998. Total production reflects the quantities attributable to the joint venture.
(j) Rio Tinto owns a 33.52 per cent indirect interest in Oyu Tolgoi through its 50.79 per cent interest in Turquoise Hill Resources Ltd.
(k) Includes 100 per cent of production from Paraburdoo, Mt Tom Price, Marandoo, Yandicoogina, Brockman, Nammuldi, Silvergrass and the Eastern Range mines. Whilst Rio Tinto owns 54 per cent of the Eastern Range mine, under the terms of the joint venture agreement, Hamersley Iron manages the operation and is obliged to purchase all mine production from the joint venture and therefore all of the production is included in Rio Tinto's share of production.
(l) Quantities comprise 100 per cent of Rio Tinto Fer et Titane and Rio Tinto's 74 per cent share of Richards Bay Minerals' production. Ilmenite mined in Madagascar is processed in Canada.
(m) ERA and Rössing report drummed U_3O_8.
(n) On 16 July 2019, Rio Tinto completed the sale of its entire interest in the Rössing uranium mine in Namibia to China National Uranium Corporation Limited.

Ore reserves

Ore Reserves and Mineral Resources for Rio Tinto managed operations are reported in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, December 2012 (the JORC Code) as required by the Australian Securities Exchange (ASX). Codes or guidelines similar to JORC with only minor regional variations have been adopted in South Africa, Canada, the US, Chile, Peru, the Philippines, the UK, Ireland and Europe. Together these Codes represent current best practice for reporting Ore Reserves and Mineral Resources.

The JORC Code envisages the use of reasonable investment assumptions, including the use of projected long-term commodity prices, in calculating Ore Reserve estimates. However, for US reporting, the US Securities and Exchange Commission requires historical price data to be used. For this reason, some Ore Reserves reported to the SEC in the Form 20-F may differ from those reported below.

Ore Reserve and Mineral Resource information in the tables below is based on information compiled by Competent Persons (as defined by JORC), most of whom are full time employees of Rio Tinto or related companies. Each has had a minimum of five years relevant estimation experience and is a member of a recognised professional body whose members are bound by a professional code of ethics. Each Competent Person consents to the inclusion in this report of information they have provided in the form and context in which it appears.

Competent Persons responsible for the estimates are listed on pages 280 to 281, by operation, along with their professional affiliation, employer and accountability for Ore Reserves and/or Mineral Resources. Where operations are not managed by Rio Tinto, the Ore Reserves are published as received from the managing company. The Ore Reserve figures in the following tables are as of 31 December 2019. Summary data for year end 2018 are shown for comparison. Metric units are used throughout. The figures used to calculate Rio Tinto's share of Ore Reserves are often more precise than the rounded numbers shown in the tables, hence small differences might result if the calculations are repeated using the tabulated figures.

		Proved ore reserves at end 2019		Probable ore reserves at end 2019		Total ore reserves 2019 compared with 2018				Average mill recovery	Interest	Rio Tinto share
	Type of mine[a]	Tonnage	Grade	Tonnage	Grade	**2019** Tonnage	2018 Tonnage	**2019** Grade	2018 Grade	%	%	
Bauxite[b]		millions of tonnes	% Al_2O_3	millions of tonnes	% Al_2O_3	**millions of tonnes**	millions of tonnes	**% Al_2O_3**	% Al_2O_3			**Recoverable mineral millions of tonnes**
Reserves at operating mines												
Gove (Australia)[c]	O/P	127	49.3	4	49.5	**131**	142	**49.3**	49.3		100.0	**131**
Porto Trombetas (MRN) (Brazil)[d]	O/P	29	48.3	4	48.8	**33**	48	**48.3**	50.1		12.0	**4**
Sangaredi (Guinea)[e]	U/P	341	47.0	87	47.1	**428**	466	**47.1**	47.3		23.0	**98**
Weipa (Australia)[f]												
– Amrun[g]	O/P	273	52.7	981	53.2	**1,253**	1,104	**53.1**	53.2		100.0	**1,253**
– East Weipa and Andoom[h]	O/P	146	50.8			**146**	163	**50.8**	50.5		100.0	**146**
Total												**1,632**
Borates[i]		millions of tonnes		millions of tonnes		**millions of tonnes**	millions of tonnes					**Marketable product millions of tonnes**
Reserves at operating mine												
Rio Tinto Borates – Boron (US)	O/P	12		4.4		**16**	15				100.0	**16**
Copper		millions of tonnes	% Cu	millions of tonnes	% Cu	**millions of tonnes**	millions of tonnes	**% Cu**	% Cu			**Recoverable metal millions of tonnes**
Reserves at operating mines												
Bingham Canyon (US)	O/P	399	0.45	213	0.38	**612**	619	**0.43**	0.42	87	100.0	**2.277**
Escondida (Chile)												
– sulphide	O/P	3,517	0.70	1,849	0.56	**5,366**	5,564	**0.65**	0.66	85	30.0	**8.841**
– sulphide leach	O/P	1,308	0.42	335	0.41	**1,642**	1,728	**0.42**	0.41	39	30.0	**0.793**
– oxide	O/P	102	0.65	122	0.54	**224**	247	**0.59**	0.60	62	30.0	**0.246**
Oyu Tolgoi (Mongolia)												
– Oyut open pit[j]	O/P	307	0.52	477	0.39	**783**	878	**0.44**	0.43	78	33.5	**0.907**
– Oyut stockpiles		48	0.33			**48**	53	**0.33**	0.31	73	33.5	**0.038**
Total												**13.103**
Reserves at development projects												
Oyu Tolgoi (Mongolia)												
– Hugo Dummett North[k]	U/G			447	1.64	**447**	464	**1.64**	1.66	93	33.5	**2.283**
– Hugo Dummett North Extension	U/G			32	1.64	**32**	35	**1.64**	1.59	93	29.5	**0.144**
Total												**2.428**

Ore reserves continued

	Type of mine[a]	Proved ore reserves at end 2019		Probable ore reserves at end 2019		Total ore reserves 2019 compared with 2018				Average mill recovery %	Interest %	Rio Tinto share
		Tonnage	Grade	Tonnage	Grade	**2019** Tonnage	2018 Tonnage	**2019** Grade	2018 Grade			
Diamonds[b]		millions of tonnes	carats per tonne	millions of tonnes	carats per tonne	**millions of tonnes**	millions of tonnes	**carats per tonne**	carats per tonne			**Recoverable diamonds millions of carats**
Reserves at operating mines												
Argyle (Australia)[l]	U/G			5.1	1.9	**5.1**	11	**1.9**	2.2		100.0	**9.5**
Diavik (Canada)[m]	O/P + U/G	5.2	2.4	5.3	2.4	**11**	12	**2.4**	2.4		60.0	**14.9**
Total												**24.4**
Gold		millions of tonnes	grammes per tonne	millions of tonnes	grammes per tonne	**millions of tonnes**	millions of tonnes	**grammes per tonne**	grammes per tonne			**Recoverable metal millions of ounces**
Reserves at operating mines												
Bingham Canyon (US)	O/P	399	0.17	213	0.15	**612**	619	**0.16**	0.17	67	100.0	**2.158**
Oyu Tolgoi (Mongolia)												
– Oyut open pit[n]	O/P	307	0.39	477	0.23	**783**	878	**0.29**	0.27	67	33.5	**1.622**
– Oyut stockpiles		48	0.12			**48**	53	**0.12**	0.13	44	33.5	**0.028**
Total												**3.807**
Reserves at development projects												
Oyu Tolgoi (Mongolia)												
– Hugo Dummett North[k]	U/G			447	0.34	**447**	464	**0.34**	0.34	79	33.5	**1.287**
– Hugo Dummett North Extension	U/G			32	0.57	**32**	35	**0.57**	0.55	81	29.5	**0.140**
Total												**1.427**
Iron Ore[n][b]		millions of tonnes	% Fe	millions of tonnes	% Fe	**millions of tonnes**	millions of tonnes	**% Fe**	% Fe			**Marketable product millions of tonnes**
Reserves at operating mines												
Hamersley Iron (Australia)												
– Greater Brockman 2 Nammuldi (Brockman and Marra Mamba ore)[o]	O/P	192	61.8	105	59.9	**298**	362	**61.1**	61.5		100.0	**298**
– Brockman 4 (Brockman and Marra Mamba ore)	O/P	264	62.3	81	60.4	**345**	365	**61.9**	62.1		100.0	**345**
– Marandoo (Marra Mamba ore)	O/P	149	63.9	47	58.2	**196**	192	**62.5**	62.9		100.0	**196**
– Greater Tom Price (Brockman and Marra Mamba ore)	O/P	194	62.4	119	61.6	**313**	332	**62.1**	62.0		100.0	**313**
– Paraburdoo (Brockman ore)[p]	O/P	2	61.6	5	62.4	**7**	9	**62.2**	62.6		100.0	**7**
– Yandicoogina (Pisolite ore)	O/P	509	58.3			**509**	549	**58.3**	58.4		100.0	**509**
Channar JV (Australia)												
– Channar (Brockman ore)[q]	O/P	10	61.7	6	61.0	**16**	24	**61.4**	61.1		60.0	**9**
Eastern Range JV (Australia)												
– Eastern Range (Brockman ore)[r]	O/P	23	61.8	5	60.8	**28**	43	**61.6**	61.3		54.0	**15**
Hope Downs JV (Australia)												
– Hope Downs 1 (Marra Mamba ore)[s]	O/P	85	62.7	81	60.1	**165**	188	**61.4**	61.5		50.0	**83**
– Hope Downs 4 (Brockman ore)[t]	O/P	50	63.7	65	63.2	**116**	133	**63.4**	63.4		50.0	**58**
Robe River JV (Australia)												
– Robe Valley (Pisolite ore)	O/P	127	56.7	217	56.2	**344**	370	**56.4**	56.4		53.0	**182**
– West Angelas (Marra Mamba ore)[u]	O/P	128	62.1	74	61.4	**201**	233	**61.9**	61.9		53.0	**107**
Iron Ore Company of Canada (Canada)[v]	O/P	237	65.0	291	65.0	**528**	545	**65.0**	65.0		58.7	**310**
Total												**2,431**
Reserves at development projects												
Hamersley Iron (Australia)												
– Koodaideri (Brockman ore)[w]	O/P	214	62.4	302	61.2	**516**	549	**61.7**	61.8		100.0	**516**
– Turee Central (Brockman ore)	O/P	72	62.0	6	61.4	**78**	78	**61.9**	61.9		100.0	**78**
– Western Range (Brockman ore)[x]	O/P	171	62.7	29	61.4	**201**	–	**62.5**	–		100.0	**201**
Total												**795**

	Type of mine[a]	Proved ore reserves at end 2019		Probable ore reserves at end 2019		Total ore reserves 2019 compared with 2018				Average mill recovery %	Interest %	Rio Tinto share
		Tonnage	Grade	Tonnage	Grade	**2019 Tonnage**	2018 Tonnage	**2019 Grade**	2018 Grade			
Molybdenum		millions of tonnes	% Mo	millions of tonnes	% Mo	**millions of tonnes**	millions of tonnes	**% Mo**	% Mo			**Recoverable metal millions of tonnes**
Reserves at operating mine												
Bingham Canyon (US)[y]	O/P	399	0.041	213	0.020	**612**	619	**0.034**	0.035	66	100.0	**0.136**
Silver		millions of tonnes	grammes per tonne	millions of tonnes	grammes per tonne	**millions of tonnes**	millions of tonnes	**grammes per tonne**	grammes per tonne			**Recoverable metal millions of ounces**
Reserves at operating mines												
Bingham Canyon (US)	O/P	399	2.03	213	2.04	**612**	619	**2.04**	2.04	72	100.0	**28.840**
Oyu Tolgoi (Mongolia)												
– Oyut open pit[j]	O/P	307	1.32	477	1.14	**783**	878	**1.21**	1.18	52	33.5	**5.356**
– Oyut stockpiles		48	0.93			**48**	53	**0.93**	0.95	47	33.5	**0.226**
Total												**34.422**
Reserves at development projects												
Oyu Tolgoi (Mongolia)												
– Hugo Dummett North[k]	U/G			447	3.35	**447**	464	**3.35**	3.37	81	33.5	**13.078**
– Hugo Dummett North Extension	U/G			32	3.84	**32**	35	**3.84**	3.72	83	29.5	**0.969**
Total												**14.047**

Titanium Dioxide Feedstock[z]	Type of mine[a]	Proved ore reserves at end 2019 Tonnage millions of tonnes	Proved ore reserves at end 2019 Grade %Ti Minerals	Probable ore reserves at end 2019 Tonnage millions of tonnes	Probable ore reserves at end 2019 Grade %Ti Minerals	Total ore reserves 2019 compared with 2018 **2019 Tonnage millions of tonnes**	2018 Tonnage millions of tonnes	**2019 Grade %Ti Minerals**	2018 Grade %Ti Minerals	Average mill recovery %	Interest %	Rio Tinto share **Marketable product millions of tonnes**
Reserves at operating mines												
QMM (Madagascar)	D/O	369	3.5	13	3.5	**382**	405	**3.5**	3.5		80.0	**5.3**
RBM (South Africa)	D/O+O/P	878	2.3	622	2.5	**1,500**	1,584	**2.4**	2.4		74.0	**11.7**
RTFT (Canada)[aa]	O/P			149	80.3	**149**	119	**80.3**	83.2		100.0	**47.4**
Total												**64.4**

Uranium		millions of tonnes	% U_3O_8	millions of tonnes	% U_3O_8	**millions of tonnes**	millions of tonnes	**% U_3O_8**	% U_3O_8			**Recoverable metal millions of tonnes**
Reserves at operating mines												
Energy Resources of Australia (Australia)												
– Ranger #3 stockpiles[bb]				2.4	0.071	**2.4**	4.9	**0.071**	0.076	85	68.4	**0.0010**
Rössing SJ (Namibia)[cc]	O/P					**–**	72	**–**	0.039	–	–	**–**
Total												**0.0010**

Zircon[dd]		millions of tonnes	% Zircon	millions of tonnes	% Zircon	**millions of tonnes**	millions of tonnes	**% Zircon**	% Zircon			**Marketable product millions of tonnes**
Reserves at operating mines												
QMM (Madagascar)	D/O	369	0.2	13	0.2	**382**	405	**0.2**	0.2		80.0	**0.4**
RBM (South Africa)	D/O+O/P	878	0.3	622	0.4	**1,500**	1,584	**0.3**	0.3		74.0	**3.0**
Total												**3.4**

(a) Type of mine: O/P = open pit, O/C = open cut, U/G = underground, D/O = dredging operation.
(b) Reserves of bauxite, diamonds and iron ore are shown as recoverable Reserves of marketable product after accounting for all mining and processing losses. Mill recoveries are therefore not shown.
(c) Gove Reserves are stated as dry tonnes and total alumina grade.
(d) Porto Trombetas (MRN) Reserves are stated as dry tonnes and available alumina grade. Reserve tonnes decreased following mining depletion and an updated life of mine plan.
(e) Sangaredi Reserves tonnes are reported on a 3% moisture basis and alumina grades are reported as total alumina.
(f) Weipa Reserves are stated as dry tonnes and total alumina grade.
(g) Amrun Reserves tonnes increased as a result of updated mining cost assumptions and a new geological model incorporating additional drilling.
(h) East Weipa and Andoom Reserves tonnes decreased following mining depletion, technical risk assessment and cut-off grade changes.
(i) Reserves of borates are expressed in terms of marketable product (B_2O_3) after all mining and processing losses.
(j) Oyut open pit Reserves tonnes decreased following mining depletion and an update to operating cost assumptions.
(k) The Hugo Dummett North underground mine is currently under construction.
(l) Argyle Reserves are based on a 1.4 millimetre lower cut-off size and a final re-crushing size of 8 millimetres. The decrease in Reserves tonnes and grade follows mining depletion.
(m) Diavik Reserves are based on a nominal 1 millimetre lower cut-off size and a final re-crushing size of 5 millimetres.
(n) Australian iron ore Reserves tonnes are reported on a dry weight basis. As Rio Tinto only markets blended iron ore products from multiple mine sources, a detailed breakdown of constituent elements by individual deposit is not reported.
(o) Greater Brockman 2 Nammuldi (Brockman and Marra Mamba ore) Reserves tonnes decreased due to mining depletion and updates to the geological model, Resource classification and mining recovery factors. The reductions are partially offset by pit design changes.
(p) Paraburdoo (Brockman ore) Reserves tonnes decreased following mining depletion.
(q) Channar (Brockman ore) Reserves tonnes decreased due to mining depletion, updated pit designs and mining recovery factors.
(r) Eastern Range (Brockman ore) Reserves tonnes decreased due to mining depletion, updates to the geological model and pit designs, and cut-off grade changes.
(s) Hope Downs 1 (Marra Mamba ore) Reserves tonnes decreased following mining depletion.
(t) Hope Downs 4 (Brockman ore) Reserves tonnes decreased following mining depletion.
(u) West Angelas (Marra Mamba ore) Reserves tonnes decreased following mining depletion and an updated geological model, partially offset by the addition of a satellite pit.
(v) Reserves at Iron Ore Company of Canada are reported as marketable product (57%pellets and 43% concentrate for sale) at a natural moisture content of two per cent. The marketable product is derived from mined material comprising 560 million dry tonnes at 38.6% iron (Proved) and 693 million dry tonnes at 38.1% iron (Probable) using process recovery factors derived from current IOC concentrating and pellet operations.
(w) The Koodaideri (Brockman ore) mine is currently under construction.
(x) Western Range (Brockman ore) Reserves are reported for the first time following completion of a Pre-Feasibility Study. A JORC Table 1 in support of this change will be released to the market contemporaneously with the release of this Annual report and can be viewed at riotinto.com/invest/financial-news-performance/resources-and-reserves. Discussions about a Joint Venture covering the Western Range mining hub with China Baowu Group are continuing.
(y) Bingham Canyon Reserves molybdenum grades interpolated from exploration drilling assays have been factored based on a long reconciliation history to blast hole and mill samples.
(z) The marketable product (TiO_2 slag) is shown after all mining and processing losses. The Reserves are expressed as in situ tonnes.
(aa) RTFT Reserves tonnes increased following a decrease in the cut-off grade.
(bb) The decrease in Ranger #3 stockpiles Reserves tonnes follows processing depletion.
(cc) Released to the market by Rio Tinto on 16 July 2019, Rio Tinto sold its interest in the Rössing uranium mine.
(dd) The marketable product (zircon at RBM and zirsil at QMM) is shown after all mining and processing losses. The Reserves are expressed as in situ tonnes.

Mineral resources

As required by the Australian Securities Exchange, the following tables contain details of other mineralisation that has a reasonable prospect of being economically extracted in the future but which is not yet classified as Proved or Probable Ore Reserves. This material is defined as Mineral Resources under the JORC Code. Estimates of such material are based largely on geological information with only preliminary consideration of mining, economic and other factors. While in the judgment of the Competent Person there are realistic expectations that all or part of the Mineral Resources will eventually become Proved or Probable Ore Reserves, there is no guarantee that this will occur as the result depends on further technical and economic studies and prevailing economic conditions in the future. As in the case of Ore Reserves, managed operations' estimates are completed using or testing against Rio Tinto long-term pricing and market forecasts/scenarios. Mineral Resources are stated as additional to the Ore Reserves reported earlier. Where operations are not managed by Rio Tinto, the Mineral Resources are published as received from the managing company. Where new project Mineral Resources or Ore Reserves are footnoted as being reported for the first time, additional information about them can be viewed on the Rio Tinto website.

	Likely mining method[a]	Measured resources at end 2019		Indicated resources at end 2019		Inferred resources at end 2019		Total resources 2019 compared with 2018				Rio Tinto Interest %
								2019	2018	2019	2018	
		Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Tonnage	Grade	Grade	
Bauxite		millions of tonnes	% Al_2O_3	millions of tonnes	% Al_2O_3	millions of tonnes	% Al_2O_3	**millions of tonnes**	millions of tonnes	**% Al_2O_3**	% Al_2O_3	
Gove (Australia)[b]	O/P	15	48.9	12	47.5	1	48.2	**28**	28	**48.2**	48.2	100.0
Porto Trombetas (MRN) (Brazil)[c]	O/P	281	49.7	41	48.9	134	49.9	**456**	456	**49.7**	49.7	12.0
Sangaredi (Guinea)[d]	O/P	165	43.9	5,835	46.6	785	45.8	**6,785**	5,660	**46.5**	47.2	23.0
Weipa (Australia)[e]												
– East Weipa and Andoom[f]	O/P	11	52.1					**11**	15	**52.1**	49.5	100.0
– North of Weipa	O/P					1,330	52.0	**1,330**	1,330	**52.0**	52.0	100.0
– Amrun	O/P	35	48.7	271	49.8	274	50.5	**580**	635	**50.1**	49.9	100.0
Borates[g]		millions of tonnes		millions of tonnes		millions of tonnes		**millions of tonnes**	millions of tonnes			
Jadar (Serbia)[h]	U/G			10		11		**21**	21			100.0
Copper		millions of tonnes	% Cu	millions of tonnes	% Cu	millions of tonnes	% Cu	**millions of tonnes**	millions of tonnes	**% Cu**	% Cu	
Bingham Canyon (US)												
– Open Pit[i]	O/P	14	0.46	18	0.44	11	0.22	**42**	82	**0.39**	0.28	100.0
– North Rim Skarn	U/G	1	3.50	9	3.60	10	3.70	**20**	20	**3.65**	3.65	100.0
Escondida (Chile)												
– Chimborazo sulphide	O/P			139	0.50	84	0.60	**223**	223	**0.54**	0.54	30.0
– Escondida sulphide	O/P	523	0.59	1,255	0.44	10,156	0.53	**11,934**	11,763	**0.52**	0.51	30.0
– Escondida mixed[j]	O/P	13	0.53	17	0.47	26	0.43	**56**	55	**0.47**	0.41	30.0
– Escondida oxide[j]	O/P	22	0.76	8	0.55	5	0.49	**35**	23	**0.67**	0.63	30.0
– Pampa Escondida sulphide	O/P	294	0.53	1,150	0.55	6,000	0.43	**7,444**	7,444	**0.45**	0.45	30.0
– Pinta Verde sulphide	O/P			23	0.50	37	0.45	**60**	60	**0.47**	0.47	30.0
– Pinta Verde oxide	O/P	109	0.60	64	0.53	15	0.54	**188**	188	**0.57**	0.57	30.0
La Granja (Peru)	O/P			130	0.85	4,190	0.50	**4,320**	4,320	**0.51**	0.51	100.0
Oyu Tolgoi (Mongolia)												
– Heruga ETG[k]	U/G					1,448	0.41	**1,448**	1,700	**0.41**	0.39	29.5
– Heruga OT[k]	U/G					105	0.42	**105**	117	**0.42**	0.41	33.5
– Hugo Dummett North[l]	U/G	41	1.58	349	1.18	765	0.80	**1,155**	1,213	**0.94**	0.91	33.5
– Hugo Dummett North Extension	U/G			87	1.59	167	1.02	**254**	263	**1.21**	1.19	29.5
– Hugo Dummett South[m]	U/G					724	0.84	**724**	839	**0.84**	0.77	33.5
– Oyut Open Pit	O/P	16	0.39	80	0.34	318	0.29	**413**	449	**0.31**	0.31	33.5
– Oyut Underground[n]	U/G	14	0.47	69	0.38	175	0.39	**257**	300	**0.39**	0.37	33.5
Resolution (US)	U/G			530	1.92	1,257	1.36	**1,787**	1,787	**1.53**	1.53	55.0
Diamonds		millions of tonnes	carats per tonne	millions of tonnes	carats per tonne	millions of tonnes	carats per tonne	**millions of tonnes**	millions of tonnes	**carats per tonne**	carats per tonne	
Diavik (Canada)[o]	O/P+U/G			0.1	3.2	1.3	2.6	**1.5**	2.6	**2.7**	2.6	60.0
Gold		millions of tonnes	grammes per tonne	millions of tonnes	grammes per tonne	millions of tonnes	grammes per tonne	**millions of tonnes**	millions of tonnes	**grammes per tonne**	grammes per tonne	
Bingham Canyon (US)												
– Open Pit[i]	O/P	14	0.13	18	0.15	11	0.24	**42**	82	**0.17**	0.10	100.0
– North Rim Skarn	U/G	1	2.10	9	1.70	10	1.50	**20**	20	**1.62**	1.62	100.0

Mineral resources continued

	Likely mining method[a]	Measured resources at end 2019		Indicated resources at end 2019		Inferred resources at end 2019		Total resources 2019 compared with 2018				Rio Tinto Interest
								2019	2018	2019	2018	
		Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Tonnage	Grade	Grade	
Gold (continued)		millions of tonnes	grammes per tonne	millions of tonnes	grammes per tonne	millions of tonnes	grammes per tonne	**millions of tonnes**	millions of tonnes	**grammes per tonne**	grammes per tonne	%
Escondida (Chile)												
– Pampa Escondida sulphide	O/P	294	0.07	1,150	0.10	6,000	0.04	**7,444**	7,444	**0.05**	0.05	30.0
Oyu Tolgoi (Mongolia)												
– Heruga ETG[k]	U/G					1,448	0.40	**1,448**	1,700	**0.40**	0.37	29.5
– Heruga OT[k]	U/G					105	0.30	**105**	117	**0.30**	0.29	33.5
– Hugo Dummett North[l]	U/G	41	0.42	349	0.31	765	0.28	**1,155**	1,213	**0.29**	0.28	33.5
– Hugo Dummett North Extension	U/G			87	0.54	167	0.36	**254**	263	**0.42**	0.41	29.5
– Hugo Dummett South[m]	U/G					724	0.07	**724**	839	**0.07**	0.07	33.5
– Oyut Open Pit	O/P	16	0.41	80	0.29	318	0.17	**413**	449	**0.21**	0.18	33.5
– Oyut Underground[n]	U/G	14	0.88	69	0.59	175	0.40	**257**	300	**0.48**	0.48	33.5
Iron Ore[q]		millions of tonnes	% Fe	millions of tonnes	% Fe	millions of tonnes	% Fe	**millions of tonnes**	millions of tonnes	**% Fe**	% Fe	
Hamersley Iron (Australia)												
– Brockman	O/P	267	62.1	786	62.4	2,309	62.1	**3,362**	3,289	**62.2**	62.2	100.0
– Brockman Process Ore	O/P	259	57.2	221	57.1	695	57.4	**1,175**	1,170	**57.3**	57.3	100.0
– Marra Mamba	O/P	205	62.2	315	61.7	1,105	61.3	**1,625**	1,685	**61.5**	61.5	100.0
– Detrital	O/P			113	61.5	668	61.0	**781**	814	**61.1**	61.0	100.0
– Channel Iron Deposit	O/P	512	56.8	264	56.6	1,962	56.7	**2,738**	2,999	**56.7**	56.8	100.0
Channar JV (Australia)												
– Brockman	O/P	25	62.1	5	61.9	9	61.7	**39**	41	**62.0**	62.0	60.0
– Brockman Process Ore[q]	O/P	12	57.4	2	57.0	1	56.9	**15**	17	**57.3**	57.4	60.0
Eastern Range JV (Australia)												
– Brockman	O/P	14	61.9	5	61.8	1	61.3	**20**	21	**61.8**	61.8	54.0
– Brockman Process Ore	O/P	11	56.8	3	57.0	1	57.0	**15**	15	**56.9**	56.7	54.0
Hope Downs JV (Australia)												
– Brockman	O/P	101	62.5	325	62.4	245	62.1	**671**	666	**62.3**	62.4	50.0
– Brockman Process Ore	O/P	44	57.0	168	56.8	175	55.9	**387**	384	**56.4**	56.5	50.0
– Marra Mamba	O/P	136	62.9	124	61.6	154	60.7	**414**	423	**61.7**	61.7	50.0
– Detrital	O/P			23	59.2	83	59.6	**106**	106	**59.5**	59.4	50.0
Rhodes Ridge JV (Australia)												
– Brockman	O/P			565	63.9	1,462	62.6	**2,027**	2,027	**62.9**	62.9	50.0
– Brockman Process Ore	O/P			176	57.6	484	56.5	**660**	660	**56.8**	56.8	50.0
– Marra Mamba	O/P			25	61.3	2,566	62.0	**2,591**	2,614	**62.0**	61.9	50.0
– Detrital	O/P					328	60.1	**328**	328	**60.1**	60.1	50.0
Robe JV (Australia)												
– Brockman	O/P			156	62.5	490	61.3	**646**	618	**61.6**	61.6	53.0
– Brockman Process Ore	O/P			75	56.8	415	56.7	**490**	488	**56.7**	56.7	53.0
– Marra Mamba	O/P	151	61.9	197	61.4	166	61.5	**514**	527	**61.6**	61.4	53.0
– Detrital	O/P			22	59.5	100	61.1	**122**	124	**60.8**	60.8	53.0
– Channel Iron Deposit	O/P	211	55.2	1,625	58.6	2,442	55.7	**4,278**	4,303	**56.8**	56.8	53.0
Iron Ore Company of Canada (Canada)[s]	O/P	151	41.0	669	38.4	972	38.1	**1,792**	1,916	**38.4**	38.5	58.7
Simandou (Guinea)[t]	O/P	324	66.8	1,709	65.3	723	65.1	**2,757**	2,757	**65.5**	65.5	45.1
Lithium		millions of tonnes	% Li_2O	millions of tonnes	% Li_2O	millions of tonnes	% Li_2O	**millions of tonnes**	millions of tonnes	**% Li_2O**	% Li_2O	
Jadar (Serbia)	U/G			53	1.8	83	1.9	**136**	136	**1.9**	1.9	100.0
Molybdenum		millions of tonnes	% Mo	millions of tonnes	% Mo	millions of tonnes	% Mo	**millions of tonnes**	millions of tonnes	**% Mo**	% Mo	
Bingham Canyon (US)												
– Open Pit[u]	O/P	14	0.031	18	0.017	11	0.003	**42**	82	**0.018**	0.043	100.0
Oyu Tolgoi (Mongolia)												
– Heruga ETG[k]	U/G					1,448	0.012	**1,448**	1,700	**0.012**	0.011	29.5
– Heruga OT[k]	U/G					105	0.011	**105**	117	**0.011**	0.011	33.5
Resolution (US)	U/G			530	0.039	1,257	0.035	**1,787**	1,787	**0.036**	0.036	55.0

	Likely mining method[a]	Measured resources at end 2019		Indicated resources at end 2019		Inferred resources at end 2019		Total resources 2019 compared with 2018				Rio Tinto interest
		Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	**2019**	2018	**2019**	2018	
Silver		millions of tonnes	grammes per tonne	millions of tonnes	grammes per tonne	millions of tonnes	grammes per tonne	**millions of tonnes**	millions of tonnes	**grammes per tonne**	grammes per tonne	%
Bingham Canyon (US)												
– Open Pit[i]	O/P	14	1.90	18	2.21	11	2.18	**42**	82	**2.10**	1.54	100.0
– North Rim Skarn	U/G	1	20.00	9	21.00	10	21.00	**20**	20	**20.95**	20.95	100.0
Oyu Tolgoi (Mongolia)												
– Heruga ETG[k]	U/G					1,448	1.46	**1,448**	1,700	**1.46**	1.39	29.5
– Heruga OT[k]	U/G					105	1.58	**105**	117	**1.58**	1.56	33.5
– Hugo Dummett North[l]	U/G	41	3.74	349	2.92	765	2.40	**1,155**	1,213	**2.61**	2.54	33.5
– *Hugo Dummett North Extension*	U/G			87	4.11	167	2.78	**254**	263	**3.24**	3.18	29.5
– Hugo Dummett South[m]	U/G					724	1.88	**724**	839	**1.88**	1.78	33.5
– Oyut Open Pit	O/P	16	1.21	80	1.17	318	1.03	**413**	449	**1.06**	1.04	33.5
– Oyut Underground[n]	U/G	14	1.27	69	1.11	175	1.21	**257**	300	**1.19**	1.18	33.5
Titanium dioxide feedstock		millions of tonnes	% Ti Minerals	millions of tonnes	% Ti Minerals	millions of tonnes	% Ti Minerals	**millions of tonnes**	millions of tonnes	**% Ti Minerals**	% Ti Minerals	
QMM (Madagascar)	D/O	469	4.2	804	4.3	154	3.1	**1,427**	1,427	**4.1**	4.1	80.0
RBM (South Africa)[v]	D/O+O/P			13	13.3			**13**	15	**13.3**	13.8	74.0
RTFT (Canada)[w]	O/P			11	84.9	16	79.2	**27**	19	**81.6**	84.6	100.0
Uranium		millions of tonnes	% U_3O_8	millions of tonnes	% U_3O_8	millions of tonnes	% U_3O_8	**millions of tonnes**	millions of tonnes	**% U_3O_8**	% U_3O_8	
Energy Resources of Australia (Australia)												
– Jabiluka	U/G	1.2	0.887	14	0.520	10	0.545	**25**	25	**0.547**	0.547	68.4
– Ranger #3 Deeps	U/G	3.7	0.272	10	0.218	5.4	0.203	**20**	20	**0.224**	0.224	68.4
– Ranger #3 stockpiles				27	0.040			**27**	27	**0.040**	0.040	68.4
Zircon		millions of tonnes	% Zircon	millions of tonnes	% Zircon	millions of tonnes	% Zircon	**millions of tonnes**	millions of tonnes	**% Zircon**	% Zircon	
QMM (Madagascar)	D/O	469	0.2	804	0.2	154	0.2	**1,427**	1,427	**0.2**	0.2	80.0
RBM (South Africa)[v]	D/O+O/P			13	8.3			**13**	15	**8.3**	8.2	74.0

(a) Likely mining method: O/P = open pit; O/C = open cut; U/G = underground; D/O = dredging operation.
(b) Gove Resources are stated as dry tonnes and total alumina grade.
(c) Porto Trombetas (MRN) Resources are stated as dry tonnes and available alumina grade.
(d) Sangaredi Resources tonnes are reported on a 3% moisture basis and alumina grades are reported as total alumina. The increase is a result of a geological model update based on additional drilling and cut-off grade changes.
(e) Weipa Resources are stated as dry tonnes and total alumina grade.
(f) East Weipa and Andoom Resources tonnes decreased following the conversion of Resources to Reserves.
(g) Borates Resources are reported as in situ B_2O_3, rather than marketable product as in Reserves.
(h) Jadar equivalent in situ Resource is 52.7 million tonnes at 19.2% B_2O_3 (Indicated) and 83.4 million tonnes at 13.2% B_2O_3 (Inferred).
(i) The conversion of Resources to Reserves, together with mine design changes, resulted in a decrease in Bingham Canyon – Open Pit Resources tonnes at a higher grade.
(j) The increase in Escondida – oxide Resources tonnes and Escondida – mixed Resources grade is due to a pit design update in response to higher copper price forecast, lower production cost and a Resource model estimate update incorporating additional drilling.
(k) Heruga ETG and Heruga OT Resources tonnes decreased and grade increased following a review of mining costs and subsequent changes to the cut-off grade.
(l) The Hugo Dummett North Resources include approximately 0.68 million tonnes of stockpiled material at a grade of 1.17% copper, 0.46 grammes per tonnes gold and 3.16 grammes per tonnes silver.
(m) Hugo Dummett South Resources tonnes decreased and grade increased following a review of mining costs and subsequent changes to the cut-off grade.
(n) Oyut Underground Resources tonnes decreased and grade increased following a review of mining costs and subsequent changes to the cut-off grade.
(o) Diavik Resources tonnes decreased following the conversion of Resources to Reserves.
(p) Oyut Open Resource gold grade increased following a review of mining costs and subsequent changes to the cut-off grade. The other impacts included annual production and a pit design update.
(q) Iron ore Resource tonnes are reported on a dry weight basis. As Rio Tinto only markets blended iron ore products from multiple mine sources, a detailed breakdown of constituent elements by individual deposit is not reported.
(r) Channar JV Brockman Process Ore Mineral Resources tonnes have decreased following updates to the geological models.
(s) Resources at Iron Ore Company of Canada are reported as in-situ material on a dry basis. This in-situ material has the potential to produce marketable product (57% pellets and 43% concentrate for sale at a natural moisture content of two per cent) comprising 64 million tonnes at 65% iron (Measured), 279 million tonnes at 65% iron (Indicated) and 394 million tonnes at 65% iron (Inferred) using process recovery factors derived from current IOC concentrating and pellet operations
(t) Rio Tinto and Chinalco, who respectively own 45.05% and 39.95% of Simandou Blocks 3 and 4, are working with the government of Guinea to realise value from the world-class iron ore deposit. The government of Guinea owns a 15% stake in the project.
(u) The conversion of Resources to Reserves, together with a mine design change, resulted in a decrease in Bingham Canyon - Open Pit Resources tonnes and grade. Bingham Canyon open pit molybdenum grades interpolated from exploration drilling assays have been factored based on a long reconciliation history to blast hole and mill samples.
(v) RBM Resources tonnes decreased following mining depletion of stockpiled mineral separation plant tailings.
(w) RTFT Resources tonnes increased following the addition of a new deposit, reported for the first time. A JORC Table 1 in support of this change will be released to the market contemporaneously with the release of this Annual report and can be viewed at riotinto.com/invest/financial-news-performance/resources-and-reserves.

Mineral resources and ore reserves corporate governance

Mineral Resources and Ore Reserves corporate governance
Rio Tinto has well established governance processes in place to support the generation and publication of Mineral Resources and Ore Reserves, which includes a series of structures and processes independent of operational reporting through business units and product groups.

Audit Committee
The Audit Committee has in its remit the governance of Resources and Reserves. This includes an annual review of Mineral Resources and Ore Reserves at a Group level, as well as review of findings and progress from the Group Resources and Reserves internal audit programme within the regular meeting schedule.

Ore Reserves Steering Committee
The Ore Reserves Steering Committee (ORSC) meets at least quarterly, chaired by the Group Executive, Growth and Innovation, and comprises senior representatives from technical, financial, governance and business groups within the Group. The ORSC role includes oversight of the appointment of Competent Persons nominated by the business units, review of Exploration Results, Mineral Resource or Ore Reserve data prior to public reporting and development of Group Resource and Reserves standards and guidance.

Orebody Knowledge Centre of Excellence
In 2019, Rio Tinto formed the Orebody Knowledge Centre of Excellence, which contains a dedicated Orebody Technical Assurance team. Orebody Knowledge Technical Assurance in conjunction with the ORSC is the guardian and author of Group Resource and Reserve standards and guidance and is responsible for governance and compilation of Group Resource, Reserve and reconciliation reporting. The Technical Assurance team also monitors the external reporting environment, and facilitates internal audits and monitors actions with Group Internal Audit.

Group Internal Audit
The Resource and Reserve internal audit programme is conducted by independent external consulting personnel in a programme managed by Group Internal Audit with the assistance of the Orebody Knowledge Centre of Excellence and the ORSC. In 2019, four internal audits were completed. Material findings are reported outside of the product group reporting line to the Audit Committee, and all reports and action plans are reviewed by the ORSC for alignment to internal and external reporting standards.

JORC compliance
Rio Tinto has continued the development of internal systems and controls in order to meet JORC (2012) compliance in all external reporting including the preparation of all reported data by Competent Persons as members of The Australasian Institute of Mining and Metallurgy (The AusIMM), Australian Institute of Geoscientists (AIG) or recognised professional organisations (RPOs). JORC Table 1 reports for new or materially upgraded significant deposits are released to market by Rio Tinto and are also available on the Group's website. JORC Table 1 and NI 43-101 technical reports generated by non-managed units or joint venture partners are referenced within the reporting footnotes with the location and initial reporting date identified.

Mineral Resources and Ore Reserves from externally managed operations, where Rio Tinto holds a minority share, are reported as received from the managing entity. Figures from Rio Tinto managed operations are the responsibility of the managing directors of the business units and estimates are carried out by Competent Persons as defined by JORC.

2019 highlights
- Orebody Knowledge Centre of Excellence formed
- Dedicated Orebody Knowledge Technical Assurance team
- K2fly's RCubed Mineral Resources and Ore Reserves reporting solution agreement signed: Next gen platform for governance and reporting
- Ongoing professional development with two Competent Persons workshops

Competent persons

	Association[a]	Employer	Accountability	Deposits
Bauxite				
G Rogers	AusIMM	Rio Tinto	Resources	Gove, East Weipa and Andoom, North of Weipa, Amrun
W Saba	AusIMM		Reserves	Gove, East Weipa and Andoom, Amrun
M Keersemaker	AusIMM	CBG Consultant – Aluminpro	Reserves	Sangaredi
M A Diallo	EFG	Compagnie des Bauxites de Guinée	Resources	
M A H Monteiro	AusIMM	Mineração Rio do Norte	Resources and Reserves	Trombetas
Borates				
B Griffiths	SME	Rio Tinto	Resources and Reserves	Rio Tinto Borates – Boron
R Torres	AusIMM		Resources	
Copper				
A Schwarz	SME	Rio Tinto	Resources	Resolution[c]
M Bixley	AusIMM	Rio Tinto	Reserves	Oyu Tolgoi[b][c][d]
O Dendev	AusIMM		Resources	
F Prince	AusIMM		Reserves	
R Hayes	AusIMM	Rio Tinto	Resources	Bingham Canyon[b][c][d]
E Mader	AusIMM		Reserves	
P Rodriguez	AusIMM		Resources	
K Schroeder	AusIMM		Resources	
J Vickery	AusIMM		Resources and Reserves	
E Woods	AusIMM		Reserves	
R Maureira	AusIMM	Minera Escondida Ltda.	Resources	Escondida, Escondida – Chimborazo – sulphide, Pampa Escondida – sulphide[b], Pinta Verde
F B Vargara	AusIMM		Reserves	Escondida
J Marshall	AusIMM	Rio Tinto	Resources	La Granja

	Association[a]	Employer	Accountability	Deposits
Diamonds				
S Brennan	AusIMM	Rio Tinto	Resources and Reserves	Argyle
M Rayner	AusIMM		Resources and Reserves	
K Pollock	NAPEG	Rio Tinto	Resources and Reserves	Diavik
C Auld	NAPEG		Reserves	
Iron ore				
K Tindale	AusIMM	Rio Tinto	Resources	Simandou
M McDonald	PEGNL	Rio Tinto	Resources	Iron Ore Company of Canada
B Power	PEGNL		Resources	
S Roche	AusIMM		Reserves	
R Way	PEGNL		Resources	
R Williams	PEGNL		Reserves	
P Ziemendorf	AusIMM		Reserves	
H McLean	AusIMM	Rio Tinto	Resources	Rio Tinto Iron Ore – Hamersley, Channar, Eastern Range, Hope Downs, Robe, Rhodes Ridge
P Savory	AusIMM		Resources	
B Sommerville	AusIMM		Resources	
R Bleakey	AusIMM		Reserves	Rio Tinto Iron Ore – Hamersley, Channar, Eastern Range, Hope Downs, Robe
L Couto	AusIMM		Reserves	
R Sarin	AusIMM		Reserves	
R Verma	AusIMM		Reserves	
Lithium				
J Garcia	EFG	Rio Tinto	Resources	Jadar[e]
N Grubin	EFG		Resources	
M Sweeney	AusIMM		Resources	
Titanium dioxide feedstock				
F A Consuegra	NAPEG	Rio Tinto	Resources and Reserves	Rio Tinto Fer et Titane (RTFT)
J Dumouchel	OGQ		Resources	
D Gallant	OIQ	Rio Tinto	Reserves	Rio Tinto Fer et Titane (RTFT)
T Daling	SAIMM	Rio Tinto	Reserves	Richards Bay Minerals (RBM)[f]
A Louw	SACNASP		Resources	
S Mnunu	SACNASP		Resources	
P De Kock	SAIMM	Rio Tinto	Reserves	QMM Madagascar Minerals[f]
F Hees	AusIMM		Resources	
Uranium				
S Pevely	AusIMM	Rio Tinto	Resources and Reserves	Energy Resources of Australia – Ranger 3, Jabiluka

(a) AusIMM: Australasian Institute of Mining and Metallurgy
AIG: Australasian Institute of Geoscientists
APGO: Association of Professional Geoscientists of Ontario
EFG: European Federation of Geologists
NAPEG: Association of Professional Engineers; Geologists and Geophysicists of the Northwest Territories
OGQ: Ordre des Géologues du Québec
OIQ: L'Ordre des Ingénieurs du Québec
PEGNL: Professional Engineers and Geoscientists Newfoundland and Labrador
PEO: Professional Engineers Ontario
SACNASP: South African Council for Natural Scientific Professions
SAIMM: South African Institute of Mining and Metallurgy
SME: Society of Mining, Metallurgy and Exploration
(b) Includes gold
(c) Includes molybdenum
(d) Includes silver
(e) Includes borates
(f) Includes zircon

Mines and production facilities

Group mines as at 31 December 2019 (Rio Tinto's interest is 100% unless otherwise shown)

Mine	Location	Access	Title/lease
Iron Ore			
Hamersley Iron Brockman 2 Brockman 4 Marandoo Mount Tom Price Nammuldi Paraburdoo Silvergrass Western Turner Syncline Yandicoogina	Pilbara region, Western Australia	Hamersley Iron/Robe railway and port network	Agreements for life of mine with Government of Western Australia, save for the Yandicoogina mining lease, which expires in 2039 with an option to extend for 21 years.
Eastern Range (54%)	Pilbara region, Western Australia	Hamersley Iron/Robe railway and port network	Mineral lease expires in 2028 with successive options to extend by 21 years.
Channar (60%)	Pilbara region, Western Australia	Hamersley Iron/Robe railway and port network	Mining lease expires in 2028 with an option to extend by five years.
Hope Downs 1 (50%)	Pilbara region, Western Australia	Hamersley Iron/Robe railway and port network	Mining lease expires in 2027 with two options to extend of 21 years each.
Hope Downs 4 (50%)	Pilbara region, Western Australia	Hamersley iron/Robe railway and port network	Mining lease expires in 2027 with two options to extend of 21 years each.
Robe River Iron Associates (53%) Robe Valley (Mesa A, and Mesa J) West Angelas	Pilbara region, Western Australia	Hamersley Iron/Robe railway and port network	Agreements for life of mine with Government of Western Australia.
Dampier Salt (68.4%)	Dampier, Lake MacLeod and Port Hedland, Western Australia	Road and port	Mining Leases expiring in 2034 at Dampier; 2029 at Port Hedland and 2021 at Lake MacLeod. Lake McLeod's lease renewal until 2031 currently being progressed.

	History	Type of mine	Power source
	Iron Ore		
	Mount Tom Price began operations in 1966, followed by Paraburdoo in 1974. In the 1990s, Channar, Brockman 2, Marandoo and Yandicoogina achieved first ore. Since 2000, Eastern Ranges, Nammuldi, Brockman 4, Western Turner Syncline and Silvergrass have joined the network of Hamersley Iron mines.	Open pit	Hamersley Iron/Robe power network
	The Bao-Hi joint venture was established in 2002 and has delivered sales of more than 180 million tonnes of iron ore to China. The joint venture is 54% owned by Rio Tinto and 46% by China Baowu Group.	Open pit	Hamersley Iron/Robe power network
	The Channar Mining Joint Venture, established in 1987, was the first large-scale mining joint venture between Chinese and Australian companies. The joint venture is 60% owned by Rio Tinto and 40% by Sinosteel Corporation. It has delivered sales of more than 270 million tonnes of iron ore to China.	Open pit	Hamersley Iron/Robe power network
	Joint venture between Rio Tinto and Hancock Prospecting. Construction of Stage 1 to 22 million tonnes per annum commenced 2006 and first production occurred 2007. Stage 2 to 30 million tonnes per annum completed 2009.	Open pit	Hamersley Iron/Robe power network
	Joint venture between Rio Tinto and Hancock Prospecting. Construction of wet plant processing to 15 million tonnes per annum commenced 2011 and first production occurred 2013.	Open pit	Hamersley Iron/Robe power network
	First shipment in 1972 from Robe Valley. Interest acquired in 2000 through North Limited acquisition. First ore was shipped from West Angelas in 2002.	Open pit	Hamersley Iron/Robe power network
	Construction of the Dampier field started in 1969; first shipment in 1972. Lake MacLeod was acquired in 1978 as an operating field. Port Hedland was acquired in 2001 as an operating field.	Solar evaporation of seawater and underground brine; extraction of gypsum	Long-term contracts with Hamersley Iron and Horizon Power and on-site generation

Mines and production facilities continued

Group mines as at 31 December 2019 (Rio Tinto's interest is 100% unless otherwise shown)

Mine	Location	Access	Title/lease
Copper and Diamonds			
Copper			
Escondida (30%)	Atacama Desert, Chile	Pipeline and road to deep sea port at Coloso; road and rail	Rights conferred by Government under Chilean Mining Code.
Rio Tinto Kennecott Bingham Canyon	Near Salt Lake City, Utah, US	Pipeline, road and rail	Owned.
Oyu Tolgoi (51% of Turquoise Hill Resources Ltd. which owns 66% of Oyu Tolgoi LLC)	Khanbogd soum, Umnugovi province, Mongolia	Air and road	Three mining licences are held by Oyu Tolgoi LLC and two further licences are held in joint venture with Entrée Gold LLC. The licence term under the Minerals Law of Mongolia is 30 years with two 20-year extensions. First renewals are due in 2033 and 2039 for the Oyu Tolgoi and Entrée Gold licences respectively.
Diamonds			
Argyle	Kimberley Ranges, Western Australia	Road and air	Interest increased from 59.7% following purchase of Ashton Mining in 2000. Underground mine project approved in 2005 to extend economic mine life to 2020.
Diavik (60%)	Northwest Territories (NWT), Canada	Air, ice road in winter	Mining leases are issued by the NWT Government. One lease was renewed in 2017 and two leases were renewed in February 2018. The new leases will expire in 2038-2039.
Energy and Minerals			
Industrial minerals			
Rio Tinto Borates – Boron	California, US	Road and rail	Owned.
Rio Tinto Fer et Titane Lac Tio	Havre-Saint-Pierre, Province of Quebec, Canada	Rail and port (St Lawrence River)	Mining covered by two concessions granted by Province of Quebec in 1949 and 1951 which, subject to certain Mining Act restrictions, confer rights and obligations of an owner.
QIT Madagascar Minerals (80%)	Fort-Dauphin, Madagascar	Road and port	Mining lease granted by central government.
Richards Bay Minerals (74%)	Richards Bay, KwaZulu-Natal, South Africa	Rail, road and port	Mineral rights for Reserve 4 and Reserve 10 issued by South African State and converted to new order mining rights from 9 May 2012. Mining rights run until 8 May 2041 for both lease areas.
Iron ore			
Iron Ore Company of Canada (IOC) (58.7%)	Labrador City, Province of Newfoundland and Labrador, Canada	Railway and port facilities in Sept-Îles, Quebec (owned and operated by IOC)	Sublease with the Labrador Iron Ore Royalty Corporation, which has lease agreements with the Government of Newfoundland and Labrador that are due to be renewed in 2020, 2022, 2025 and 2031.
Uranium			
Energy Resources of Australia (68.4%) Ranger	Northern Territory, Australia	Road, rail and port	Mining tenure granted by Federal Government.

History	Type of mine	Power source
Copper and Diamonds		
Copper		
Production started in 1990 and since then capacity has been expanded numerous times. Today, copper concentrate is produced by three concentrator plants, the most recent of which was commissioned in 2016. Copper Cathode is produced by both oxide leach and sulphide leach plants. A desalination plant supplies water to the mine site.	Open pit	Supplied from grid under various contracts with local generating companies. In 2019 Escondida announced the migration to renewable energy power sources from 2021.
Interest acquired in 1989. In 2012, the pushback of the south wall commenced, extending the mine life to 2032.	Open pit	Supplied from grid under long-term contracts with Rocky Mountain Power, supplemented by onsite power
Oyu Tolgoi was first discovered in 1996. Construction began in late 2009 after signing of an Investment Agreement with the Government of Mongolia, and first concentrate was produced in 2012. First sales of concentrate were made to Chinese customers in 2013. In 2015, Underground Development Plan was signed with Government of Mongolia.	Open pit and underground	Grid power from China and supplementary diesel power generation at site. Signed Tavan Tolgoi Power Plant Power Source Framework agreement in December 2018.
Diamonds		
Interest increased from 59.7% following purchase of Ashton Mining in 2000. Underground mine project approved in 2005 to extend economic mine life to 2020.	Underground (previously open pit)	Long-term contract with Ord Hydro Consortium and on-site generation
Deposits discovered 1994-1995. Construction approved 2000. Diamond production started 2003. Fourth pipe commenced production in 2018. Mine life is up to 2025.	Underground (previously open pit) and new A21 pipe is open pit	On-site diesel generators; installed capacity 44MW and 9.2MW of wind capacity
Energy and Minerals		
Industrial minerals		
Deposit discovered in 1925 and acquired by Rio Tinto in 1967.	Open pit	On-site co-generation units and local power grid
Production started 1950; interest acquired in 1989.	Open pit	Supplied by Hydro Quebec at regulated tariff
Exploration project started in 1986; construction approved 2005. Ilmenite and zirsil production started 2008. QMM intends to extract ilmenite and zirsil from heavy mineral sands over an area of about 6,000 hectares along the coast over the next 40 years.	Mineral sand dredging	On-site heavy fuel oil generators
Production started 1977; initial interest acquired 1989. Fifth mining plant commissioned in 2000. One mining plant decommissioned in 2008. In September 2012, Rio Tinto doubled its holding in Richards Bay Minerals to 74% following the acquisition of BHP Billiton's entire interests.	Dune sand dredging	Contract with ESKOM
Iron ore		
Interest acquired in 2000 through North. Current operation began in 1962 and has processed over one billion tonnes of crude ore since. Annual capacity 23 million tonnes of concentrate of which 12.5 million tonnes can be pelletised.	Open pit	Supplied by Newfoundland and Labrador Hydro
Uranium		
Mining commenced 1981. Interest acquired through acquisition of North 2000. Open pit mining ended 2012, since then ERA has been processing ore stockpiles.	Stockpile	On-site diesel generation

Mines and production facilities continued

Group smelters and refineries (Rio Tinto's interest 100% unless otherwise shown)

Smelter/refinery	Location	Title/lease	Plant type/product	Capacity as of 31 December 2019 (based on 100% ownership)
Aluminium				
Alma	Alma, Quebec, Canada	100% freehold	Aluminium smelter producing aluminium rod, t-foundry, molten metal, high purity, remelt	471,000 tonnes per year aluminium
Alouette (40%)	Sept-Îles, Quebec, Canada	100% freehold	Aluminium smelter producing aluminium high purity, remelt	606,000 tonnes per year aluminium
Arvida	Saguenay, Quebec, Canada	100% freehold	Aluminium smelter producing aluminium billet, molten metal, remelt	174,000 tonnes per year aluminium
Arvida AP60	Saguenay, Quebec, Canada	100% freehold	Aluminium smelter producing aluminium high purity, remelt	60,000 tonnes per year aluminium
Bécancour (25.1%)	Bécancour, Quebec, Canada	100% freehold	Aluminium smelter producing aluminium slab, billet, t-foundry, remelt, molten metal	446,000 tonnes per year aluminium
Bell Bay	Bell Bay, Northern Tasmania, Australia	100% freehold	Aluminium smelter producing aluminium slab, molten metal, small form and t-foundry, remelt	195,000 tonnes per year aluminium
Boyne Smelters (59.4%)	Boyne Island, Queensland, Australia	100% freehold	Aluminium smelter producing aluminium billet, EC grade, small form and t-foundry, remelt	584,000 tonnes per year aluminium
Grande-Baie	Saguenay, Quebec, Canada	100% freehold	Aluminium smelter producing aluminium slab, molten metal, high purity, remelt	233,000 tonnes per year aluminium
ISAL	Reykjavik, Iceland	100% freehold	Aluminium smelter producing aluminium remelt, billet	212,000 tonnes per year aluminium
Jonquière (Vaudreuil)	Jonquière, Quebec, Canada	100% freehold	Refinery producing specialty alumina and smelter grade alumina	1,570,000 tonnes per year alumina
Kitimat	Kitimat, British Columbia, Canada	100% freehold	Aluminium smelter producing aluminium slab, remelt, high purity	432,000 tonnes per year aluminium
Laterrière	Saguenay, Quebec, Canada	100% freehold	Aluminium smelter producing aluminium slab, remelt, molten metal	257,000 tonnes per year aluminium
Queensland Alumina (80%)	Gladstone, Queensland, Australia	73.3% freehold; 26.7% leasehold (of which more than 80% expires in 2026 and after)	Refinery producing alumina	3,950,000 tonnes per year alumina
São Luis (Alumar) (10%)	São Luis, Maranhão, Brazil	100% freehold	Refinery producing alumina	3,700,000 tonnes per year alumina
Sohar (20%)	Sohar, Oman	100% leasehold (expiring 2039)	Aluminium smelter producing aluminium, high purity, remelt	390,000 tonnes per year aluminium
Tiwai Point (New Zealand Aluminium Smelters) (79.4%)	Invercargill, Southland, New Zealand	19.6% freehold; 80.4% leasehold (expiring in 2029 and use of certain Crown land)	Aluminium smelter producing aluminium billet, slab, small form foundry, high purity, remelt	373,000 tonnes per year aluminium
Tomago (51.6%)	Tomago, New South Wales, Australia	100% freehold	Aluminium smelter producing aluminium billet, slab, remelt	590,000 tonnes per year aluminium
Yarwun	Gladstone, Queensland, Australia	97% freehold; 3% leasehold (expiring 2101 and after)	Refinery producing alumina	3,200,000 tonnes per year alumina
Copper and Diamonds				
Rio Tinto Kennecott	Magna, Salt Lake City, Utah, US	100% freehold	Flash smelting furnace/Flash convertor furnace copper refinery and precious metals plant	335,000 tonnes per year refined copper
Energy and Minerals				
Boron	California, US	100% freehold	Borates refinery	576,000 tonnes per year boric oxide
IOC Pellet Plant (58.7%)	Labrador City, Newfoundland and Labrador, Canada	100% freehold (asset), 100% leasehold (land) under sublease with Labrador Iron Ore Royalty Corporation for life of mine.	Pellet induration furnaces producing multiple iron ore pellet types	12.5 million tonnes per year pellet
Rio Tinto Fer et Titane Sorel Plant	Sorel-Tracy, Quebec, Canada	100% freehold	Ilmenite smelter	1,300,000 tonnes per year titanium dioxide slag, 1,000,000 tonnes per year iron
Richards Bay Minerals (74%)	Richards Bay, South Africa	100% freehold	Ilmenite smelter	1,050,000 tonnes per year titanium dioxide slag, 565,000 tonnes per year iron

Information on Group power plants (Rio Tinto's interest 100% unless otherwise shown)

Power plant	Location	Title/lease	Plant type/product	Capacity as of 31 December 2019 (based on 100% ownership)
Iron Ore				
Cape Lambert power station (67%)	Cape Lambert, Western Australia, Australia	Lease	Two LM6000PF gas-fired turbines	80MW
Paraburdoo power station	Paraburdoo, Western Australia, Australia	Lease	Three LM6000PC gas-fired turbines One Frame5 dual-fuel turbine	138MW
Yurralyi Maya power station (84.2%)	Dampier, Western Australia, Australia	Miscellaneous licence	Four LM6000PD gas-fired turbines One LM6000PF gas-fired turbine (dual-fuel potential)	200MW
West Angelas power station (67%)	West Angelas, Western Australia, Australia	Miscellaneous licence	Two LM6000PF dual-fuel turbines	80MW
Aluminium				
Gladstone power station (42%)	Gladstone, Queensland, Australia	100% freehold	Thermal power station	1,680MW
Gove power station	Nhulunbuy, Northern Territory, Australia	100% leasehold	Diesel generation	24MW
Kemano power station	Kemano, British Columbia, Canada	100% freehold	Hydroelectric power	896MW
Quebec power stations	Saguenay, Quebec, Canada (Chute-à-Caron, Chute-à-la-Savane, Chute-des-Passes, Chute-du-Diable, Isle-Maligne, Shipshaw)	100% freehold (certain facilities leased from Quebec Government until 2058 pursuant to Peribonka Lease)	Hydroelectric power	3,147MW
Yarwun alumina refinery co-generation plant	Gladstone, Queensland, Australia	100% freehold	Gas turbine and heat recovery steam generator	160MW
Weipa power stations and solar generation facility	Lorim Point, Andoom, and Weipa, Australia	100% leasehold	Diesel generation supplemented by solar generation facility	38MW
Amrun power station	Amrun, Australia	100% leasehold	Diesel generation	24MW
Copper and Diamonds				
Rio Tinto Kennecott power stations	Salt Lake City, Utah, US	100% freehold	Thermal power station idled through December 31 2025, per Rocky Mountain Power supply contract provision Steam turbine running off waste heat boilers at the copper smelter Combined heat and power plant supplying steam to the copper refinery	75MW 31.8MW 6.2MW
Energy and Minerals				
Boron co-generation plant	Boron, California, US	100% freehold	Co-generation uses natural gas to generate steam and electricity, used to run Boron's refining operations	48MW
Energy Resources of Australia (Rio Tinto: 68.4%)	Ranger Mine, Jabiru, Northern Territory, Australia	Lease	Five diesel generator sets rated at 5.17MW; one diesel generator set rated at 2MW; four additional diesel generator sets rated at 2MW	35.8MW
IOC power station	Sept Îles, Quebec, Canada	Statutory grant	Hydroelectric power	22MW
QMM power plant	Fort Dauphin, Madagascar	100% freehold	Diesel generation	24MW

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Independent Limited Assurance Report to the Directors of Rio Tinto plc and Rio Tinto Limited

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The Board of Directors of Rio Tinto plc and Rio Tinto Limited (together "Rio Tinto") engaged us to provide limited assurance on the selected subject matter described below and set out in the Sustainability sections of the Rio Tinto Annual Report 2019 and the Rio Tinto Strategic Report 2019 for the year ended 31 December 2019.

Our conclusion
Based on the procedures we have performed and the evidence we have obtained, nothing has come to our attention that causes us to believe that the selected subject matter within the Sustainability sections of the Rio Tinto Annual Report 2019 and the Rio Tinto Strategic Report 2019 for the year ended 31 December 2019 has not been prepared, in all material respects, in accordance with the Reporting Criteria.

This conclusion is to be read in the context of what we say in the remainder of our report.

Selected Subject Matter
The scope of our work was limited to assurance over the selected subject matter within the Sustainability sections of the Rio Tinto Annual Report 2019 and the Rio Tinto Strategic Report 2019 for the year ended 31 December 2019 (the "selected subject matter").

The selected subject matter and the Reporting Criteria against which it was assessed are summarised below. Our assurance does not extend to information in respect of earlier periods or to any other information included in the Rio Tinto Annual Report 2019 or the Rio Tinto Strategic Report 2019.

Selected subject matter
- Rio Tinto's assertion that it has incorporated the requirements of the International Council on Mining and Metals (ICMM) 10 Principles for sustainable development, and the mandatory requirements set out in the ICMM Position Statements, into its own policies, strategies and standards.
- Rio Tinto's assertions regarding the approach that it has adopted to identify and prioritise its material sustainable development risks and opportunities set out in the Sustainability sections of the Rio Tinto Annual Report 2019 and the Rio Tinto Strategic Report 2019.
- Rio Tinto's assertions regarding the existence and status of implementation of systems and approaches used to manage the following selected sustainable development risk areas:
  - Safety
  - Greenhouse gas emissions
  - Energy use
  - Health
  - Business Integrity
- The following Rio Tinto performance data related to the selected sustainable development risk areas:
  - Number of fatalities
  - All injury frequency rate
  - Lost time injury frequency rate
  - Number of lost time injuries
  - New cases of occupational illness
  - Number of incidents reported either through Talk to Peggy, compliance managers or team leaders
  - Total greenhouse gas emissions
  - Greenhouse gas emissions intensity
  - Total energy use

Understanding reporting and measurement methodologies
The selected subject matter needs to be read and understood together with the Reporting Criteria, which Rio Tinto is solely responsible for selecting and applying. The absence of a significant body of established practice on which to draw to evaluate and measure non-financial information allows for different, , but acceptable, measurement techniques and can affect comparability between entities and over time. The Reporting Criteria used for the reporting of the selected subject matter are the ICMM Sustainable Development Framework: ICMM Principles (Revised 2015) and the definitions and approaches within the Basis of reporting glossary which will be presented at https://www.riotinto.com/sustainability/sustainability-reporting as at 27 February 2020.

Professional standards applied and level of assurance
We performed a limited assurance engagement in accordance with International Standard on Assurance Engagements 3000 (Revised) *Assurance Engagements other than Audits and Reviews of Historical Financial Information*, and, in respect of the greenhouse gas emissions, in accordance with International Standard on Assurance Engagements 3410 *Assurance engagements on greenhouse gas statements*, issued by the International Auditing and Assurance Standards Board.

A limited assurance engagement is substantially less in scope than a reasonable assurance engagement in relation to both the risk assessment procedures, including an understanding of internal control, and the procedures performed in response to the assessed risks.

Our Independence and Quality Control
We applied the Institute of Chartered Accountants in England and Wales (ICAEW) Code of Ethics, which includes independence and other requirements founded on fundamental principles of integrity, objectivity, professional competence and due care, confidentiality and professional behaviour.

We apply International Standard on Quality Control (UK) 1 and accordingly maintain a comprehensive system of quality control including documented policies and procedures regarding compliance with ethical requirements, professional standards and applicable legal and regulatory requirements.

Our work was carried out by an independent and multi-disciplinary team with experience in sustainability reporting and assurance.

Work done
We are required to plan and perform our work in order to consider the risk of material misstatement of the selected subject matter. In doing so, we:
- made enquiries of relevant management of Rio Tinto regarding the processes and controls for capturing, collating and reporting the performance data within the selected subject matter, and evaluated the design and effectiveness of these processes and controls;
- validated the operation of controls over the accuracy of injury and illness classification and assessed the final injury and illness classification applied for a sample of injuries and illnesses reported during the year ended 31 December 2019;
- tested the arithmetic accuracy of a sample of calculations of performance data within the selected subject matter;
- assessed the appropriateness of the greenhouse gas emission factors applied in calculating the Total greenhouse gas emissions and Greenhouse gas emissions intensity;
- tested performance data, on a selective basis, substantively at both an operational and corporate level, which included testing at a selection of 8 operations from across Aluminium, Growth & Innovation, Copper & Diamonds, Energy & Minerals, and Iron Ore;
- undertook analytical procedures over the selected subject matter; and
- made enquiries of relevant management and reviewed a sample of relevant management information and documentation supporting assertions made in the selected subject matter.

Rio Tinto's responsibilities

The Directors of Rio Tinto are responsible for:

- designing, implementing and maintaining internal controls over information relevant to the preparation of the selected subject matter that is free from material misstatement, whether due to fraud or error;
- establishing objective Reporting Criteria for preparing the selected subject matter;
- measuring and reporting the selected subject matter based on the Reporting Criteria; and
- the content of the Rio Tinto Annual Report 2019 and the Rio Tinto Strategic Report 2019.

Our responsibilities

We are responsible for:

- planning and performing the engagement to obtain limited assurance about whether the selected subject matter is free from material misstatement, whether due to fraud or error;
- forming an independent conclusion, based on the procedures we have performed and the evidence we have obtained; and
- reporting our conclusion to the Directors of Rio Tinto.

Restriction on use

This report, including our conclusions, has been prepared solely for the Board of Directors of Rio Tinto in accordance with the agreement between us, to assist the Directors in reporting Rio Tinto's sustainability performance and activities. We permit this report to be disclosed in the Rio Tinto Annual Report 2019 and the Rio Tinto Strategic Report 2019 for the year ended 31 December 2019, to assist the Directors in responding to their governance responsibilities by obtaining an independent assurance report in connection with the selected subject matter. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the Board of Directors and Rio Tinto for our work or this report except where terms are expressly agreed between us in writing.

PricewaterhouseCoopers LLP

PricewaterhouseCoopers LLP
Chartered Accountants
1 Embankment Place, London
WC2N 6RH, United Kingdom

26 February 2020

Shareholder information

Organisational structure
The Rio Tinto Group consists of Rio Tinto plc (registered in England and Wales as company number 719885 under the UK Companies Act 2006 and listed on the London Stock Exchange), and Rio Tinto Limited (registered in Australia as ABN 96 004 458 404 under the Australian Corporations Act 2001 and listed on the Australian Securities Exchange).

Rio Tinto is headquartered in London with a corporate office in Melbourne.

Rio Tinto plc has a sponsored American depositary receipts (ADR) facility, with underlying shares registered with the US Securities and Exchange Commission and listed on the New York Stock Exchange.

Nomenclature and financial data
Rio Tinto plc and Rio Tinto Limited operate together and are referred to in this report as Rio Tinto, the Rio Tinto Group or the Group. These expressions are used for convenience, since both companies, and other companies in which they directly or indirectly own investments, are separate and distinct legal entities. Likewise, the words 'we', 'us', 'our' and 'ourselves' are used in some places to refer to the companies of the Rio Tinto Group in general. These expressions are also used where no useful purpose is served by identifying any particular company or companies. We usually omit "Limited", "plc", "Pty", "Inc.", "Limitada", "L.L.C.", "A.S." or "SA" from Group company names, except to distinguish between Rio Tinto plc and Rio Tinto Limited. Financial data in US dollars ($) is derived from, and should be read in conjunction with, the 2019 financial statements. In general, where we have provided financial data in pounds sterling (£) and Australian dollars (A$), it has been translated from the consolidated financial statements, and is provided solely for convenience; exceptions arise where data has been extracted directly from source records. Certain key information has been provided in US dollars, pounds sterling and Australian dollars in the 2019 financial statements.

History
Rio Tinto plc was incorporated on 30 March 1962 (then called The Rio Tinto-Zinc Corporation Limited (RTZ)) and was formed by the merger of The Rio Tinto Company Limited and The Consolidated Zinc Corporation Limited. The Rio Tinto Company was incorporated in 1873 to reopen ancient copper workings in Spain. The Consolidated Zinc Corporation Limited began operations in the early twentieth century as part of the Australian mining industry. Based at Broken Hill in New South Wales, it began mining silver, lead and zinc deposits and later expanded into lead and zinc smelting.

Rio Tinto Limited was incorporated on 17 December 1959 (then called The Rio Tinto Mining Company of Australia Pty Limited). In 1962 the Australian interests of The Consolidated Zinc Corporation Limited and The Rio Tinto Company Limited were merged to form Conzinc Riotinto of Australia Limited, a limited liability company under the laws of the State of Victoria, Australia. In 1980, Conzinc Riotinto of Australia Limited changed its name to CRA Limited.

Between 1962 and 1995, both RTZ and CRA discovered important mineral deposits, developed major mining projects and grew through acquisition.

RTZ and CRA began operating in 1995 through a dual listed companies structure. In 1997, RTZ became Rio Tinto plc and CRA became Rio Tinto Limited.

Dual listed companies structure
In 1995, Rio Tinto shareholders approved the terms of the dual listed companies' merger (the DLC structure). The aim was to put shareholders of both companies in substantially the same position they would be in if they held shares in a single entity owning all assets of both companies.

Following the approval of the DLC structure, both companies entered into a DLC Merger Sharing Agreement (the Sharing Agreement). As part of this both companies agreed to be managed in a unified way, to share the same board of directors, and to put in place arrangements to provide shareholders of both companies with a common economic interest in the DLC structure.

To achieve this third objective, the Sharing Agreement fixed the ratio of dividend, voting and capital distribution rights attached to each Rio Tinto plc share and each Rio Tinto Limited share at an Equalisation Ratio of 1:1. This has remained unchanged ever since, although the Sharing Agreement makes clear this can be revised in special circumstances, for example where certain modifications are made to the share capital of one company (such as rights issues, bonus issues, share splits and share consolidations) but not to the other.

Outside the circumstances specified in the Sharing Agreement, the Equalisation Ratio can only be altered with the approval of shareholders under the class rights action approval procedure, described in the Voting arrangements section below. Any adjustments must be confirmed by the Group's external auditors.

Consistent with the DLC structure, the directors of both companies aim to act in the best interests of Rio Tinto as a whole. The class rights action approval procedure exists to deal with instances where there may be a conflict of interest between the shareholders of the two companies.

To ensure that the boards of both companies are identical, resolutions to appoint or remove directors must be put to shareholders of both companies as Joint Decisions, described in the Voting arrangements section below. The Articles of Association of Rio Tinto plc and the Constitution of Rio Tinto Limited make clear that a person can only be a director of one company if he or she is also a director of the other. This means that if a person were removed as a director of Rio Tinto plc, he or she would also cease to be a director of Rio Tinto Limited.

One consequence of the DLC merger is that Rio Tinto is subject to a wide range of laws, rules and regulatory reviews across multiple jurisdictions. Where these rules differ, Rio Tinto will comply with the requirements in each jurisdiction at a minimum.

Dividend arrangements
The Sharing Agreement ensures that dividends paid on Rio Tinto plc and Rio Tinto Limited shares are equalised on a net cash basis without taking into account any associated tax credits. Dividends are determined in US dollars and (with the exception of ADR holders, paid in sterling and Australian dollars), both companies are required to announce and pay dividends and other distributions at the same time or as close to this as possible.

In the unlikely event that one company does not have sufficient distributable reserves to pay the equalised dividend or equalised capital distribution, it would be entitled to a top-up payment from the other company. The top-up payment could be made as a dividend on the DLC dividend share, or by way of a contractual payment.

If the payment of an equalised dividend would contravene the law applicable to one of the companies, they can depart from the Equalisation Ratio. In that situation, the relevant company must put aside reserves for payment on the relevant shares at a later date.

Rio Tinto shareholders have no direct rights to enforce the dividend equalisation provisions of the Sharing Agreement.

By allowing dividends to be paid between companies and their subsidiaries, DLC dividend shares give the Group extra flexibility to manage internal funds.

Voting arrangements
In principle, the Sharing Agreement enables the shareholders of Rio Tinto plc and Rio Tinto Limited to vote as a joint electorate on any matters that affect them in similar ways. These are referred to as Joint Decisions, and include the creation of new classes of share capital, the appointment or removal of directors and auditors, and the receiving of annual financial statements. All shareholder resolutions that include Joint Decisions are voted on a poll.

The Sharing Agreement also protects shareholders of both companies by requiring joint approval for decisions that do not affect the shareholders of both companies equally. These are known as class rights actions, and are voted on a poll. For example, fundamental elements of the DLC structure cannot be changed unless approved separately by the shareholders of both companies.

Exceptions to these principles can arise in situations such as where legislation requires the separate approval of a decision by the appropriate majority of shareholders in one company, and where approval of the matter by shareholders of the other company is not required.

Where a matter has been expressly categorised as either a Joint Decision or a class rights action, the directors cannot change that categorisation. If a matter falls within both categories, it is treated as a class rights action. In addition, if an issue is not expressly listed in either category, directors can decide how it should be put to shareholders for approval.

To support joint voting arrangements, both companies have entered into shareholder voting agreements, where a Special Voting Share is issued to a special purpose company (SVC) and held in trust for shareholders by a common trustee. Rio Tinto plc (RTP) has issued its Special Voting Share (RTP Special Voting Share) to Rio Tinto Limited (RTL) Shareholder SVC, while Rio Tinto Limited has issued its Special Voting Share (RTL Special Voting Share) to RTP Shareholder SVC. The total number of votes cast on Joint Decisions by the shareholders of one company are decided at a parallel meeting of the other company. The exact role of these SVCs is described below.

In exceptional circumstances, certain shareholders can be excluded from voting at their respective company's general meetings. For example, they may have acquired shares in the other company in excess of a given threshold without making an offer for all the shares in the other company. In this situation, votes cast by these excluded shareholders are disregarded.

Following the companies' general meetings, the overall results of the voting are announced to relevant stock exchanges and the media, and published on the Rio Tinto website.

At a Rio Tinto plc shareholders' meeting during which a Joint Decision is considered, each Rio Tinto plc share carries one vote. The holder of the Special Voting Share has one vote for each vote cast by the public shareholders of Rio Tinto Limited in their parallel meeting. The holder of the Special Voting Share must vote in accordance with the votes cast by public shareholders for and against the equivalent resolution at the parallel Rio Tinto Limited shareholders' meeting. The holders of Rio Tinto Limited ordinary shares do not hold voting shares in Rio Tinto plc by virtue of their holding in Rio Tinto Limited, and cannot enforce the voting arrangements relating to the Special Voting Share.

Similarly, at a Rio Tinto Limited shareholders' meeting during which a Joint Decision is considered, each Rio Tinto Limited share carries one vote and the holder of its Special Voting Share will have one vote for each vote cast by the public shareholders of Rio Tinto plc in their parallel meeting. The holder of the Special Voting Share must vote in accordance with the votes cast for and against the equivalent resolution at the parallel Rio Tinto plc shareholders' meeting. The holders of Rio Tinto plc ordinary shares do not hold any voting shares in Rio Tinto Limited by virtue of their holding in Rio Tinto plc, and cannot enforce the voting arrangements relating to the Special Voting Share.

Capital distribution arrangements
If either company goes into liquidation, the Sharing Agreement ensures a valuation is made of the surplus assets of both companies. If the surplus assets available for distribution by one company on each of the shares held by its shareholders exceed the surplus assets available for distribution by the other company on each of the shares held by its shareholders, then an equalising payment must be made – to the extent permitted by applicable law – such that the amount available for distribution on each share held by shareholders of both companies reflects the Equalisation Ratio.

The aim is to ensure the shareholders of both companies have equivalent entitlements to the assets of the combined Group on a per share basis, taking account of the equalisation ratio.

The Sharing Agreement does not grant any enforceable rights to the shareholders of either company upon liquidation of either company.

Limitations on ownership of shares and merger obligations
The laws and regulations of the UK and Australia impose restrictions and obligations on persons who control interests in publicly listed companies in excess of defined thresholds. These can include an obligation to make a public offer for all outstanding issued shares of the relevant company. The threshold applicable to Rio Tinto plc under UK law and regulations is 30% and to Rio Tinto Limited under Australian law and regulations is 20% on both a standalone and Joint Decision basis.

As part of the DLC merger, the Articles of Association of Rio Tinto plc and the Constitution of Rio Tinto Limited were amended with the aim of extending these laws and regulations to the combined enterprise. This amendment also ensures that a person cannot exercise control over one company without having made offers to the public shareholders of both companies.

This guarantees the equal treatment of both sets of shareholders, and that the two companies are considered as a single economic entity. The Articles of Association of Rio Tinto plc and the Constitution of Rio Tinto Limited impose restrictions on any person who controls, directly or indirectly, 20% or more of the votes on a Joint Decision. If, however, such a person has an interest in either Rio Tinto Limited or Rio Tinto plc only, then the restrictions only apply if they control, directly or indirectly, 30% or more of the votes at that company's general meetings.

If one of these thresholds is exceeded, the person cannot attend or vote at general meetings of the relevant company, cannot receive dividends or other distributions from the relevant company, and may be divested of their interest by the directors of the relevant company (subject to certain limited exceptions and notification by the relevant company). These restrictions continue to apply until that person has either made a public offer for all the publicly held shares of the other company, has reduced their controlling interest below the thresholds specified, or has acquired through a permitted means at least 50% of the publicly held shares of each company.

This arrangement ensures that offers for the publicly held shares of both companies would be required to avoid the restrictions set out above, even if the interests which breach the thresholds are held in just one of the companies. The directors do not have the discretion to exempt a person from the operation of these rules.

Under the Sharing Agreement, the companies agree to co-operate to enforce the above restrictions contained in their Articles of Association and Constitution.

Guarantees
In 1995, each company entered into a deed poll guarantee in favour of creditors of the other company. In addition, each company guaranteed the contractual obligations of the other and the obligations of other persons guaranteed by the other company, subject to certain limited exceptions.

Beneficiaries under deed poll guarantees can make demands on the relevant guarantor without first having recourse to the company or persons whose obligations are being guaranteed. The obligations of the guarantor under each deed poll guarantee expire upon termination of the Sharing Agreement and under other limited circumstances, but only in respect of obligations arising after such termination and, in the case of other limited circumstances, the publication and expiry of due notice.

The shareholders of the companies cannot enforce the provisions of the deed poll guarantees in relation to their interest in the shares of the other company.

Shareholder information continued

Markets

Rio Tinto plc

The principal market for Rio Tinto plc shares is the London Stock Exchange, with shares trading through the Stock Exchange Electronic Trading Service (SETS) system.

Rio Tinto plc American depositary receipts (ADRs) are listed on the New York Stock Exchange.

Further details relating to Rio Tinto plc ADRs are available in Rio Tinto's Annual report on Form 20-F.

Rio Tinto Limited

Rio Tinto Limited shares are listed on the Australian Securities Exchange (ASX).

The ASX is the principal trading market for Rio Tinto Limited shares. The ASX is a national stock exchange with an automated trading system.

Share ownership

Substantial shareholders

Under the UK Disclosure and Transparency Rules and the Australian Corporations Act 2001, any shareholder of Rio Tinto plc with voting rights of 3% or more, or any person with voting power of 5% or more in Rio Tinto Limited, is required to provide the relevant companies with notice.

The shareholders who have provided this notice or an equivalent as of 14 February 2020, being the last practicable date, are:

Rio Tinto Plc	Date of notice	Number of shares	Percentage of capital
BlackRock, Inc.	4 Dec 2009	127,744,871	8.38
The Capital Group Companies, Inc.	8 Jan 2018	67,470,318	5.03
Shining Prospect Pte. Ltd	7 Dec 2018	182,550,329	14.02[a]
The Capital Group Companies, Inc.	8 Jan 2020	61,365,180	4.91
Rio Tinto Limited			
BlackRock, Inc.	13 Apr 2015	See footnote[b]	See footnote[b]
Blackrock, Inc.	13 Feb 2019	22,870,305	6.16
Shining Prospect Pte. Ltd	9 Feb 2018	See footnote[c]	See footnote[c]
The Vanguard Group, Inc.	19 Jul 2018	20,623,906	5.00

(a) In its notification of major holdings filed on 7 December 2018, Shining Prospect Pte. Ltd, a Singapore-based entity owned by Chinalco (Aluminium Corporation of China) disclosed that its percentage of voting rights in Rio Tinto plc had increased to 14.02% on 18 October 2018. This increase in voting rights is due to the ongoing on-market share buy-back programme of Rio Tinto plc shares and the number of shares held by Shining Prospect Pte. Ltd has remained unchanged.

(b) In its substantial holding notice filed on 13 April 2015, BlackRock, Inc. and its associates disclosed a holding of 120,174,604 shares in Rio Tinto plc and 22,330,443 shares in Rio Tinto Limited. Through the operation of the Australian Corporations Act 2001 as modified, these interests gave BlackRock, Inc. and its associates voting power of 7.7% in the Rio Tinto Group on a Joint Decision matter, making them substantial shareholders of Rio Tinto Limited, as well as of Rio Tinto plc.

(c) In its notice of change of interests of substantial holder filed on 9 February 2018 Shining Prospect Pte. Ltd, disclosed a holding of 182,550,329 Rio Tinto plc shares which, as at 28 November 2017, gave this entity and its associates voting power of 10.32% in the Rio Tinto Group on a Joint Decision matter. Accordingly, in addition to being substantial shareholders of Rio Tinto plc, through the operation of the Australian Corporations Act 2001 as modified and the DLC structure, these entities are substantial shareholders of Rio Tinto Limited.

As far as is known, Rio Tinto plc and Rio Tinto Limited are not directly or indirectly owned or controlled by another corporation or by any government or natural person. Rio Tinto is not aware of any arrangement that may result in a change in control of Rio Tinto plc or Rio Tinto Limited. No shareholder possesses voting rights that differ from those attaching to Rio Tinto plc's and Rio Tinto Limited's securities.

As of 14 February 2020 the total amount of the Group's voting securities owned by the directors and executives in Rio Tinto plc was 220,653 ordinary shares of 10p each or ADRs, and in Rio Tinto Limited was 131,646 ordinary shares, in aggregate representing less than 1% of the Group's total number of ordinary shares in issue.

Analysis of ordinary shareholders

	Rio Tinto plc				Rio Tinto Limited			
As at 14 February 2020 (last practicable date)	No. of accounts	%	Shares	%	No. of accounts	%	Shares	%
1 to 1,000 shares	24,263	75.616	7,428,860	0.591	132,035	84.49	37,362,715	10.06
1,001 to 5,000 shares	5,659	17.636	11,418,242	0.909	21,748	13.92	43,092,950	11.61
5,001 to 10,000 shares	611	1.904	4,264,286	0.339	1,695	1.08	11,690,753	3.15
10,001 to 25,000 shares	435	1.356	6,828,626	0.543	618	0.40	9,057,679	2.44
25,001 to 125,000 shares	577	1.798	34,215,110	2.723	134	0.09	5,803,570	1.56
125,001 to 250,000 shares	171	0.533	30,682,144	2.442	14	0.01	2,460,708	0.61
250,001 to 1,250,000 shares	243	0.757	131,609,084	10.474	22	0.01	12,430,075	3.35
1,250,001 to 2,500,000 shares	63	0.196	109,236,084	8.693	3	0.00	6,463,956	1.74
2,500,001 shares and over[a]	65	0.203	920,868,248[b]	73.285	8	0.01	242,853,808	65.42
			1,256,550,684[c]	100.00			371,216,214[d]	100
Number of holdings less than marketable parcel of A$500					2,954			

(a) Excludes shares held in Treasury.
(b) This includes 119,178,675 shares held in the name of a nominee on the share register. The shares are listed on the NYSE in the form of American depositary receipts (ADRs).
(c) The total issued share capital is made up of 1,278,627,985 publicly held shares, of which 9,440,735 are held in Treasury.
(d) Publicly held shares in Rio Tinto Limited.

Twenty largest registered shareholders

The following table lists the 20 largest registered holders of Rio Tinto Limited shares in accordance with the ASX listing rules, together with the number of shares and the percentage of issued capital each holds, as of 14 February 2020, being the last practicable date.

Rio Tinto Limited	Number of shares	Percentage of issued share capital
HSBC Custody Nominees (Australia) Limited	109,130,534	29.40
J. P. Morgan Nominees Australia Limited	72,129,036	19.43
Citicorp Nominees Pty Ltd	24,342,991	6.56
National Nominees Limited	14,231,793	3.83
BNP Paribas Nominees Pty Ltd (Agency Lending DRP A/C)	10,567,500	2.85
BNP Paribas Noms Pty Ltd (DRP)	6,527,200	1.76
Citicorp Nominees Pty Limited (Colonial First State Inv A/C)	3,786,688	1.02
HSBC Custody Nominees (Australia) Limited (NT-Comnwlth Super Corp A/C)	3,108,921	0.84
Computershare Trustees Jey Ltd (RE 3000086 A/C)	2,421,301	0.65
Argo Investments Limited	2,097,139	0.56
Australian Foundation Investment Company Limited	2,080,931	0.56
Computershare Comp Noms Ltd (VS4 A/C)	1,139,575	0.31
Australian Mutual Provident Society	871,693	0.23
HKBA Nominees Limited	806,700	0.22
Custodial Services Limited	771,064	0.21
Netwealth Investments Limited	750,124	0.20
Computershare Trustees Jey Ltd (RE 3000091 A/C)	749,778	0.20
BNP Paribas Nominees Pty Ltd (Hub24 Custodial Serv Ltd DRP)	701,300	0.19
Milton Corporation Limited	669,120	0.18
Australian United Investments Co Limited	654,874	0.18

Shareholder information continued

Material contracts

Articles of Association, Constitution, and DLC Sharing Agreement

As explained on pages 292 to 293, under the terms of the DLC structure shareholders of Rio Tinto plc and of Rio Tinto Limited entered into certain contractual arrangements designed to place the shareholders of both companies in substantially the same position as if they held shares in a single entity which owned all the assets of both companies. As far as is permitted by the UK Companies Act 2006, the Australian Corporations Act 2001 and ASX Listing Rules, this principle is reflected in the Articles of Association of Rio Tinto plc and in the Constitution of Rio Tinto Limited. The following summaries describe the material rights of shareholders of both Rio Tinto plc and Rio Tinto Limited.

Objects

At the 2009 AGMs, shareholders of Rio Tinto plc and Rio Tinto Limited approved amendments to their Articles of Association and Constitution whereby the object clauses were removed to allow the companies to have the widest possible scope of activities.

Directors Interests

Under Rio Tinto plc's Articles of Association, a director may not vote in respect of any proposal in which he or she, or any other person connected with him or her, has any interest, other than by virtue of his or her interests in shares or debentures or other securities of, in or through the company, except in certain circumstances, including in respect of resolutions:

- indemnifying him or her or a third party in respect of obligations incurred by the director on behalf of, or for the benefit of, the company, or in respect of obligations of the company, for which the director has assumed responsibility under an indemnity, security or guarantee;
- relating to an offer of securities in which he or she may be interested as a holder of securities or as an underwriter;
- concerning another body corporate in which the director is beneficially interested in less than 1% of the issued shares of any class of shares of such a body corporate;
- relating to an employee benefit in which the director will share equally with other employees;
- relating to liability insurance that the company is empowered to purchase for the benefit of directors of the company in respect of actions undertaken as directors (or officers) of the company; and
- concerning the giving of indemnities in favour of directors or the funding of expenditure by directors to defend criminal, civil or regulatory proceedings or actions against a director.

Under Rio Tinto Limited's Constitution, a director may be present at a meeting of the board while a matter in which the director has a material personal interest is being considered and may vote in respect of that matter, except where a director is constrained by Australian law.

The directors are empowered to exercise all the powers of the companies to borrow money, to charge any property or business of the companies or all, or any, of their uncalled capital, and to issue debentures or give any other security for a debt, liability or obligation of the companies or of any other person. The directors shall restrict the borrowings of Rio Tinto plc to the limitation that the aggregate amount of all monies borrowed by the company and its subsidiaries shall not exceed an amount equal to 1 ½ times the companies' share capital plus aggregate reserves unless sanctioned by an ordinary resolution of the company.

Directors are not required to hold any shares of either company by way of qualification. The Remuneration report on pages 110 to 138 provides information on shareholding policies relating to executive and non-executive directors. Please refer to the Directors' report for information on the appointment of directors.

Rights attaching to shares

Under UK law, dividends on shares may only be paid out of profits available for distribution, as determined in accordance with generally accepted accounting principles and by the relevant law. Shareholders are entitled to receive such dividends as may be declared by the directors. Directors may also pay shareholders interim dividends as justified by the financial position of the Group.

Under the Australian Corporations Act 2001, dividends on shares may only be paid if the company's assets exceed its liabilities immediately before the dividend is declared, the excess is sufficient for the payment of the dividend, the payment is fair and reasonable to the company's shareholders as a whole, and the payment does not materially prejudice the company's ability to pay its creditors.

Any Rio Tinto plc dividend unclaimed after 12 years from the date the dividend was declared, or became due for payment, will be forfeited and returned to the company. Any Rio Tinto Limited dividend unclaimed may be invested or otherwise used by the board for the benefit of the company until claimed or otherwise disposed of according to Australian law. Rio Tinto Limited is governed by the State of Victoria's unclaimed monies legislation, which requires the company to pay to the state revenue office any unclaimed dividend payments of A$20 or more that on 1 March each year have remained unclaimed for over 12 months.

Voting

Voting at any general meeting of shareholders on a resolution on which the holder of the Special Voting Share is entitled to vote shall be decided by a poll, and any other resolution shall be decided by a show of hands unless a poll has been duly demanded. On a show of hands, every shareholder who is present in person or by proxy (or other duly authorised representative) and is entitled to vote, has one vote regardless of the number of shares held. The holder of the Special Voting Share is not entitled to vote in a show of hands. On a poll, every shareholder who is present in person or by proxy (or other duly authorised representative) and is entitled to vote, has one vote for every ordinary share for which he or she is the holder. In the case of Joint Decisions, the holder of the Special Voting Share has one vote for each vote cast in respect of the publicly held shares of the other company.

A poll may be demanded by any of the following:

- the chairman of the meeting;
- at least five shareholders entitled to vote on the resolution;
- any shareholder(s) representing in the aggregate not less than one tenth (Rio Tinto plc) or one 20th (Rio Tinto Limited) of the total voting rights of all shareholders entitled to vote on the resolution;
- any shareholder(s) holding Rio Tinto plc shares conferring a right to vote at the meeting on which there have been paid-up sums in the aggregate equal to not less than one tenth of the total sum paid up on all the shares conferring that right; or
- the holder of the Special Voting Share of either company.

A proxy form gives the proxy the authority to demand a poll, or to join others in demanding one.

The necessary quorum for a Rio Tinto plc general meeting is three members present (in person or by proxy or other duly authorised representative) and entitled to vote. For a Rio Tinto Limited general meeting it is two members present (in person or by proxy or other duly authorised representative).

Matters are transacted at general meetings by the proposing and passing of resolutions as:

- ordinary resolutions (for example the election of directors), which require the affirmative vote of a majority of persons voting at a meeting for which there is a quorum; and
- special resolutions (for example amending the Articles of Association of Rio Tinto plc or the Constitution of Rio Tinto Limited), which require the affirmative vote of not less than three-quarters of the persons voting at a meeting at which there is a quorum.

The Sharing Agreement further classifies resolutions as Joint Decisions and class rights actions as explained on pages 292 to 293.

Annual general meetings must be convened with 21 days' written notice for Rio

Tinto plc and with 28 days' notice for Rio Tinto Limited. In accordance with the authority granted by shareholders at the Rio Tinto plc AGM in 2019, other meetings of Rio Tinto plc may be convened with 14 days' written notice for the passing of a special resolution, and with 14 days' notice for any other resolution, depending on the nature of the business to be transacted. All meetings of Rio Tinto Limited require 28 days' notice. In calculating the period of notice, any time taken to deliver the notice and the day of the meeting itself are not included. The notice must specify the nature of the business to be transacted.

Variation of rights
If, at any time, the share capital is divided into different classes of shares, the rights attached to each class may be varied, subject to the provisions of the relevant legislation, the written consent of holders of three-quarters in value of the shares of that class, or upon the adoption of a special resolution passed at a separate meeting of the holders of the shares of that class. At every such meeting, all of the provisions of the Articles of Association and Constitution relating to proceedings at a general meeting apply, except that the quorum for Rio Tinto plc should be two or more persons who hold or represent by proxy not less than one-third in nominal value of the issued shares of the class.

Rights upon a winding-up
Except as the shareholders have agreed or may otherwise agree, upon a winding-up, the balance of assets available for distribution after the payment of all creditors (including certain preferential creditors, whether statutorily preferred creditors or normal creditors) and subject to any special rights attaching to any class of shares, is to be distributed among the holders of ordinary shares according to the amounts paid-up on the shares held by them. This distribution should generally be made in cash. A liquidator may, however, upon the adoption of a special resolution of the shareholders, divide among the shareholders the whole or any part of the assets in specie or kind.

The Sharing Agreement describes the distribution of assets of each of the companies in the event of a liquidation, as explained on pages 292 to 293.

Facility agreement
Details of the Group's $7.5 billion multi-currency committed revolving credit facilities are set out in note 30 to the 2019 financial statements.

Exchange controls and foreign investment
Rio Tinto plc
There are no UK foreign exchange controls or other restrictions on the import or export of capital by, or on the payment of dividends to, non-resident holders of Rio Tinto plc shares, or that materially affect the conduct of Rio Tinto plc's operations. It should be noted, however, that various sanctions, laws, regulations or conventions may restrict the import or export of capital by, or the payment of dividends to, non-resident holders of Rio Tinto plc shares. There are no restrictions under Rio Tinto plc's Articles of Association or under UK law that limit the right of non-resident owners to hold or vote Rio Tinto plc shares. However, certain of the provisions of the Australian Foreign Acquisitions and Takeovers Act 1975 (the Takeovers Act) described below also apply to the acquisition by non-Australian persons of interests in securities of Rio Tinto plc.

Rio Tinto Limited
Under current Australian legislation, Australia does not impose general exchange or foreign currency controls. Subject to some specific requirements and restrictions, Australian and foreign currency may be freely brought into and sent out of Australia. There are requirements to report cash transfers in or out of Australia of A$10,000 or more. There is a prohibition on (or in some cases the specific prior approval of the Department of Foreign Affairs and Trade or Minister for Foreign Affairs must be obtained for) certain payments or other dealings connected with countries or parties identified with terrorism, or to whom United Nations or autonomous Australian sanctions apply. Sanction, anti-money laundering and counterterrorism laws may restrict or prohibit payments, transactions and dealings or require reporting of certain transactions.

Rio Tinto Limited may be required to deduct withholding tax from foreign remittances of dividends, to the extent that they are unfranked, and from payments of interest.

Acquisitions of interests in shares, and certain other equity instruments in Australian companies by non-Australian ("foreign") persons are subject to review and approval by the Treasurer of the Commonwealth of Australia under the Takeovers Act.

In broad terms, the Takeovers Act applies to acquisitions of interests in securities in an Australian entity by a foreign person where, as a result, a single foreign person (and any associate) would control 20% or more of the voting power or potential voting power in the entity, or several foreign persons (and any associates) would control 40% or more of the voting power or the potential voting power in the entity. The potential voting power in an entity is determined having regard to the voting shares in the entity that would be issued if all rights (whether or not presently exercisable) in the entity were exercised.

The Takeovers Act also applies to direct investments by foreign government investors, in certain circumstances regardless of the size of the investment. Persons who are proposing relevant acquisitions or transactions may be required to provide notice to the Treasurer before proceeding with the acquisition or transaction.

The Treasurer has the power to order divestment in cases where relevant acquisitions or transactions have already occurred, including where prior notice to the Treasurer was not required. The Takeovers Act does not affect the rights of owners whose interests are held in compliance with the legislation.

Limitations on voting and shareholding
Except for the provisions of the Takeovers Act, there are no limitations imposed by law, Rio Tinto plc's Articles of Association or Rio Tinto Limited's Constitution, on the rights of non-residents or foreigners to hold the Group's ordinary shares or ADRs, or to vote that would not apply generally to all shareholders.

Directors
Appointment and removal of directors
The appointment and replacement of directors is governed by Rio Tinto plc's Articles of Association and Rio Tinto Limited's Constitution, relevant UK and Australian legislation, and the UK Corporate Governance Code. The board may appoint a director either to fill a casual vacancy or as an addition to the board, so long as the total number of directors does not exceed the limit prescribed in these constitutional documents. An appointed director must retire and seek election to office at the next AGM of each company. In addition to any powers of removal conferred by the UK Companies Act 2006 and the Australian Corporations Act 2001, the company may by ordinary resolution remove any director before the expiry of his or her period of office and may, subject to these constitutional documents, by ordinary resolution appoint another person who is willing to act as a director in their place. In line with the UK Corporate Governance Code, all directors are required to stand for re-election at each AGM.

Shareholder information continued

Directors' powers

The board manages the business of Rio Tinto under the powers set out in these constitutional documents. These powers include the directors' ability to issue or buy-back shares. Shareholders' authority to empower the directors to purchase its own ordinary shares is sought at the AGM each year. The constitutional documents can only be amended, or replaced, by a special resolution passed in general meeting by at least 75% of the votes cast.

UK listing rules cross reference table

The following table contains only those sections of UK listing rule 9.8.4 C which are relevant. The remaining sections of listing rule 9.8.4 C are not applicable.

Listing rule	Description of listing rule	Reference in report
9.8.4 (1)	A statement of any interest capitalised by the Group during the year	Note 8 Finance income and finance costs and note 17 Deferred taxation
9.8.4 (12)	Details of any arrangement under which a shareholder has waived or agreed to waive any dividends	Note 11 Dividends

Shareholder security

Shareholders tell us that they sometimes receive unsolicited approaches, usually by telephone, inviting them to undertake a transaction in shares they own.

If a shareholder does not know the source of the call, they should check the details against the Financial Conduct Authority (FCA) website below and, if they have specific information, report it to the FCA using the consumer helpline or the online reporting form.

If a shareholder is worried that they are a victim of fraud and is resident in the UK, they should report the facts immediately using the Action Fraud helpline on 0300 123 2040. More information about potential scams and other investment-based fraud can be found at **actionfraud.police.uk** or **fca.org.uk/scamsmart.**

Metal prices and exchange rates

Metal prices – average for the year		2019	2018	increase/ (decrease)
Copper	– US cents/lb	273	297	-0.08%
Aluminium	– US$/tonne	1,791	2,110	-0.15%
Gold	– US$/troy oz	1,393	1,269	-0.10%
Average exchange rates against the US dollar				
Sterling		1.28	1.34	-0.45%
Australian dollar		0.70	0.75	-0.07%
Canadian dollar		0.75	0.77	-0.03%
Euro		1.12	1.18	-0.05%
South African rand		0.069	0.076	-0.09%
Year-end exchange rates against the US dollar				
Sterling		1.31	1.27	0.03%
Australian dollar		0.70	0.70	0%
Canadian dollar		0.77	0.73	0.05%
Euro		1.12	1.14	-0.02%
South African rand		0.071	0.069	0.03%

Financial calendar

2020		
17	January	Fourth quarter 2019 operations review
26	February	Announcement of results for 2019 and date of 2019 Annual report (published on 27 February (GMT))
28	February	Form 20-F publication
5	March	Rio Tinto plc and Rio Tinto Limited ordinary shares and Rio Tinto plc ADRs quoted "ex-dividend" for the 2019 final dividend
6	March	Record date for the 2019 final dividend for Rio Tinto plc and Rio Tinto Limited ordinary shares and Rio Tinto plc ADRs
10	March	Notices of AGM
24	March	Final date for elections under the Rio Tinto plc and Rio Tinto Limited dividend reinvestment plans and under facilities for dividends to be paid in alternative currency for the 2019 final dividend
7	April	Dividend currency conversion date (Rio Tinto plc holders electing to receive Australian dollars and Rio Tinto Limited holders electing to receive pounds sterling)
8	April	Annual general meeting for Rio Tinto plc, London
16	April	Payment date for the 2019 final dividend to holders of ordinary shares and ADRs
17	April	First quarter 2020 operations review
7	May	Annual general meeting for Rio Tinto Limited, Brisbane
17	July	Second quarter operations review 2020
29	July	Announcement of half-year results for 2020
6	August	Rio Tinto plc and Rio Tinto Limited ordinary shares and Rio Tinto plc ADRs quoted "ex-dividend" for the 2020 interim dividend
7	August	Record date for the 2020 interim dividend for Rio Tinto plc and Rio Tinto Limited ordinary shares and Rio Tinto plc ADRs
26	August	Final date for elections under the Rio Tinto plc and Rio Tinto Limited dividend reinvestment plans and under facilities for dividends to be paid in alternative currency for the 2020 interim dividend
10	September	Dividend currency conversion date (Rio Tinto plc holders electing to receive Australian dollars and Rio Tinto Limited holders electing to receive pounds sterling)
17	September	Payment date for the 2020 interim dividend to holders of ordinary shares and ADRs
16	October	Third quarter 2020 operations review
2021		
	January	Fourth quarter 2020 operations review
	February	Announcement of results for 2020
	April	Annual general meeting for Rio Tinto plc, London
	April	First quarter 2021 operations review
	May	Annual general meeting for Rio Tinto Limited, Sydney
	July	Second quarter 2021 operations review
	August	Announcement of half-year results for 2021
	October	Third quarter 2021 operations review

Contact details

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Rio Tinto's agent in the US is Cheree Finan, who may be contacted at
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Shareholders
Please refer queries about shareholdings to the investor centre of the respective registrar.

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Website: computershare.com

Holders of Rio Tinto American depositary receipts (ADRs)
Please contact the ADR administrator if you have any queries about your ADRs.

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US residents only, toll free Global invest direct:
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Website: adr.com
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New Zealand residents only, toll free:
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Forward-looking statements

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Forward-looking statements
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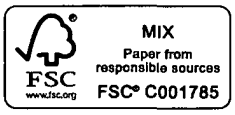

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Cover image: Every MW wind turbine uses three tonnes of copper. Rio Tinto is building high-value copper growth options.