

Rio Tinto delivers underlying EBITDA of \$26.3 billion and total dividends of 492 US cents per share

22 February 2023

Rio Tinto Chief Executive Jakob Stausholm said: "We are building a stronger Rio Tinto and delivering against our four objectives. Our operational performance has improved, as evidenced by a number of second half records being set at our Pilbara iron ore mine and rail system. We are also investing for the future, doubling our stake in the Oyu Tolgoi copper-gold project in Mongolia through the acquisition of Turquoise Hill Resources, progressing the Rincon Lithium Project in Argentina and reaching milestone agreements that underpin the long-term success of our Pilbara iron ore business.

"We continue to focus on making lasting change to strengthen our workplace culture and to building better relationships with Indigenous peoples, communities and other partners. At all times we will seek to find better ways, in line with our purpose. We clearly have more to do but I am encouraged by the progress we are making.

"Despite challenging market conditions, we remain resilient because of the quality of our assets, our great people and the strength of our balance sheet. That is why we delivered strong financial results with underlying EBITDA of \$26.3 billion, free cash flow of \$9.0 billion and underlying earnings of \$13.3 billion, after taxes and government royalties of \$8.4 billion. This enables us to continue to invest in strengthening the business while also paying a total dividend of \$8.0 billion, a 60% payout, in line with our policy.

"The uplift in our operational performance, strengthening of external relationships and investment in the long-term strength of the business ensure we will be able to continue to pay attractive dividends and invest in sustaining and growing our portfolio, while contributing to society's drive to net zero."

At year end	2022	2021	2020	Change vs 2021	Change vs 2020
Net cash generated from operating activities (US\$ millions)	16,134	25,345	15,875	(36)%	2 %
Purchases of property, plant and equipment and intangible assets (US\$ millions)	6,750	7,384	6,189	(9)%	9 %
Free cash flow ¹ (US\$ millions)	9,010	17,664	9,407	(49)%	(4)%
Consolidated sales revenue (US\$ millions)	55,554	63,495	44,611	(13)%	25 %
Underlying EBITDA ¹ (US\$ millions)	26,272	37,720	23,902	(30)%	10 %
Profit after tax attributable to owners of Rio Tinto (net earnings) (US\$ millions)	12,420	21,094	9,769	(41)%	27 %
Underlying earnings per share (EPS) ¹ (US cents)	819.6	1,321.1	769.6	(38)%	6 %
Ordinary dividend per share (US cents)	492.0	793.0	464.0	(38)%	6 %
Special dividend per share (US cents)	—	247.0	93.0	(100)%	(100)%
Total dividend per share (US cents)	492.0	1,040.0	557.0	(53)%	(12)%
Net (debt)/cash ¹ (US\$ millions)	(4,188)	1,576	(664)		
Underlying return on capital employed (ROCE) ¹	25%	44%	27%		

¹ This financial performance indicator is a non-IFRS (as defined below) alternative performance measure (APM). It is used internally by management to assess the performance of the business and is therefore considered relevant to readers of this document. It is presented here to give more clarity around the underlying business performance of the Group's operations. APMs are reconciled to directly comparable IFRS financial measures on pages 69 to 78. Our financial results are prepared in accordance with IFRS — see page 35 for further information. Footnotes are set out in full on page 17.

- We are committed to having a safe work environment, preventing catastrophic events and reducing injuries. We had a fourth year in a row of zero fatalities and our all-injury frequency rate has remained stable at 0.40. We continue to implement our safety maturity model which, as our blueprint for safety, describes the systems and behaviours we apply to create a strong safety culture.

Solid financial results in 2022, set against a context of record prices in 2021

- \$16.1 billion net cash generated from operating activities, 36% lower than 2021. This included items of a non-recurring nature which were not representative of the underlying strength of the performance of the business, which, in aggregate, reduced operating cash flow by around \$2 billion. See page 5 for more detail. Free cash flow¹ of \$9.0 billion included capital expenditure of \$6.8 billion, which decreased 9% as we commissioned our current programme of Pilbara replacement projects, notably Gudai-Darri.
- \$12.4 billion of net earnings, 41% lower than 2021, reflected the movement in commodity prices, the impact of higher energy and raw materials prices on our operations, and higher rates of inflation on our operating costs and closure liabilities. Effective tax rate on net earnings of 30.9% compared with 27.7% in 2021, with the increase being primarily due to the \$0.8 billion write down of deferred tax assets in the US.
- \$26.3 billion underlying EBITDA¹ was 30% below 2021, with an underlying EBITDA margin¹ of 45%.
- \$13.3 billion underlying earnings¹ (underlying EPS¹ of 819.6 US cents) were 38% below 2021.
- \$4.2 billion of net debt¹ at year end, compared with net cash¹ of \$1.6 billion at the start of the year, primarily reflected the free cash flow¹ of \$9.0 billion, offset by \$11.7 billion of cash returns to shareholders and \$3.8 billion for the acquisitions of Turquoise Hill Resources (TRQ)² and Rincon Lithium Project.
- \$8.0 billion full-year dividend, equivalent to 492 US cents per share. This represents 60% of underlying earnings, in line with our shareholder returns policy.

Delivering on our strategy

- We have put climate change and the low-carbon transition at the heart of our strategy. We are decarbonising our assets; helping our customers decarbonise by developing new products and technologies; and growing in materials enabling the energy transition. We will deliver our strategy through four clear objectives, which guide how we operate. Progressing our strategy and four objectives will ensure that we provide the materials the world needs while maximising shareholder returns and strengthening our position as a partner of choice for our customers and other key stakeholders.
- We continue our work on social licence to restore trust and rebuild relationships, particularly with Indigenous peoples, with an absolute determination to achieve impeccable ESG credentials:
 - We are implementing all recommendations from the comprehensive external review of our workplace culture [published](#) in February to ensure that everyone at Rio Tinto has a safe, respectful and inclusive workplace. Some immediate actions include training 91% of more than 7,000 leaders in 2022 in the foundations of building psychological safety, exceeding our target of 80%.
 - We increased our gender diversity by 1.4 percentage points to 22.9%, but fell short of our target to raise female representation by two percentage points. The increases were distributed across all levels of the organisation with female senior leaders increasing from 27.4% to 28.3%. We have also increased the number of Indigenous leaders in our workforce to 46 (November 2020: 6), through internal promotion and recruitment.

- In October, we [published](#) our second Communities & Social Performance (CSP) progress report on actions addressing the 2020 Board Review of Cultural Heritage Management. It includes direct feedback from the Pilbara Traditional Owners and details the actions the company has taken to rebuild relationships with Indigenous peoples and external stakeholders. We are moving to a model of co-management of Country in our Pilbara iron ore business, and we are updating agreements with Indigenous peoples. In May, we signed a Heads of Agreement with the Puutu Kunti Kurrama and Pinikura (PKKP) people which will guide the co-management of Puutu Kunti Kurrama and Pinikura country where mining takes place. In November, we agreed with the PKKP Aboriginal Corporation [to create the Juukan Gorge Legacy Foundation](#) as part of a remedy agreement relating to the destruction of the rock shelters at Juukan Gorge in May 2020. We also signed an [updated agreement](#) with Yindjibarndi Aboriginal Corporation in Western Australia in November and signed the [first agreement](#) with the Pekuakamiulnuatsh First Nation in Quebec in December.
- To achieve our objective of becoming the best operator, we continue to roll out the Safe Production System (SPS). We achieved our SPS deployment target for 2022 with 30 deployments across 16 sites, which resulted in improved performance at those sites. Roll-outs are ongoing to continuously improve safety, strengthen employee engagement and sustainably lift operational performance across our global portfolio.
- We made significant progress with our objective to excel in development with the following key milestones in the year:
 - we [delivered](#) first ore from Gudai-Darri, our first greenfield iron ore mine in the Pilbara in more than a decade. The ramp-up continues to progress as planned, with the 43 million tonne per year capacity expected to be reached on a sustained basis during 2023.
 - we [agreed](#) to enter a joint venture with China Baowu Steel Group Co. Ltd with respect to the Western Range iron ore project in the Pilbara, investing \$2 billion (\$1.3 billion Rio Tinto share³) to develop the 25 million tonne per year capacity project. We have received all primary environmental and Australian Government approvals, while Chinese regulatory approvals continue to progress as planned. The joint venture is anticipated to commence in March, once the operational elements of the JV are in place. Rio Tinto commenced early works site mobilisation and awarded major contracts.
 - we [agreed](#), together with Wright Prospecting Pty Ltd, to modernise the joint venture covering the Rhodes Ridge project in the East Pilbara. The participants have commenced an Order of Magnitude study which will consider development of an operation before the end of the decade with initial plant capacity of up to 40 million tonnes annually, subject to receipt of relevant approvals.
 - we fired 19 drawbells in 2022 from the Hugo North copper-gold underground mine at Oyu Tolgoi in Mongolia. Drawbell progression accelerated as a result of improvement initiatives, bringing projected first sustainable production from Panel 0 forward to the first quarter of 2023. This followed the comprehensive agreement [announced](#) on 25 January 2022, which reset the relationship between partners and resulted in the start of underground operations.
 - we [completed](#) the purchase of non-controlling interests in TRQ for \$3.1 billion², simplifying ownership of the Oyu Tolgoi mine, significantly strengthening our copper portfolio and demonstrating our long-term commitment to the project and to Mongolia.

- following completion of the \$825 million Rincon acquisition, the Board approved \$194 million to develop a small starter battery-grade lithium carbonate plant with a capacity of 3,000 tonnes per year. The investment includes early works to support a full-scale operation. Construction activities progressed on phase one camp facilities with rooms for 250 persons completed. Airstrip permits were received and contractors mobilised. First saleable production is expected in the first half of 2024.
- we increased our exploration and evaluation spend by 24% to \$897 million in 2022, as we ramped up our activities in Guinea, Argentina and Australia.

Progress towards our Scope 1 and 2 emissions targets

Mt CO ₂ e	2022	2021	2018*
Scope 1 emissions	22.8	22.8	23.7
Scope 2 emissions	7.5	8.2	8.9
Total	30.3	31.0	32.5

*Adjusted 2018 baseline due to divestments and acquisitions. Actual emissions in 2018 were 33.7Mt CO₂e. Figures are more precise than the rounded numbers shown.

- Our Scope 1 and 2 emissions targets of 15% reductions by 2025 and 50% by 2030 are aligned with 1.5°C – the stretch goal of the Paris Agreement – and are really challenging. In contrast to many of our peers, about 80% of our emissions are driven by processing and producing metals and minerals which are high temperature, hard-to-abate activities. The remaining 20% are from our mining operations. The low-carbon transition is complex: developing new technologies and implementing major projects to decarbonise our business will take time.
- In 2022, our Scope 1 and 2 emissions were 30.3Mt CO₂e (31.0Mt in 2021), a reduction of 7% below our 2018 baseline. This is primarily the result of switching to renewable power at Kennecott and Escondida in prior years, as well as lower than planned production from the Kitimat and Boyne aluminium smelters in 2022. We did not advance the actual implementation of our abatement projects as fast as we would have liked last year, so our capital expenditure on decarbonisation projects was \$94 million, lower than we anticipated when we set our targets. Challenges have included late delivery of equipment, resourcing constraints impacting study progress, construction and commissioning delays and project readiness.
- In response, we established six abatement programmes, with dedicated people, to focus on the decarbonisation challenges that cut across our product groups: repowering our Pacific Aluminium Operations, renewables, aluminium anodes (ELYSISTM), alumina process heat, minerals processing and diesel transition. We are building capability and gaining a deeper understanding of our decarbonisation challenge (both constraints and opportunities), and our related operational expenditure increased to approximately \$140 million in 2022. As a result, we are better placed to deliver the complex and large-scale structural changes to our energy system needed to achieve our 2030 target.
- Given the long lead times for some of these projects, we established one additional programme to increase our investments in Nature-based Solutions projects and now expect these to make a more significant contribution to our targets. If done well, these projects can play a substantial role in addressing carbon emissions and biodiversity loss, while also providing benefits to local communities. Our people working on these '6+1' abatement programmes, along with our substantial investments in technology, will drive the innovation and transformation needed to accelerate our low carbon transition and ensure the long-term resilience of our business.
- Our 2022 Climate Change Report is available on our website, [riotinto.com](https://www.riotinto.com).

Resilient cash flow from operations

	Year ended 31 December 2022 US\$m	Year ended 31 December 2021 US\$m
Net cash generated from operating activities	16,134	25,345
Purchases of property, plant and equipment and intangible assets	(6,750)	(7,384)
Sales of property, plant and equipment	—	61
Lease principal payments	(374)	(358)
Free cash flow¹	9,010	17,664
Disposals	80	4
Cash receipt from sale of Cortez royalty	525	—
Dividends paid to equity shareholders	(11,727)	(15,357)
Acquisitions relating to Rincon and McEwen Copper	(850)	—
Purchase of the minority interest in Turquoise Hill Resources Ltd ²	(2,961)	—
Other	159	(71)
(Decrease)/Increase in net (debt)/cash¹	(5,764)	2,240

Footnotes are set out in full on page 17.

- \$16.1 billion in net cash generated from operating activities, 36% lower than 2021, was primarily driven by price movements for our major commodities and a \$0.5 billion rise in working capital, primarily due to elevated prices for raw materials in aluminium inventory. We also incurred some items of a non-recurring nature which were not representative of the underlying strength of the performance of the business. These comprised; higher tax payments (relative to profit) in 2022 as a result of a \$1.1 billion (A\$1.5 billion) final payment to the Australian Taxation Office (ATO) in respect of 2021 profits; \$0.4 billion (A\$0.6 billion) settlement with the ATO in respect of 12 historical years; and \$0.4 billion of cash losses from currency hedges on our external dividends. At the end of 2022, we had no material outstanding tax payable on Australian profits.
- We made some significant investments in growth with the \$0.8 billion acquisition of Rincon and the \$3.0 billion² purchase of non-controlling interests in TRQ (including transaction costs), giving us a 66% shareholding in the Oyu Tolgoi copper-gold mine, our largest growth project. Our capital expenditure of \$6.8 billion encompassed \$0.6 billion of growth capital, \$2.2 billion of replacement capital, \$3.9 billion of sustaining capital and \$0.1 billion of decarbonisation spend. We funded our capital expenditure from operating activities and expect to continue funding our capital programme from internal sources, except for the Oyu Tolgoi underground development, which is project-financed.
- \$11.7 billion of dividends paid in 2022, being the 2021 final ordinary and special dividends paid in April 2022 (\$7.6 billion) and the 2022 interim ordinary dividend paid in September (\$4.1 billion), including foreign exchange impacts.
- The above movements, together with disposals including the \$525 million of cash received from the sale of the gross production royalty at the Cortez Complex in Nevada, USA (Cortez royalty), resulted in net cash¹ decreasing by \$5.8 billion in 2022, and gave rise to net debt¹ of \$4.2 billion at 31 December 2022.

Guidance

- In 2023, we expect our share of capital investment (refer to APMs on page 75 and 76) to be around \$8.0 billion (previously \$8.0 to \$9.0 billion), including growth capital of around \$2.0 billion, depending on the ramp-up of spend at Simandou. In 2024 and 2025, this rises to \$9.0 to \$10.0 billion per year, including the ambition to invest up to \$3.0 billion in growth per year, depending on opportunities. Each year also includes sustaining capital of around \$3.5 billion, of which around \$1.5 billion a year is for Pilbara iron ore (subject to ongoing inflationary pressure and exchange rates) and \$2.0 to \$3.0 billion of replacement capital. Around 40% of our share of capital investment is denominated in Australian dollars. Guidance includes around \$1.5 billion over the next three years on decarbonisation projects, mainly relating to Pilbara renewables: this will accelerate thereafter, bringing our best estimate to around \$7.5 billion, in aggregate, out to 2030. This remains subject to Traditional Owner and other stakeholder engagement, regulatory approvals and technology developments.
- Effective tax rate on underlying earnings is expected to be around 30% in 2023.

Unit costs	2022 Actuals	2023 Guidance
Pilbara iron ore unit cash costs, free on board (FOB) basis - US\$ per wet metric tonne ⁴	21.3	21.0-22.5
Australian dollar exchange rate	0.69	0.70
Copper C1 unit costs (includes Kennecott, Oyu Tolgoi and Escondida) - US cents per lb	163	160-180

Production (Rio Tinto share, unless otherwise stated)	2022 Actuals	2023 Guidance
Pilbara iron ore (shipments, 100% basis) (Mt)	322	320 to 335
Bauxite (Mt)	55	54 to 57
Alumina (Mt)	7.5	7.7 to 8.0
Aluminium (Mt)	3.0	3.1 to 3.3
Mined copper (kt)	521	650 to 710 ⁵
Refined copper (kt)	209	180 to 210
Diamonds (M carats)	4.7	3.0 to 3.8
Titanium dioxide slag (Mt)	1.2	1.1 to 1.4
IOC ⁶ iron ore pellets and concentrate (Mt)	10.3	10.5 to 11.5
Boric oxide equivalent (Mt)	0.5	~0.5

Footnotes set out in full on page 17.

- Production and unit cost guidance is consistent with our Fourth Quarter Operations Review released on 17 January 2023.
- Iron ore shipments and bauxite production guidance remain subject to weather and market conditions. Pilbara shipments guidance remains subject to progressing the ramp-up from new mines and management of cultural heritage.

Underlying EBITDA and underlying earnings by product group

	Underlying EBITDA			Underlying earnings		
	2022 US\$m	2021 US\$m	Change %	2022 US\$m	2021 US\$m	Change %
Year ended 31 December						
Iron Ore	18,612	27,592	(33)%	11,182	17,323	(35)%
Aluminium	3,672	4,382	(16)%	1,472	2,468	(40)%
Copper	2,376	3,969	(40)%	521	1,579	(67)%
Minerals	2,419	2,603	(7)%	849	888	(4)%
Reportable segment total	27,079	38,546	(30)%	14,024	22,258	(37)%
Other operations	(16)	(28)	(43)%	(340)	(84)	305 %
Inter-segment transactions	24	42	(43)%	26	19	37 %
Central pension costs, share-based payments, insurance and derivatives	377	110	243 %	374	133	181 %
Restructuring, project and one-off costs	(173)	(80)	116 %	(87)	(51)	71 %
Other central costs	(766)	(613)	25 %	(651)	(585)	11 %
Central exploration and evaluation	(253)	(257)	(2)%	(209)	(215)	(3)%
Net interest				138	(95)	(245)%
Total	26,272	37,720	(30)%	13,275	21,380	(38)%

Underlying EBITDA and underlying earnings are APMs used by management to assess the performance of the business, and provide additional information which investors may find useful. APMs are reconciled to directly comparable IFRS financial measures on pages 69 to 78.

Central and other costs

Pre-tax central pension costs, share-based payments, insurance and derivatives were a \$377 million credit compared with a \$110 million credit in 2021, reflecting gains on derivatives recognised in 2022 of \$132 million, compared to derivative losses recognised in 2021 of \$97 million, along with lower central pension costs.

On a pre-tax basis, restructuring, project and one-off central costs were 116% higher than 2021 mainly associated with corporate projects, in particular workstreams surrounding Everyday Respect.

Other central costs of \$766 million were 25% higher than in 2021, reflecting the Group's investment in the rollout of SPS across the Group, our enhanced capability to progress our ESG and CSP objectives and investment in technology, R&D and associated partnerships.

Net interest increased \$233 million to a credit of \$138 million due to higher interest rates, an increase in cash balances through the year and the absence of losses on early redemption of bonds recorded in 2021.

Continuing to invest in greenfield exploration

We have a strong portfolio of greenfield exploration projects in early exploration and studies stages, with activity in 18 countries across seven commodities. This is reflected in our pre-tax central spend of \$253 million in 2022. The bulk of this exploration expenditure was focused on copper projects in Australia, Colombia, Namibia, Peru, the United States and Zambia; diamonds in Angola; and heavy mineral sands projects in Australia and South Africa. Exploration is ongoing for nickel in Canada and Finland and in lithium across all regions, with opportunities emerging in the United States and Africa. Mine-lease exploration continued at Rio Tinto managed businesses, including Pilbara Iron in Australia, Diavik in Canada and Cape York bauxite operations in Australia.

Commentary on financial results

To provide 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
2021 underlying EBITDA	37,720
Prices	(8,101)
Exchange rates	801
Volumes and mix	606
General inflation	(1,478)
Energy	(1,169)
Operating cash unit costs	(2,202)
Higher exploration and evaluation expenditure	(171)
Non-cash costs/other	266
2022 underlying EBITDA	26,272

Solid financial results impacted by significant movements in commodity prices

We saw significant movement in pricing for our commodities, amidst growing recession fears and a decline in consumer confidence.

Movements in commodity prices resulted in a \$8,101 million decline in underlying EBITDA overall compared with 2021. This was primarily from lower iron ore prices (\$9,155 million) and lower London Metal Exchange (LME) copper prices and a negative provisional pricing impact (\$733 million). This was partly offset by a price uplift for our Aluminium business (\$886 million), driven by a first-half rise in LME prices, improved product premiums and higher alumina pricing, which fell away sharply in the second half. We have included a table of prices and exchange rates on page 79.

The monthly average Platts index for 62% iron fines converted to a Free on Board (FOB) basis was 25% lower on average compared with 2021.

The average LME price for copper was 6% lower, while the average LME aluminium price was 9% higher, compared with 2021. The gold price was flat compared with 2021.

The midwest premium duty paid for aluminium in the US averaged \$655 per tonne, 12% higher than in 2021.

Weaker local currencies during 2022

Compared with 2021, on average, the US dollar strengthened by 8% against the Australian dollar and by 4% against the Canadian dollar. Currency movements increased underlying EBITDA by \$801 million relative to 2021.

Improvement in sales volumes and mix

Higher sales volumes and changes in product mix across the portfolio increased underlying EBITDA by \$606 million compared to 2021. This was mostly attributable to increased iron ore sales from the ramp-up of Gudai-Darri along with higher portside sales in China, and favourable value-added product premiums for our Aluminium business.

Impact of rising inflation and significantly higher energy prices

Average movements in energy prices compared with 2021 reduced underlying EBITDA by \$1,169 million, mainly due to higher diesel prices for our trucks, trains and ships. In addition, rising general price inflation across our global operations resulted in a \$1,478 million reduction in underlying EBITDA, including \$0.2 billion for the impact of higher than expected inflation on closure provisions (for closed or fully impaired sites and environmental liabilities).

Disciplined focus on costs offset some of the market-linked increases

We remained focused on cost control throughout the year, in particular maintaining discipline on fixed costs. However, a rise in our operating cash unit costs reduced underlying EBITDA by \$2,202 million (on a unit cost basis) compared with 2021. This mainly reflected cyclical cost pressures from higher market-linked prices for raw materials, in particular in our Aluminium business. We also experienced fixed cost inefficiencies from lower volumes at our Pacific alumina refineries and at the Boyne aluminium smelter due to production disruptions. In addition, we increased resourcing in our iron ore business to support the ramp-up at Gudai-Darri and targeted investment in pit health and asset maintenance across the Pilbara.

Increasing our global exploration and evaluation activity

We increased our exploration and evaluation expenditure by \$171 million, or 24%, to \$897 million. This was mainly attributable to increased activity at the Simandou iron ore project in Guinea and the Rincon Lithium Project in Argentina.

Non-cash costs/other

Movements in non-cash costs, one-off and other items increased underlying EBITDA by \$266 million compared with 2021. This mainly reflected the acquisition of the remaining 40% of Diavik in November 2021 (+\$163 million), lower incremental COVID-19 costs (+\$123 million), gain on asset sale at Kennecott (+\$133 million) and lower charges to the income statement on updates to closure cost estimates relating to closed and legacy sites (+\$166 million). This was partially offset by reduced capacity at the Kitimat aluminium smelter (-\$329 million) as ramp-up activities progressed in 2022 following the strike which commenced in July 2021.

Net earnings

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

	US\$m
2021 net earnings	21,094
Total changes in underlying EBITDA	(11,448)
Increase in depreciation and amortisation (pre-tax) in underlying earnings	(319)
Increase in interest and finance items (pre-tax) in underlying earnings	(1,112)
Decrease in tax on underlying earnings	3,949
Decrease in underlying earnings attributable to outside interests	825
Total changes in underlying earnings	(8,105)
Changes in exclusions from underlying earnings:	
Write-off of Federal deferred tax assets in the United States	(820)
Movement in exchange differences and gains/losses on derivatives	(683)
Gain recognised by Kitimat relating to LNG Canada's project	(230)
Loss on disposal of interest in subsidiary	(105)
Movement in impairment charges net of reversals	145
Movement in closure estimates (non-operating and fully impaired sites)	793
Gain on sale of Cortez royalty	331
2022 net earnings	12,420

Depreciation and amortisation, net interest and finance items, tax and non-controlling interests

The depreciation and amortisation charge was \$319 million higher than 2021, mainly due to an increase in capitalised closure costs in 2021 at a number of our Aluminium sites. Our capital base was also higher in Iron Ore, Copper and Minerals as a result of our investment activities. This was partially offset by a stronger US dollar against the Australian dollar.

Interest and finance items (pre-tax) were higher mainly as a result of a \$1,101 million increase in amortisation of discount on provisions, as higher inflation had an impact on the Group's closure and restoration/environmental liabilities. The amortisation charge of \$1,517 million (2021: \$415 million) incorporates an estimate of inflation at the start of each six-month reporting period. At the end of each half year we update the underlying cash flows for the latest estimate of experienced inflation for the current financial year and record this as "changes to existing provisions". For operating sites this adjustment usually results in a corresponding adjustment to Property, plant and equipment, and for closed and fully impaired sites the adjustment is charged or credited to the Income statement. These income statement amounts are included within underlying earnings except for the re-measurement of provisions for legacy sites that were never operated by Rio Tinto.

The 2022 effective corporate income tax rate on pre-tax earnings, excluding equity accounted units, was 30.9%, compared with 27.7% in 2021. The effective tax rate on pre-tax earnings in Australia was 31.7% in 2022, compared with 30.7% in 2021. We [reached](#) agreement with the Australian Taxation Office (ATO) on all tax matters in dispute. As part of this agreement, in August we paid the ATO additional tax of A\$613 million for the period from 2010 to 2021. Over this 12-year period, we paid nearly A\$80 billion in tax and royalties in Australia.

Items excluded from underlying earnings

The *Inflation Reduction Act of 2022* in the United States may give rise to investment credits on some of our existing projects, with longer dated projects potentially becoming more favourable. However, it also includes a new Corporate Alternative Minimum Tax regime, which has led to the Group reviewing the carrying value of US Federal deferred tax balances. The resulting \$820 million write down of Federal deferred tax assets has been excluded from underlying earnings on the grounds of materiality.

In 2022, we recognised an exchange and derivative loss of \$137 million. This includes losses of \$373 million on revaluation of certain derivatives which do not qualify for hedge accounting. These include currency hedges relating to our external dividends, and exchange losses of \$262 million on US dollar debt in non-US dollar functional currency Group companies, partly offset by \$478 million of exchange gains on intragroup balances. These losses compared with a 2021 gain of \$546 million, giving rise to an unfavourable year-on-year movement of \$683 million. The 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.

During 2022, LNG Canada elected to terminate their option to purchase additional land at Kitimat, Canada. This resulted in a \$106 million gain which includes the release of deferred income and receipt of a cancellation fee payment. During 2021, we recognised a \$336 million gain on recognition of a new wharf at Kitimat that was built and paid for by LNG Canada. These gains have been excluded from underlying earnings consistent with prior years, as they are part of a series of material transactions unrelated to the core business.

Impairment charges, net of reversals, decreased by \$145 million compared with 2021. In 2022, we impaired the remaining full value of the Boyne Smelter in Queensland, Australia, as a result of reduced capacity and the high cost of energy from the coal-fired power station impacting economic performance. In 2022, we also completed the sale of the Roughrider uranium undeveloped project in Saskatchewan, Canada, which resulted in a reversal of previous impairments.

There is a detailed explanation of the impairment process on pages 50 to 51.

In 2022, we recognised \$178 million in closure costs representing adjustments to the closure estimates relating to legacy sites where the disturbance preceded ownership by Rio Tinto, including inflationary increases to provisions for these sites in excess of the unwind of discount. This was \$793 million lower than 2021 closure charges, which related to Energy Resources of Australia (ERA), Gove refinery and Diavik closure provision increases, and further increases at a number of the Group's legacy sites where the disturbance preceded our ownership.

In 2022, we completed the \$525 million sale of a gold royalty which was retained following the disposal of the Cortez mine in 2008. The carrying value of the royalty at 31 December 2021 was \$88 million, resulting in a post-tax gain of \$331 million. This has been excluded from underlying earnings on the grounds of materiality.

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 2022 was \$12.4 billion (2021: \$21.1 billion). We recorded a profit after tax in 2022 of \$13.1 billion (2021: \$22.6 billion) of which a profit of \$0.7 billion (2021: \$1.5 billion) was attributable to non-controlling interests.

Net earnings and underlying earnings

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

	Year ended 31 December 2022 US\$m	Year ended 31 December 2021 US\$m
Underlying earnings	13,275	21,380
Items excluded from underlying earnings		
Impairment charges net of reversals	(52)	(197)
Gains recognised by Kitimat relating to LNG Canada's project	106	336
Loss on disposal of interest in subsidiary	(105)	—
Foreign exchange and derivative gains on net debt and intragroup balances and derivatives not qualifying for hedge accounting	(137)	546
Change in closure estimates (non-operating and fully impaired sites)	(178)	(971)
Gain on sale of Cortez royalty	331	—
Write-off of Federal deferred tax assets in the United States	(820)	—
Net earnings	12,420	21,094

On pages 72 to 73 there is a detailed reconciliation from underlying earnings to net earnings, including pre-tax amounts and additional explanatory notes. The differences between profit after tax and underlying EBITDA are set out in the table on page 47.

Balance sheet

Net cash¹ reduced by \$5.8 billion in 2022, resulting in a net debt¹ position of \$4.2 billion at 31 December 2022. This reflected \$11.7 billion returned to shareholders in the year, \$3.0 billion² acquisition of the remaining non-controlling interest of TRQ and \$0.8 billion acquisition of the Rincon Lithium Project, partially offset by \$9.0 billion of free cash flow and the \$0.5 billion received from the sale of the Cortez royalty.

Our net gearing ratio¹ (net debt/ (cash) to total capital) was 7% at 31 December 2022 (31 December 2021: (3)%), see page 78.

Our total financing liabilities excluding net debt derivatives at 31 December 2022 (see page 77) were \$12.3 billion (31 December 2021: \$13.5 billion) and the weighted average maturity was around 11 years. At 31 December 2022, approximately 77% of these liabilities were at floating interest rates (85% excluding leases). The maximum amount within non-current borrowings maturing in any one calendar year is \$1.5 billion, which matures in 2024.

We had \$8.8 billion in cash and cash equivalents plus other short-term cash investments at 31 December 2022 (31 December 2021: \$15.2 billion).

Provision for closure costs

At 31 December 2022, provisions for close-down and restoration costs and environmental clean-up obligations were \$15.8 billion (31 December 2021: \$14.5 billion). The principal movements during the year were the result of a remeasurement of underlying cash flows, including the effect of inflation. This was recorded as an increase to mining properties for current operating sites (\$0.5 billion) and as a charge to profit for legacy sites (\$0.5 billion). Also contributing to the increase in the provision was amortisation of discount (\$1.5 billion) which includes the effect of higher inflation in the year. These increases were partly offset by utilisation of the provision through spend (-\$0.6 billion) and a weaker Australian dollar, Canadian dollar and South African rand against the US dollar (-\$0.7 billion).

Of the \$15.8 billion in provisions, \$11.6 billion relates to operating sites and \$4.2 billion is for legacy sites. Remaining lives of operations and infrastructure range from one to over 50 years with an average for all sites, weighted by present closure obligation, of around 15 years (2021: 16 years).

The provisions are based on risk-adjusted real cash flows using a real-rate discount rate of 1.5% to reflect obligations at the present value of cash flows on 31 December 2022 terms.

In 2023, we expect to utilise around \$0.8 billion of the provisions as we advance our closure activities at Argyle, ERA, Gove alumina refinery and legacy sites.

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% to 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 dividend with additional returns to shareholders in periods of strong earnings and cash generation.

60% payout ratio on the ordinary dividend

	2022 US\$bn	2021 US\$bn
Ordinary dividend		
Interim	4.3	6.1
Final	3.7	6.7
Full-year ordinary dividend	8.0	12.8
Payout ratio on ordinary dividend	60%	60%
Additional returns		
Special dividend announced in July 2021, paid in September 2021	n/a	3.0
Special dividend announced in February 2022, paid in April 2022	n/a	1.0
Total cash returns to shareholders declared*	8.0	16.8
Combined total as % of underlying earnings	60%	79%

* Based on weighted average number of shares and declared dividends per share for the respective periods and excluding foreign exchange impacts on payment.

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 2022 final dividend has been converted at exchange rates applicable on 21 February 2023 (the latest practicable date before the dividend was declared). American Depositary Receipt (ADR) holders receive dividends at the declared rate in US dollars.

Ordinary dividend per share declared	2022	2021
Rio Tinto Group		
Interim (US cents)	267.00	376.00
Final (US cents)	225.00	417.00
Full-year (US cents)	492.00	793.00
Rio Tinto plc		
Interim (UK pence)	221.63	270.84
Final (UK pence)	185.35	306.72
Full-year (UK pence)	406.98	577.56
Rio Tinto Limited		
Interim (Australian cents)	383.70	509.42
Final (Australian cents)	326.49	577.04
Full-year (Australian cents)	710.19	1,086.46

Special dividend per share declared	2022	2021
Rio Tinto Group		
Interim (US cents)	n/a	185.00
Final (US cents)	n/a	62.00
Full-year (US cents)	n/a	247.00
Rio Tinto plc		
Interim (UK pence)	n/a	133.26
Final (UK pence)	n/a	45.60
Full-year (UK pence)	n/a	178.86
Rio Tinto Limited		
Interim (Australian cents)	n/a	250.64
Final (Australian cents)	n/a	85.80
Full-year (Australian cents)	n/a	336.44

The 2022 final ordinary 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 20 April 2023, we will pay the 2022 final ordinary dividend to holders of ordinary shares and holders of ADRs on the register at the close of business on 10 March 2023 (record date). The ex-dividend date is 9 March 2023.

Rio Tinto plc shareholders may choose to receive their dividend in Australian dollars or New Zealand dollars, and Rio Tinto Limited shareholders may choose to receive theirs in pounds sterling or New Zealand dollars. Currency conversions will be based on the pound sterling, Australian dollar and New Zealand 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 28 March 2023.

We will operate our Dividend Reinvestment Plans for the 2022 final dividend (visit riotinto.com for details). Rio Tinto plc and Rio Tinto Limited shareholders' election notice for the Dividend Reinvestment Plans must be received by 28 March 2023. 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.

Capital projects

Approved projects (Rio Tinto 100% owned unless otherwise stated)	Total approved capital cost (100% unless otherwise stated)	Approved capital remaining to be spent from 1 January 2023	Status/Milestones
Completed in 2022			
Investment in Gudai-Darri, a new production hub in the Pilbara region of Western Australia. The investment incorporates a processing plant and infrastructure including a 166-kilometre rail line connecting the mine to our existing network.	\$3.1bn	\$0.2bn	We delivered first ore in June 2022. Production from the mine ramped up in the second half of the year and we expect Gudai-Darri to reach its nameplate capacity of 43 million tonne per year on a sustained basis during 2023. The mine has an expected life of more than 40 years.
Investment in the Robe River Joint Venture (West Angelas C and D and Mesa B, C and H at Robe Valley) in the Pilbara to sustain production capacity.	\$1.0bn (Rio Tinto share)	\$0.1bn (Rio Tinto share)	In the third quarter of 2022, Mesa A rectification works were successfully completed, with the plant operating at design rates. Final train load out tie-in works at Mesa J were also completed, with first ore achieved.
Investment in a second tunnel at the 1000MW Kemano hydropower facility at Kitimat, British Columbia, Canada, which will ensure the long-term reliability of the power supply to the Kitimat smelter.	\$0.8bn	-	The new 16-kilometre tunnel produced its first megawatt of electricity in July 2022 after construction was completed in May 2022.
Ongoing			
Iron Ore			
Investment in the Western Range iron ore project, a joint venture between Rio Tinto (54%) and China Baowu Steel Group Co. Ltd (46%) in the Pilbara to sustain production of the Pilbara Blend from Rio Tinto's existing Paraburdoo hub.	\$1.3bn (Rio Tinto share) ³	\$1.1bn (Rio Tinto share)	Announced in September 2022, the mine will have a production capacity of 25 million tonnes per year. The project includes construction of a primary crusher and an 18-kilometre conveyor connection to the Paraburdoo processing plant. Early works construction commenced in 2022 and major contracts have been awarded by Rio Tinto. First production is anticipated in 2025.
Copper			
Phase two of the south wall pushback to extend mine life at Kennecott by a further six years. A \$108 million investment in underground characterisation studies is ongoing, with \$55 million in development capital approved to commence underground mining.	\$1.5bn	\$1.1bn	Approved in December 2019, the investment will further extend strip waste rock mining and support additional infrastructure development. This will allow mining to continue into a new area of the orebody between 2026 and 2032.
Development of the Oyu Tolgoi underground copper/gold mine in Mongolia (Rio Tinto 66%), which is expected to produce (from the open pit and underground) an average of ~500,000 tonnes ⁷ of copper per year from 2028 to 2036 and an average of ~350,000 tonnes ⁷ of copper per year for a further five years, compared with 130,000 tonnes in 2022 (open pit).	\$7.06bn ⁸	\$1.6bn	The project was originally approved in May 2016 for \$5.3 billion, with an additional \$1.45 billion approved by the Rio Tinto Board in December 2020, following completion of the Definitive Estimate. By the end of 2022, a total of 19 drawbells had been fired. Progression accelerated as a result of improvement initiatives implemented by the Oyu Tolgoi teams, bringing projected first sustainable production from Panel 0 forward to the first quarter of 2023. This followed the comprehensive agreement between the Oyu Tolgoi partners announced in January 2022.
Minerals			
Development of the Zulti South project at Richards Bay Minerals (RBM) in South Africa (Rio Tinto 74%).	\$0.5bn	\$0.4bn	Approved in April 2019 to underpin RBM's supply of zircon and ilmenite over the life of the mine. The project remains on full suspension.
Development of the greenfield Jadar lithium-borates project in Serbia. The development will include an underground mine with associated infrastructure and equipment, including electric haul trucks, as well as a beneficiation chemical processing plant.	\$2.4bn	\$2.4bn	The Board committed the funding in July 2021, subject to receiving all relevant approvals, permits and licences. We are focused on consultation with all stakeholders to explore all options following the Government of Serbia's cancellation of the Spatial Plan in January 2022.

Future options

Status	
Iron Ore: Pilbara brownfields	
Over the medium term, our Pilbara system capacity remains between 345 and 360 million tonnes per year. Meeting this range, and the planned product mix, will require the approval and delivery of the next tranche of replacement mines.	In addition to Western Range (Greater Paraburdoo), which has commenced early works construction, other key projects to be delivered over the next five years include Hope Downs 1 Sustaining (Hope Downs 2 and Bedded Hilltop), West Angelas Sustaining, Greater Nammuldi Sustaining and Brockman 4 Sustaining (Brockman Syncline 1). We continue to work closely with local communities, Traditional Owners and government to progress approvals for the new mining projects.
Iron Ore: Rhodes Ridge	
In October, Rio Tinto (50%) and Wright Prospecting Pty Ltd (50%) agreed to modernise the joint venture covering the Rhodes Ridge project in the Eastern Pilbara, providing a pathway for development utilising Rio Tinto's rail, port and power infrastructure. Rhodes Ridge contains 5.8 billion tonnes of high-grade Mineral Resources at an average grade of 62.3% Fe. The project's total resource, 6.7 billion tonnes at an average grade of 61.6% Fe, represents approximately one third of our existing Resource base in the Pilbara. ⁹ A resource-drilling programme is currently underway to support future project studies.	The participants have commenced an Order of Magnitude study, conducted by Rio Tinto, which will consider the development of an operation before the end of the decade with initial plant capacity of up to 40 million tonnes annually, subject to the receipt of relevant approvals. We expect to complete the Rhodes Ridge Order of Magnitude study in 2023.
Iron Ore: Simandou	
The Simandou iron ore project in Guinea ¹⁰ contains one of the world's largest known undeveloped high-grade low-impurity iron ore deposits, demand for which is increasing as steelmakers look to reduce carbon emissions. Simandou is set to diversify our strong iron ore portfolio, complementing our high-grade Iron Ore Company of Canada products and supporting the long-term attractiveness of our Pilbara Blend™ offering.	Negotiations towards the co-development of project infrastructure progressed further with the December signing of a non-binding term sheet between our Simfer joint venture, Baowu, Winning Consortium Simandou (WCS) and the Government of Guinea ¹¹ . The term sheet further establishes the co-development principles following the incorporation of La Compagnie du TransGuinée on 27 July 2022, and is a pivotal next step towards securing the shareholder agreement, cost estimates and regulatory authority approvals necessary to progress the co-development of rail and port facilities.
Lithium: Rincon	
We completed the acquisition of the Rincon Lithium Project in Salta province, Argentina in March 2022. Development of a small starter, battery-grade lithium carbonate plant with a capacity of 3,000 tonnes per year is underway.	In July 2022, we approved \$140 million of investment and \$54 million for early works to support a full-scale operation to be expensed through exploration and evaluation expenditure. Construction activities progressed on phase one camp facilities with rooms for 250 persons completed. Airstrip permits were received and contractors mobilised. First saleable production from the small starter plant is expected in the first half of 2024.
Copper: Resolution	
The Resolution Copper project is a proposed underground copper mine in the Copper Triangle, in Arizona, United States. It has the potential to supply up to 25% of US copper demand.	The US Forest Service continued work to progress the Final Environmental Impact Statement and complete actions necessary for the land exchange. We continued to advance partnership discussions with several federally recognised Native American Tribes who are part of the formal consultation process.
Copper: Winu	
In late 2017, we discovered copper-gold mineralisation at the Winu project in the Paterson Province in Western Australia. In 2021, we reported our first Indicated Mineral Resource. The pathway is expected to take longer than originally anticipated and remains subject to regulatory and other required approvals.	We continued to strengthen our relationships and advanced agreement making with our host Traditional Owners, the Martu and Nyangumarta groups. Planned drilling, fieldwork and study activities continued, strengthening the development pathway ahead of applications for regulatory and other required approvals.
Aluminium: ELYSIS	
ELYSIS, our joint venture with Alcoa, supported by Apple, the Government of Canada and the Government of Quebec, is developing a breakthrough inert anode technology that eliminates all direct greenhouse gases from the aluminium smelting process.	Construction of the first commercial-scale prototype cells is underway at our Alma smelter and is expected to become operational in 2023. ELYSIS aims to have its technology available for installation from 2024 and production of larger volumes of carbon-free aluminium approximately two years later.

Footnotes

1. *This financial performance indicator is a non-IFRS (as defined below) alternative performance measure (APM). It is used internally by management to assess the performance of the business and is therefore considered relevant to readers of this document. It is presented here to give more clarity around the underlying business performance of the Group's operations. APMs are reconciled to directly comparable International Financial Reporting Standards (IFRS) financial measures on pages 69 to 78. Our financial results are prepared in accordance with IFRS - see page 35 for further information.*
2. *Total consideration of \$3,139 million for the minority interest in TRQ excludes transaction costs of \$74 million. In 2022, we paid \$2,928 million to shareholders and \$33 million of transaction costs. In 2023, we expect to pay the remaining \$41 million of transaction costs and approximately \$211 million to dissenting shareholders, depending on the outcome and timing of dissent proceedings.*
3. *Rio Tinto share includes 100% of funding costs for Paraburdoo plant upgrades.*
4. *Pilbara unit cash costs exclude COVID-19 costs (2022: \$0.4 per tonne. 2021: \$0.5 per tonne).*
5. *Oyu Tolgoi production for 2022 remains on a 33.52% Rio Tinto share basis. Subsequent to Rio Tinto's acquisition of Turquoise Hill Resources which completed on 16 December, 2023 mined copper guidance now includes Oyu Tolgoi on a 100% consolidated basis and continues to reflect our 30% share of Escondida.*
6. *Iron Ore Company of Canada continues to be reported as Rio Tinto share.*
7. *The 500ktpa target (stated as recovered metal) for the Oyu Tolgoi underground and open pit mines is underpinned 21% by Proved Ore Reserves and 79% by Probable Ore Reserves for the years 2028 to 2036. The 350ktpa production target for the following five years is underpinned 22% by Proved Ore Reserves and 78% by Probable Ore Reserves. These production targets have been scheduled from current mine designs by Competent Persons in accordance with the requirements of the Australasian Code for Reporting of Exploration Results, Minerals Resources and Ore Reserves, 2012 Edition (the JORC code).*
8. *A cost and schedule reforecast was performed in June 2022 and estimates that \$7.06 billion is required to complete the Hugo North 1 project (an increase of \$0.3 billion beyond the 2020 Definitive Estimate). The 2022 Reforecast excludes impacts of COVID-19 restrictions arising after June 2022. The 2022 reforecast remains subject to Oyu Tolgoi Board approval.*
9. *The Mineral Resource estimates for the Rhodes Ridge Joint Venture (JV) were reported in our 2020 Annual Report released to the Australian Securities Exchange (ASX) on 22 February 2021 (and form part of the Pilbara Mineral Resource estimates reported in our 2021 Annual Report released to the ASX on 24 February 2022). The Competent Persons responsible for reporting these Mineral Resource estimates were Mr P Savory, who is a Fellow of The Australasian Institute of Mining and Metallurgy, and Ms N Brajkovich and Mr C Kyngdon, who are Members of The Australasian Institute of Mining and Metallurgy. We are not aware of any new information or data that materially affects these Mineral Resource estimates and confirm that all material assumptions and technical parameters underpinning the estimate continue to apply and have not materially changed. The form and context in which the Competent Persons' findings are presented have not been materially modified from when they were reported. Mineral Resources are quoted in this release on a 100% basis, as dry in-situ tonnes.*
10. *The Simandou iron ore project operates under the Simfer joint venture where the Government of Guinea holds 15% and Simfer Jersey holds 85%. Simfer Jersey is owned by Rio Tinto (53%) and Chalco Iron Ore Holdings (CIOH) (47%). CIOH is owned by Chinalco (75%), Baowu (20%), China Civil Engineering Construction Corporation (CCECC) (2.5%) and China Harbour Engineering Company (CHEC) (2.5%). This structure has been in place since 2017.*
11. *This followed notification to Rio Tinto and the Government of Guinea of Baowu's earlier entry into a term sheet agreement with WCS in respect of an investment into WCS mine (blocks 1 and 2) and infrastructure vehicle – an agreement welcomed by Rio Tinto.*

Review of operations

Iron Ore

Year ended 31 December	2022	2021	Change
Pilbara production (million tonnes — 100%)	324.1	319.7	1 %
Pilbara shipments (million tonnes — 100%)	321.6	321.6	— %
Salt production (million tonnes — Rio Tinto share) ¹	5.8	5.8	(2)%
Segmental revenue (US\$ millions)	30,906	39,582	(22)%
Average realised price (US\$ per dry metric tonne, FOB basis)	106.1	143.8	(26)%
Underlying EBITDA (US\$ millions)	18,612	27,592	(33)%
Pilbara underlying FOB EBITDA margin ²	68%	76%	
Underlying earnings (US\$ millions)	11,182	17,323	(35)%
Net cash generated from operating activities (US\$ millions)	14,005	19,177	(27)%
Capital expenditure (US\$ millions) ³	(2,940)	(3,947)	(26)%
Free cash flow (US\$ millions)	11,033	15,172	(27)%
Underlying return on capital employed ⁴	62%	100%	

1. Dampier Salt is reported within Iron Ore, reflecting management responsibility. Iron Ore Company of Canada continues to be reported within Minerals. The Simandou iron ore project in Guinea is reported within Copper.
2. The Pilbara underlying free on board (FOB) EBITDA margin is defined as Pilbara underlying EBITDA divided by Pilbara segmental revenue, 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. Underlying return on capital employed (ROCE) is defined as underlying earnings excluding net interest divided by average capital employed.

Financial performance

We achieved a number of operational records across the mine and rail system in the second half of 2022, due to operational improvements and the ramp-up of Gudai-Darri. In the year, we safely commissioned our Pilbara projects, despite challenging conditions with COVID-19, labour and supply chain disruptions. The focus now moves to the next tranche of mines starting with Western Range.

Underlying EBITDA of \$18.6 billion was 33% lower than 2021, due to lower prices (\$8.8 billion), following the 25% drop in the monthly average Platts index for 62% iron fines adjusted to an FOB basis. Higher sales volumes were achieved from our portside operations in China, which improved underlying EBITDA by \$0.6 billion. We also increased resourcing to support the ramp-up at Gudai-Darri and targeted investment in pit health and asset maintenance across the Pilbara.

This additional investment, together with rising input prices, including diesel price escalation and labour, resulted in 2022 Pilbara unit cash costs of \$21.3 per tonne (excluding COVID-19 costs of \$0.4 per tonne). This compared with \$18.6 per tonne in 2021 (excluding COVID-19 costs of \$0.5 per tonne).

Our Pilbara operations delivered an underlying FOB EBITDA margin of 68%, compared with 76% in 2021, largely due to the change in the iron ore price.

We price the majority of our iron ore sales (77%) by reference to the average index price, for the month of shipment. In 2022, we priced approximately 10% of sales with 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 72% of sales including freight and 28% on an FOB basis.

We achieved an average iron ore price of \$97.6 per wet metric tonne on an FOB basis (2021: \$132.3 per wet metric tonne) across our product suite. This equates to \$106.1 per dry metric tonne, assuming 8% moisture (2021: \$143.8 per dry metric tonne), which compares with the monthly average Platts index for 62% iron fines converted to an FOB basis of \$109.8 per dry metric tonne (2021: \$146.9 per dry metric tonne). The 3% lower realised price compared to the Platts index was due to lower average grades, partially offset by higher premiums for lump products.

Segmental revenue for our Pilbara operations included freight revenue of \$2.2 billion (2021: \$2.7 billion).

Net cash generated from operating activities of \$14.0 billion was \$5.2 billion lower than 2021, with lower pricing partly offset by a monetisation of working capital. Free cash flow of \$11.0 billion was \$4.1 billion lower than 2021 due to the factors above, partially offset by a \$1.0 billion reduction in capital expenditure to \$2.9 billion following completion of brownfield mine replacement tie-in projects.

Review of operations

Pilbara operations produced 324.1 million tonnes (Rio Tinto share 272.9 million tonnes), 1% higher than 2021. Shipments of 321.6 million tonnes (Rio Tinto share 270.8 million tonnes), in line with 2021, included 35.5 million tonnes of lower grade SP10 products, 11% of shipments, on a 100% basis (2021: 11% of shipments).

Performance improvements continued across the system and we achieved a number of operational records in the second half across the mine and rail system. System inventories at the end of December were healthy, including strong blasted stocks, mine stocks and port stocks.

Our iron ore portside sales in China were 24.3 million tonnes in 2022 (14.0 million tonnes in 2021). At the end of the December, inventory levels were 7.8 million tonnes, including 5.5 million tonnes of Pilbara product. In 2022, approximately 80% of our portside sales were either screened or blended in Chinese ports.

Aluminium

Year ended 31 December	2022	2021	Change
Bauxite production ('000 tonnes — Rio Tinto share)	54,618	54,326	1 %
Alumina production ('000 tonnes — Rio Tinto share)	7,544	7,894	(4)%
Aluminium production ('000 tonnes — Rio Tinto share)	3,009	3,151	(4)%
Segmental revenue (US\$ millions)	14,109	12,695	11 %
Average realised aluminium price (US\$ per tonne)	3,330	2,899	15 %
Underlying EBITDA (US\$ millions)	3,672	4,382	(16)%
Underlying EBITDA margin (integrated operations)	29%	38%	
Underlying earnings (US\$ millions)	1,472	2,468	(40)%
Net cash generated from operating activities (US\$ millions)	3,055	3,606	(15)%
Capital expenditure — excluding EAUs (US\$ millions) ¹	(1,377)	(1,300)	6 %
Free cash flow (US\$ millions)	1,652	2,272	(27)%
Underlying return on capital employed ²	10%	16%	

1. 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).

2. Underlying return on capital employed (ROCE) is defined as underlying earnings excluding net interest divided by average capital employed.

Financial performance

Strong pricing in the first half fell away sharply in the second, which, together with rising energy and raw materials costs, led to a significant margin squeeze on our Aluminium business and a 16% decrease in underlying EBITDA for the year as a whole. Underlying EBITDA margin fell nine percentage points, but remained robust for the year at 29%.

Underlying EBITDA of \$3.7 billion benefited from higher product premiums for primary metal in addition to the stronger pricing environment for primary metal and alumina in the first half. However, this was offset by higher coal prices and costs for key materials such as caustic soda, coke, pitch and anodes, leading to an increase in cash costs for alumina and primary metal.

We achieved an average realised aluminium price of \$3,330 per tonne, 15% higher than 2021 (\$2,899 per tonne).

Average realised aluminium prices comprise the LME price, a market premium and a value-added product (VAP) premium. The cash LME price averaged \$2,703 per tonne, 9% higher than 2021, while in our key US market, the Midwest premium duty paid, which is 57% of our volumes (2021: 55%), increased by 12% to \$655 per tonne (2021: \$584 per tonne). Our VAP sales were stable at 50% of the primary metal we sold (2021: 50%) and generated product premiums averaging \$431 per tonne of VAP sold (2021: \$230 per tonne).

Our conversion of underlying EBITDA to cash remained relatively strong, with net cash generated from operating activities of \$3.1 billion and free cash flow of \$1.7 billion.

Review of operations

Bauxite production of 54.6 million tonnes was 1% higher than 2021, despite equipment reliability issues at Weipa and Gove in Australia.

We shipped 38.0 million tonnes of bauxite to third parties in 2022, 1% higher than 2021. In 2022, segmental revenue for bauxite increased 9% to \$2.4 billion; this includes freight revenue of \$635 million (2021: \$462 million).

Alumina production of 7.5 million tonnes was 4% lower than 2021. The refineries in the Pacific (Yarwun and Queensland Alumina Limited) were impacted by a range of challenges in 2022, including unplanned outages and equipment reliability issues. COVID-19 absenteeism impacted production in early 2022 but eased in the second half. Production at the Vaudreuil refinery in Quebec remained stable.

As the result of Queensland Alumina Limited's (QAL) activation of a step-in process following sanction measures by the Australian Government, we have taken on 100% of capacity for as long as the step-in continues. We are using Rusal's 20% share of capacity under the tolling arrangement with QAL. This additional output is excluded from our production results as QAL remains 80% owned by Rio Tinto and 20% owned by Rusal.

Aluminium production of 3.0 million tonnes was 4% lower than 2021, due to reduced output at our Kitimat smelter in British Columbia, Canada and Boyne smelter in Queensland, Australia. The rate of pot restarts at Kitimat picked up in the fourth quarter and Boyne smelter cell recovery efforts continued on plan. Recovery at both smelters is progressing, with full ramp-up expected to be completed during the course of 2023. All of our other aluminium smelters continued to demonstrate stable performance.

Copper

Year ended 31 December	2022	2021	Change
Mined copper production ('000 tonnes — Rio Tinto share)	521.1	493.5	6 %
Refined copper production ('000 tonnes — Rio Tinto share)	209.2	201.9	4 %
Segmental revenue (US\$ millions)	6,699	7,827	(14)%
Average realised copper price (US cents per pound) ¹	403	424	(5)%
Underlying EBITDA (US\$ millions)	2,376	3,969	(40)%
Underlying EBITDA margin (product group operations)	49%	59%	
Underlying earnings (US\$ millions)	521	1,579	(67)%
Net cash generated from operating activities (US\$ millions) ²	1,374	2,634	(48)%
Capital expenditure — excluding EAUs ³ (US\$ millions)	(1,622)	(1,328)	22 %
Free cash flow (US\$ millions)	(265)	1,295	(120)%
Underlying return on capital employed (product group operations) ⁴	6%	14%	

1. Average realised price for all units sold. Realised price does not include the impact of the provisional pricing adjustments, which negatively impacted revenues by \$175 million (2021: \$246 million benefit).

2. Net cash generated from operating activities excludes the operating cash flows of equity accounted units (EAUs) but includes dividends from EAUs (Escondida).

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 EAUs.

4. Underlying return on capital employed (ROCE) is defined as underlying earnings (product group operations) excluding net interest divided by average capital employed.

Financial performance

Underlying EBITDA was down 40% to \$2.4 billion, with \$0.7 billion of the reduction a result of lower copper prices, particularly in the second half of the year. An anticipated decrease in by-product sales volumes (particularly lower gold in concentrate at Oyu Tolgoi), rising cash costs, higher energy prices and an increase in exploration and evaluation expenditure also impacted EBITDA in 2022. Underlying EBITDA margin remained strong at 49%.

Our copper unit costs, at 163 cents per pound, increased by 81 cents, largely driven by the decline in by-product credits, together with rising input and higher labour costs, following the implementation of new labour laws in Mongolia and a new five-year collective bargaining agreement at Kennecott.

We generated \$1.4 billion in net cash from operating activities, a 48% decrease on 2021, from the same drivers as underlying EBITDA, together with a smaller increase in working capital compared to 2021.

Negative free cash flow of \$0.3 billion reflected the significant investment of \$2.0 billion in our projects, an increase of 26% on 2021. This mainly related to the ongoing development of the Oyu Tolgoi underground project, underground growth projects at Kennecott and the Simandou iron ore project in Guinea.

Review of operations

Mined copper production, at 521 thousand tonnes, was 6% higher than 2021 due to higher grades at Kennecott and Escondida, partly offset by lower grades and recoveries at Oyu Tolgoi as a result of planned mine sequencing.

The 4% increase in refined copper production to 209 thousand tonnes mainly reflected a furnace failure in 2021 at Kennecott which resulted in the smelter being offline for the majority of the fourth quarter of 2021. Unplanned maintenance was required in the fourth quarter of 2022 in our anode furnaces, leading to extended downtime and continued poor anode production.

Oyu Tolgoi underground project

A comprehensive agreement was [reached](#) with the Government of Mongolia on 25 January 2022, resetting the relationship between the partners, increasing the value the project delivers for Mongolia, and allowing underground operations to commence.

In 2022, Rio Tinto and the Government of Mongolia remained focused on supporting Oyu Tolgoi to reach the sustainable production milestone, and continuing progress on the remaining measures contained in Mongolian Parliamentary Resolution 103.

At the end of 2022, a total of 19 drawbells had been fired. Drawbell progression accelerated as a result of improvement initiatives implemented by the Oyu Tolgoi teams, bringing projected first sustainable production from Panel 0 forward to the first quarter of 2023 (previously first half of 2023).

At the end of December, shafts 3 and 4 sinking had reached 378 metres and 507 metres below ground level respectively. Operational safety sinking pauses have caused some delays against the 2022 reforecast¹ to shaft sinking. Final depths required for shafts 3 and 4 are 1,148 and 1,149 metres below ground level respectively. Construction of conveyor-to-surface works continued with civil scope of works completed and other contractors mobilised to site.

Study work for Panels 1 and 2, which are required to support the ramp-up to 95,000 tonnes of ore per day, remains on track to be completed in the first half of 2023. It will incorporate any ventilation impacts due to the shaft 3 and 4 delays as a result of COVID-19 restrictions and reprioritisation of the mobilised workforce over the course of 2022.

On 16 December, we [completed](#) the acquisition of Turquoise Hill Resources Ltd (TRQ) for consideration of approximately \$3.1 billion², simplifying ownership of the Oyu Tolgoi mine, significantly strengthening our copper portfolio, and demonstrating our long-term commitment to the project and Mongolia. We now hold a 66% direct interest with the remaining 34% owned by the Government of Mongolia through Erdenes Oyu Tolgoi. This is allowing us to focus fully on strengthening our relationship with the Government of Mongolia and moving the project forward with a simpler and more efficient ownership and governance structure.

1. A cost and schedule reforecast was performed in June 2022 and estimates that \$7.06 billion is required to complete the Hugo North 1 project (an increase of \$0.3 billion beyond the 2020 Definitive Estimate). The 2022 Reforecast excludes impacts of COVID-19 restrictions arising after June 2022. The 2022 reforecast remains subject to Oyu Tolgoi Board approval.
2. Total consideration of \$3,139 million for the minority interest in TRQ excludes transaction costs of \$74 million. In 2022, we paid \$2,928 million to shareholders and \$33 million of transaction costs. In 2023, we expect to pay the remaining \$41 million of transaction costs and approximately \$211 million to dissenting shareholders, depending on the outcome and timing of dissent proceedings.

Minerals

Year ended 31 December	2022	2021	Change
Iron ore pellets and concentrates production ¹ (million tonnes — Rio Tinto share)	10.3	9.7	6 %
Titanium dioxide slag production ('000 tonnes — Rio Tinto share)	1,200	1,014	18 %
Borates production ('000 tonnes — Rio Tinto share)	532	488	9 %
Diamonds production ('000 carats — Rio Tinto share) ²	4,651	3,847	21 %
Segmental revenue (US\$ millions)	6,754	6,481	4 %
Underlying EBITDA (US\$ millions)	2,419	2,603	(7)%
Underlying EBITDA margin (product group operations)	40%	43%	
Underlying earnings (US\$ millions)	849	888	(4)%
Net cash generated from operating activities (US\$ millions)	1,522	1,433	6 %
Capital expenditure (US\$ millions) ³	(679)	(644)	5 %
Free cash flow (US\$ millions)	814	762	7 %
Underlying return on capital employed (product group operations) ⁴	22%	21%	

1. Iron Ore Company of Canada (IOC) continues to be reported within Minerals.

2. On 17 November 2021, Rio Tinto's interest in Diavik increased from 60% to 100%. Production and financials reflect this from 1 November 2021.

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. Underlying return on capital employed (ROCE) is defined as underlying earnings (product group operations) excluding net interest divided by average capital employed.

Financial performance

In 2022, we benefited from strong market conditions for titanium dioxide pigment and borates, partially offset by a weaker market for iron ore pellets and concentrate, albeit off record levels. We also saw higher diamond prices compared with 2021, following a pandemic-related build up of demand and low inventory levels.

Underlying EBITDA of \$2.4 billion was 7% lower than 2021, primarily due to inflationary pressures, energy price increases and Rincon evaluation costs. This was partially offset by prices and higher EBITDA in relation to the increased ownership in Diavik.

Net cash generated from operating activities of \$1.5 billion was 6% higher than 2021, while free cash flow of \$0.8 billion was 7% higher, reflecting a higher EBITDA cash conversion supported by lower dividends paid to holders of non-controlling interests at Iron Ore Company of Canada.

Review of operations

Production of iron ore pellets and concentrate at IOC was 6% higher than 2021 due to the successful deployment of the Safe Production System (SPS) at the concentrator, which was completed in the year. Record performance metrics were achieved in the year, including monthly records for concentrate production and total material moved in the second quarter. Planning for SPS deployment at the pellet plant commenced in December.

Titanium dioxide production of 1.2 million tonnes was 18% higher than 2021 due to community disruptions at Richards Bay Minerals (RBM) in South Africa in 2021, and continued improved performance of operations at Rio Tinto Iron and Titanium Quebec Operations, Canada. Nationwide loadshedding of electrical power caused production constraints at RBM in late 2022.

Borates production was 9% higher than 2021, with strong production rates, higher grades and improved equipment reliability.

Our share of carats recovered was 21% higher than 2021, from our increased share of production since taking 100% ownership of Diavik in November 2021, partly offset by lower carats recovered due to lower grades.

Price and exchange rate sensitivities

The following sensitivities give the estimated effect on underlying EBITDA, assuming that each price or exchange rate moved in isolation. The relationship between currencies and commodity prices is a complex one; movements in exchange rates can affect movements in commodity prices and vice versa. The exchange rate sensitivities quoted here include the effect on operating costs of movements in exchange rates, but do not include the effect of the revaluation of foreign currency working capital. Please use them with care.

	Average published price/exchange rate for 2022	US\$ million impact on full-year 2022 underlying EBITDA of a 10% change in prices/exchange rates
Aluminium - US\$ per tonne	2,703	1,076
Copper - US cents per pound	398	505
Gold - US\$ per troy ounce	1,800	68
Iron ore realised price (FOB basis) - US\$ per dry metric tonne	106.1	2,608
Australian dollar against the US dollar	0.69	629
Canadian dollar against the US dollar	0.77	339
Oil (Brent) - US per barrel	100	220

The impact of a \$100 per tonne change in each of the input costs below is expected to have the following impact on our Canadian¹ aluminium smelting unit cash cost² of \$1,678 per tonne in 2022 (\$1,373 per tonne in 2021):

	US\$/t
Alumina (FOB)	191
Green petroleum coke (FOB)	23
Calcined petroleum coke (FOB)	36
Coal tar pitch (FOB)	8

1. Canadian smelters include all fully-owned smelters in Canada (Alma, AP60, Arvida, Grande-Baie, Kitimat and Laterrière), as well as our share of the Becancour and Alouette smelters.
2. The smelting unit cash cost refers to all costs which have been incurred before casting, excluding depreciation but including corporate allocations and with alumina at market price, to produce one metric tonne of primary aluminium.

Condensed consolidated financial statements for the year ended 31 December 2022

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Group income statement

Year ended 31 December	Note	2022 US\$m	2021 US\$m
Consolidated operations			
Consolidated sales revenue	3,4	55,554	63,495
Net operating costs (excluding items disclosed separately)		(34,770)	(32,690)
Impairment reversals/(charges net of reversals)	5	150	(269)
Loss on disposal of interest in subsidiary	5	(105)	—
Exploration and evaluation expenditure (net of profit relating to interests in undeveloped projects)		(896)	(719)
Operating profit		19,933	29,817
Share of profit after tax of equity accounted units		777	1,042
Impairment of investments in equity accounted units	5	(202)	—
Profit before finance items and taxation		20,508	30,859
Finance items			
Net exchange gains on external and intragroup net (debt)/cash balances		253	802
Net losses on derivatives not qualifying for hedge accounting		(424)	(231)
Finance income		179	64
Finance costs		(335)	(243)
Amortisation of discount on provisions	9	(1,519)	(418)
		(1,846)	(26)
Profit before taxation		18,662	30,833
Taxation	6	(5,586)	(8,258)
Profit after tax for the year		13,076	22,575
– attributable to owners of Rio Tinto (net earnings)		12,420	21,094
– attributable to non-controlling interests		656	1,481
Basic earnings per share		766.8c	1,303.4c
Diluted earnings per share		762.1c	1,295.0c

The notes on pages 35 to 64 are an integral part of these condensed consolidated financial statements.

Group statement of comprehensive income

Year ended 31 December	Note	2022 US\$m	2021 US\$m
Profit after tax for the year		13,076	22,575
Other comprehensive (loss)/income			
Items that will not be reclassified to the income statement:			
Re-measurement gains on pension and post-retirement healthcare plans		578	1,026
Changes in the fair value of equity investments held at fair value through other comprehensive income (FVOCI)		—	5
Tax relating to these components of other comprehensive income		(123)	(305)
Share of other comprehensive income of equity accounted units, net of tax		5	12
		460	738
Items that have been/may be subsequently reclassified to the income statement:			
Currency translation adjustment ^(a)		(2,371)	(1,843)
Currency translation on subsidiary disposed of, transferred to the income statement		105	—
Fair value movements:			
– Cash flow hedge losses		(167)	(211)
– Cash flow hedge losses transferred to the income statement		106	14
Net change in costs of hedging reserve		4	(18)
Tax relating to these components of other comprehensive loss		21	62
Share of other comprehensive losses of equity accounted units, net of tax		(27)	(12)
		(2,329)	(2,008)
Total other comprehensive (loss)/income for the year, net of tax		(1,869)	(1,270)
Total comprehensive income for the year		11,207	21,305
– attributable to owners of Rio Tinto		10,705	19,896
– attributable to non-controlling interests		502	1,409

(a) Excludes a currency translation charge of US\$240 million (2021: charge of US\$211 million) arising on Rio Tinto Limited's share capital for the year ended 31 December 2022, which is recognised in the Group statement of changes in equity on page 33.

Group cash flow statement

Year ended 31 December	Note	2022 US\$m	2021 US\$m
Cash flows from consolidated operations^(a)		23,158	33,936
Dividends from equity accounted units		879	1,431
Cash flows from operations		24,037	35,367
Net interest paid		(573)	(438)
Dividends paid to holders of non-controlling interests in subsidiaries		(421)	(1,090)
Tax paid		(6,909)	(8,494)
Net cash generated from operating activities		16,134	25,345
Cash flows from investing activities			
Purchases of property, plant and equipment and intangible assets		(6,750)	(7,384)
Sales of property, plant and equipment and intangible assets		—	61
Acquisitions of subsidiaries, joint ventures and associates	7	(850)	—
Disposals of subsidiaries, joint ventures, unincorporated joint operations and associates	7	80	4
Purchases of financial assets		(55)	(45)
Sales of financial assets ^{(b)(c)}		892	114
Net (funding of)/receipts from equity accounted units		(75)	6
Other investing cash flows ^(d)		51	85
Net cash used in investing activities		(6,707)	(7,159)
Cash flows before financing activities		9,427	18,186
Cash flows from financing activities			
Equity dividends paid to owners of Rio Tinto		(11,727)	(15,357)
Proceeds from additional borrowings ^(e)		321	1,488
Repayment of borrowings and associated derivatives ^(e)		(790)	(1,707)
Lease principal payments		(374)	(358)
Proceeds from issue of equity to non-controlling interests		86	66
Purchase of non-controlling interest ^(f)	12	(2,961)	—
Other financing cash flows		(28)	6
Net cash used in financing activities		(15,473)	(15,862)
Effects of exchange rates on cash and cash equivalents		15	100
Net (decrease)/increase in cash and cash equivalents		(6,031)	2,424
Opening cash and cash equivalents less overdrafts		12,805	10,381
Closing cash and cash equivalents less overdrafts	8	6,774	12,805
(a) Cash flows from consolidated operations			
Profit after tax for the year		13,076	22,575
Adjustments for:			
– Taxation	6	5,586	8,258
– Finance items		1,846	26
– Share of profit after tax of equity accounted units		(777)	(1,042)
– Loss on disposal of interest in subsidiary	5	105	—
– Impairment charges of investments in equity accounted units after tax	5	202	—
– Impairment reversal/(charges net of reversals)	5	(150)	269
– Depreciation and amortisation		5,010	4,697
– Provisions (including exchange differences on provisions)	9	1,006	1,903
– Pension settlement		—	(291)
Utilisation of other provisions	9	(176)	(128)
Utilisation of provisions for close-down and restoration	9	(609)	(541)
Utilisation of provisions for post-retirement benefits and other employment costs	9	(254)	(231)
Change in inventories		(1,185)	(1,397)
Change in receivables and other assets ^(g)		20	(367)
Change in trade and other payables		700	685
Other items ^(h)		(1,242)	(480)
		23,158	33,936

Group cash flow statement (continued)

- (b) In 2022, we received net proceeds of US\$352 million (2021: US\$107 million) from our sales and purchases of investments within a separately managed portfolio of fixed income instruments. Purchases and sales of these securities are reported on a net cash flow basis within "Sales of financial assets" or "Purchases of financial assets" depending on the overall net position at each reporting date.
- (c) Sale of financial assets includes US\$525 million of cash received from the sale of our gross production royalty from the Cortez Complex in Nevada, USA, (the "Cortez royalty") comprising a gold mine joint venture operated by Barrick Gold Corporation ("Barrick") and Newmont Corporation and the Fourmile project owned and operated by Barrick.
- (d) In 2022 other investing cash flows includes inflows relating to payments from a trust fund controlled by the Government of Australia to Energy Resources Australia ('ERA') for closure activity that has been completed. At 31 December 2022 the total amount held in the trust fund was US\$329 million (31 December 2021: US\$388 million). In 2021 other investing cash flows included a net settlement upon completion of a transaction increasing the Group's 60% share in the Diavik Diamond Mine to sole ownership.
- (e) In 2021, we issued US\$1.25 billion 30-years fixed rate SEC-registered debt securities with a coupon of 2.75%. The funds were received net of issuance fees and discount. We also completed a US\$1.2 billion (nominal value) bond buy-back programme. There were no issuances in 2022.
- (f) On 16 December 2022 we acquired the remaining 49% share of Turquoise Hill Resources for expected consideration of US\$3.2 billion inclusive of transaction fees. At 31 December 2022 US\$2,961 million had been paid.
- (g) In 2021, the Mongolian Tax Authority required payment by Oyu Tolgoi of US\$356 million in relation to disputed tax matters. Oyu Tolgoi continues to dispute the matters and has classified amounts subject to international arbitration as prepayments pending resolution.
- (h) Other items includes the deduction of the US\$432 million relating to the gain recognised on sale of the Cortez royalty shown in "Sale of financial assets" and the recognition of realised losses of US\$459 million on currency forwards not designated as hedges (2021: realised losses US\$131 million). In 2021 other items also included US\$336 million relating to a gain on recognition of a new wharf at Kitimat, Canada with no associated cash flow.

Group balance sheet

	Note	2022 US\$m	2021 US\$m
Non-current assets			
Goodwill		826	879
Intangible assets	5	3,645	2,832
Property, plant and equipment		64,734	64,927
Investments in equity accounted units		3,298	3,504
Inventories		203	196
Deferred tax assets		2,766	3,375
Receivables and other assets		1,893	2,194
Tax recoverable		—	29
Other financial assets		406	528
		77,771	78,464
Current assets			
Inventories		6,213	5,436
Receivables and other assets		3,478	3,574
Tax recoverable		347	72
Other financial assets		2,160	2,543
Cash and cash equivalents	8	6,775	12,807
		18,973	24,432
Total assets		96,744	102,896
Current liabilities			
Borrowings		(923)	(812)
Leases		(292)	(324)
Other financial liabilities		(69)	(245)
Trade and other payables		(8,047)	(7,733)
Tax payable		(223)	(1,407)
Close-down and restoration provisions		(1,142)	(1,023)
Provisions for post-retirement benefits and other employment costs		(353)	(383)
Other provisions		(554)	(700)
		(11,603)	(12,627)
Non-current liabilities			
Borrowings		(10,148)	(11,356)
Leases		(908)	(1,039)
Other financial liabilities		(904)	(393)
Trade and other payables		(604)	(798)
Tax payable		(36)	(660)
Deferred tax liabilities		(3,601)	(3,503)
Close-down and restoration provisions	9	(14,617)	(13,519)
Provisions for post-retirement benefits and other employment costs	9	(1,305)	(2,109)
Other provisions	9	(744)	(302)
		(32,867)	(33,679)
Total liabilities		(44,470)	(46,306)
Net assets		52,274	56,590
Capital and reserves			
Share capital ^(a)			
– Rio Tinto plc		207	207
– Rio Tinto Limited		3,330	3,570
Share premium account		4,322	4,320
Other reserves		7,805	9,998
Retained earnings		34,511	33,337
Equity attributable to owners of Rio Tinto		50,175	51,432
Attributable to non-controlling interests	12	2,099	5,158
Total equity		52,274	56,590

Group balance sheet (continued)

- (a) At 31 December 2022, Rio Tinto plc had 1,249.7 million ordinary shares in issue and held by the public, and Rio Tinto Limited had 371.2 million shares in issue and held by the public. There were no cross holdings of shares between Rio Tinto Limited and Rio Tinto plc in either periods presented. As required to be disclosed under the ASX Listing Rules, the net tangible assets per share amounted to US\$28.20 (31 December 2021: US\$29.47).

Group statement of changes in equity

	Attributable to owners of Rio Tinto					Non-controlling interests US\$m	Total equity US\$m
	Share capital US\$m	Share premium account US\$m	Other reserves US\$m	Retained earnings US\$m	Total US\$m		
Year ended 31 December 2022							
Opening balance	3,777	4,320	9,998	33,337	51,432	5,158	56,590
Change in accounting policy (refer to note 2)	—	—	—	(17)	(17)	—	(17)
Revised opening balance	3,777	4,320	9,998	33,320	51,415	5,158	56,573
Total comprehensive income for the year	—	—	(2,165)	12,870	10,705	502	11,207
Currency translation arising on Rio Tinto Limited's share capital	(240)	—	—	—	(240)	—	(240)
Dividends ^(a)	—	—	—	(11,716)	(11,716)	(421)	(12,137)
Own shares purchased from Rio Tinto shareholders to satisfy share awards to employees ^(b)	—	—	(84)	(16)	(100)	—	(100)
Change in equity interest held by Rio Tinto (refer to note 12)	—	—	—	701	701	(3,907)	(3,206)
Treasury shares reissued and other movements	—	2	—	—	2	—	2
Equity issued to holders of non-controlling interests (note 12)	—	—	—	(711)	(711)	797	86
Employee share awards charged to the income statement	—	—	56	63	119	—	119
Transfers and other movements	—	—	—	—	—	(30)	(30)
Closing balance	3,537	4,322	7,805	34,511	50,175	2,099	52,274

	Attributable to owners of Rio Tinto					Non-controlling interests US\$m	Total equity US\$m
	Share capital US\$m	Share premium account US\$m	Other reserves US\$m	Retained earnings US\$m	Total US\$m		
Year ended 31 December 2021							
Opening balance	3,988	4,314	11,960	26,792	47,054	4,849	51,903
Total comprehensive income for the year	—	—	(1,916)	21,812	19,896	1,409	21,305
Currency translation arising on Rio Tinto Limited's share capital	(211)	—	—	—	(211)	—	(211)
Dividends ^(a)	—	—	—	(15,385)	(15,385)	(1,090)	(16,475)
Own shares purchased from Rio Tinto shareholders to satisfy share awards to employees ^(b)	—	—	(95)	(18)	(113)	—	(113)
Change in equity interest held by Rio Tinto	—	—	—	76	76	(76)	—
Treasury shares reissued and other movements	—	6	—	—	6	—	6
Equity issued to holders of non-controlling interests	—	—	—	—	—	66	66
Employee share awards charged to the income statement	—	—	49	60	109	—	109
Closing balance	3,777	4,320	9,998	33,337	51,432	5,158	56,590

Group statement of changes in equity (continued)

(a) Dividends per share announced or paid during the period are summarised below:

For year ended 31 December	2022 US\$m	2021 US\$m
Dividends per share: Ordinary - paid during the year	684.0c	685.0c
Dividends per share: Special - paid during the year	62.0c	278.0c
Ordinary dividends per share: announced with the results for the year	225.0c	417.0c
Special dividends per share: announced with the results for the year	—	62.0c

(b) Net of contributions received from employees for share awards.

Selected explanatory notes to the condensed consolidated financial statements

1. Status of financial information

The full year financial information contained in this announcement, which does not constitute statutory accounts as defined in Section 434 of the Companies Act 2006, has been derived from the statutory accounts for the year ended 31 December 2022. These statutory accounts have been audited, were approved by the Board on 22 February 2023, and will be filed with the Registrar of Companies in the United Kingdom and the Australian Securities and Investments Commission in due course. Statutory accounts for the year ended 31 December 2021 have been filed with the Registrar of Companies.

Unless stated otherwise, financial information for the years ended 31 December 2022 and 31 December 2021 has been extracted from the full financial statements for that year prepared under the historical cost convention, as modified by the revaluation of certain derivative contracts, the impact of fair value hedge accounting on the hedged items and the accounting for post-retirement assets and obligations.

The Auditors' reports on the full financial statements for the years ended 31 December 2022 and 31 December 2021 were both unqualified and, in relation to Rio Tinto plc, did not contain a statement under section 498 (2) (regarding adequacy of accounting records and returns), or under section 498 (3) (regarding provision of necessary information and explanations) of the United Kingdom Companies Act 2006, and in relation to Rio Tinto Limited, contained a statement that the financial report is in accordance with the Corporations Act 2001 as amended by the ASIC Order dated 16 July 2021.

2. Basis of preparation and changes in accounting policies

The condensed consolidated financial statements included in this report have been prepared on a going concern basis in accordance with the Companies Act 2006 applicable to companies reporting under International Financial Reporting Standards and in accordance with applicable UK law, applicable Australian law as amended by the Australian Securities and Investments Commission Order dated 16 July 2021, 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) which are mandatory at 31 December 2022.

The above accounting standards and interpretations are collectively referred to as “IFRS” in this report. While the financial information included in this report has been prepared in accordance with IFRS the report does not contain all the information required to comply with IFRS. The Group will publish full financial statements that comply with IFRS on 22 February 2023.

The Group has not early adopted any amendments, standards or interpretations that have been issued but are not yet mandatory.

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 2021, except for the accounting requirements set out below, effective as at 1 January 2022, which did not have a significant impact on the Group's financial statements.

2. Basis of preparation and changes in accounting policies (continued)

Proceeds before Intended Use (Amendments to IAS 16 “Property, Plant and Equipment”)

We adopted Proceeds before Intended Use (Amendments to IAS 16 “Property, Plant and Equipment”) at 1 January 2022. The amendment prohibits the deduction, from the cost of major project construction work in progress, of proceeds (net of additional processing costs) from selling items before the related item of property, plant and equipment is available for use. Under the amendment, proceeds from selling items before the related item of property, plant and equipment is available for use are recognised within “Consolidated sales revenue” in the income statement along with the costs of producing those items within “Net operating costs (excluding items disclosed separately)”. We apportion development expenditure in the period to derive the cost associated with pre-production revenue, based on the tonnes produced in the period as a percentage of the total expected production (estimated total ore reserve). During 2021 we completed a review of the impact of these amendments and concluded that adjustments to retained earnings as at 1 January 2020, and restatement of the 2020 and 2021 Group Income Statement and Balance Sheet upon adoption of the amendments, were insignificant and as a result no restatements were made to comparative periods. During the year ended 31 December 2022 we recognised in the income statement pre-production revenue of US\$511 million and related costs of US\$30 million in relation to Gudai Darri and Oyu Tolgoi.

Onerous Contracts – Cost of Fulfilling a Contract (Amendments to IAS 37 “Provisions, Contingent Liabilities and Contingent Assets”)

We adopted Onerous Contracts – Cost of Fulfilling a Contract (Amendments to IAS 37 “Provisions, Contingent Liabilities and Contingent Assets”) at 1 January 2022. The amendments specify that the costs an entity includes in determining whether a contract is onerous are made up of all directly related costs, including both incremental amounts and an allocation of other directly related expenditure. Previously, we made provision for onerous contracts when the assets dedicated to the contract were fully impaired or the contract became stranded as a result of a business decision. From 2022, we record a provision if a contract is found to be loss-making on a stand-alone basis following allocation of all directly related costs as required by the amendments to IAS 37.

We have applied the amendments without revision to comparative amounts. We have increased other provisions and reduced our retained earnings as at 1 January 2022 by US\$17 million.

New standards issued but not yet effective

We have not early adopted any new accounting standards or amendments that have been issued but are not yet effective.

Deferred Tax related to Assets and Liabilities arising from a Single Transaction (Amendments to IAS 12 Income Taxes, mandatory in 2023 and endorsed by the UK)

The Group will adopt, from January 2023 (the transition date), the narrow-scope amendments to IAS 12, which introduce an exclusion to the initial recognition exemption application for transactions that give rise to equal and offsetting taxable and deductible temporary differences.

2. Basis of preparation and changes in accounting policies (continued)

Our existing accounting policy states that “where the recognition of an asset and liability from a single transaction gives rise to equal and offsetting temporary differences, Rio Tinto applies the initial recognition exemption allowed by IAS 12, and consequently recognises neither a deferred tax asset nor a deferred tax liability in respect of these temporary differences”. Under the amendments, deferred tax assets and liabilities are required to be recognised in respect of such temporary differences from the transition date, with restatement of comparatives for 2022 and 2021.

The most significant impact of implementing these amendments is expected to be from temporary differences related to the Group's provisions for close-down and restoration, and lease obligations and corresponding capitalised closure costs and right-of-use assets. Adjustments to deferred tax assets and liabilities related to these balances will be recognised as at 1 January 2021, being the beginning of the earliest comparative period presented in 2023 financial statements, with the cumulative effect recognised as an adjustment to retained earnings or other components of equity at that date. For other transactions the amendments apply only to those taking place on or after 1 January 2021.

The impact of restatement as at 31 December 2022 is that the Group will recognise additional gross deferred tax liabilities of US\$922 million and gross deferred tax assets of US\$1.4 billion in relation to close-down and restoration obligations and related capitalised closure costs. The Group will also recognise additional gross deferred tax liabilities of US\$140 million and gross deferred tax assets of US\$149 million in relation to lease liabilities and related right-of-use assets.

After the required offsetting within the same tax jurisdiction, these adjustments result in the Group recognising additional net deferred tax assets of US\$30 million and a reduction in net deferred tax liabilities of US\$437 million with the resulting cumulative impact increasing retained earnings (inclusive of income statement adjustments described below) by US\$459 million. As at 1 January 2021 and 31 December 2021, the restatement of gross and net deferred tax balances does not differ materially from the impact as at 31 December 2022.

The impact of restatement on net earnings for the year ended 2022 is a net charge of US\$28 million comprising a US\$84 million credit (2021:US\$22 million) related to depreciation of closure and right of use assets, and settlement of closure and lease liabilities, offset by a US\$112 million charge (2021: nil) related to the derecognition of deferred tax assets as a result of the recently enacted Corporate Alternative Minimum Tax regime in the USA (refer to Note 6).

There will be no impact on tax cash flows or amounts recognised on the balance sheet as tax recoverable or payable as a result of implementing these amendments.

IFRS 17 Insurance Contracts and amendments to IFRS 17 Insurance Contracts (mandatory in 2023 and endorsed by the UK)

The standard provides consistent principles for all aspects of accounting for insurance contracts. We are finalising our assessment and have not identified a material impact to date, particularly in areas of judgment related to reinsurance contracts with EAU and in substance self-insurance arrangements.

2. Basis of preparation and changes in accounting policies (continued)

Other amendments

The assessment is ongoing in relation to other amendments, but no material impact has been identified to date. These are listed below:

- Amendments to IAS 1 Presentation of Financial Statements: disclosure of accounting policies (mandatory in 2023 and endorsed by the UK);
- Amendments to IAS 8 Accounting policies, changes in accounting estimates and errors: definition of accounting estimates (mandatory in 2023 and endorsed by the UK)
- Amendments to IAS 1 Presentation of Financial Statements: classification of liabilities (mandatory in 2024 and not yet endorsed by the UK).

Going concern

Management has prepared detailed cash flow forecasts for the next 12 months and has updated life-of-mine plan models with longer-term cash flow projections. These forecasts demonstrate that the Group has sufficient cash, other liquid resources and undrawn credit facilities to enable it to meet its obligations as they fall due. As such, the directors considered it appropriate to adopt the going concern basis of accounting in preparing the full-year financial information.

Impact of climate change on the Group

Strategy and approach to climate change

Over a year ago, we put the low-carbon transition at the heart of our new strategy, setting a clear pathway to deliver long-term value as well as ambitious targets to decarbonise our business. In 2022, our shareholders supported our Climate Action Plan in a non-binding advisory vote on the Group's ambitions, emissions targets and actions to achieve them.

Our Scope 1 and 2 emissions reduction targets of 15% by 2025, 50% by 2030 (both relative to our 2018 equity baseline) and the aim to achieve net zero emissions by 2050 are aligned with 1.5°C – the stretch goal of the Paris Agreement. We have set up six large abatement programmes focused on renewables, Pacific aluminium operations, ELYSIS™ technology, process heat, minerals processing and diesel alternatives. To deliver our climate targets, we expect to make capital investment of US\$7.5 billion in decarbonisation projects over the period to 2030, including around US\$1.5 billion in the next three years, mainly relating to the repowering of the Pilbara. Progress towards our Scope 1 and 2 emissions targets is reflected within executive remuneration.

In 2022, we delivered the first 34MW of renewable power at Gudai-Darri and announced our plan to invest US\$600 million in 200MWh of solar power facilities and 200MWh of battery storage in the Pilbara by 2026. We agreed to test at least four battery-powered locomotives, and pilot battery-powered trucks in the Pilbara in 2024. By 2030, we aim to phase out the purchase of diesel haulage trucks and locomotives across our operations. At the Queensland Alumina refinery we are working to develop an energy efficient digestion process at an estimated cost of US\$240 million. In 2022, we continued to work with the Queensland Government and energy providers to design a renewable energy solution for Boyne Smelter. Similarly, in 2022, Tomago Aluminium Company released an expression of interest to work towards a green repowering solution for the Tomago smelter.

2. Basis of preparation and changes in accounting policies (continued)

In addition, we have signed a 130MW solar power purchase agreement for Richards Bay Minerals (RBM) in South Africa. We also intend to decarbonise our shipping fleet and aim to have net zero vessels in our portfolio by 2030. To achieve this, in 2022 we successfully completed a trial of fuel blend with biofuels and in 2023-2024 we plan to incorporate nine LNG dual-fuel chartered vessels into our fleet. Decarbonisation projects are expected to accelerate beyond 2025, which we expect to include further decarbonisation of the Pilbara electricity system (estimated at US\$3 billion out of the US\$7.5 billion total spend by 2030) and other abatement projects.

We are also stepping up our focus on Scope 3 goals, which are explicitly linked to executive remuneration. Over 90% of our Scope 3 emissions are from the downstream processing of iron ore, bauxite and other products by our customers. We have not set an overall quantitative Scope 3 emissions target, but instead engage with our customers to optimise their current operations toward low-emitting, higher efficiency processes; and foster partnerships with them, which we believe are more effective ways to advance actions. The shift toward green steel is underway and we are working on options to beneficiate our Pilbara ores to be better suited to green steel technologies and are exploring DRI pathways using sustainable resources such as hydrogen and biomass.

We expect that our annual incremental operating expenditure on building new teams and energy efficiency initiatives will be around US\$200 million, in addition to R&D investment.

Our ambition is to increase our growth capital expenditure to around US\$2 billion in 2023 and up to US\$3 billion per year in 2024-2025 to capture new growth opportunities with a focus on materials that are expected to see strong demand growth from the low carbon transition. This includes investment in future production of lithium at Rincon, copper at Oyu Tolgoi and Winu and high-grade iron ore from Simandou. Our budget for central greenfield exploration remains at approximately US\$250 million annually, mainly focused on copper with a growing battery minerals programme.

For internal capital allocation purposes for major projects, a notional carbon price of US\$75/t CO₂e is used to incentivise investment in low carbon abatement options. The US\$75/t CO₂e price is derived from our analysis of the carbon mitigation options across our assets that are needed to achieve our emissions targets. This is unrelated to the different carbon prices we use in our core scenarios which are based on our assessment of climate policy ambition.

The impact of climate change and the execution of our climate change strategy on our financial statements is discussed below:

Climate change scenarios

Our strategy and approach to climate change are informed by an analysis of the interplay of global megatrends, explored through the lens of plausible global scenarios. These set the context for our industry and underpin our commodity price outlooks, portfolio and capital allocation choices and how we operate as a business. There are many plausible scenarios for global energy transition, all with different impacts on future commodity price outcomes. As part of our 2022 strategy process, we replaced our three scenarios described in the 2021 Annual Report and now focus on two core scenarios. These are used to generate a single central Reference Case for use in commodity pricing forecasts, valuation models and reserves and resources determination, as was the case in the prior year.

2. Basis of preparation and changes in accounting policies (continued)

These changes in scenarios represent an evolution of our interpretation and estimations in the current year, not a change in accounting policy, and as such we have not restated comparative information. Our two core scenarios are:

- Competitive Leadership scenario, limiting global warming to approximately 2°C by 2100, reflects a rapidly developing world of high growth and strong climate action post-2030 with change driven by policy and competitive innovation. As a result, we expect that countries achieve their Glasgow Climate Pact commitments. Global weighted average carbon prices are forecast to rise rapidly at an average of 8% per year over the next three decades, reaching US\$42/tCO₂e in 2030, and rising rapidly post-2030 to incentivise significant mitigation in industrial sectors post-2030.
- Fragmented Leadership scenario, with global warming exceeding 2.5°C by 2100, is characterised by limited progress on policy reform with volatile low growth. We expect that nations eventually achieve their 2030 Nationally Determined Contributions as agreed in Paris in 2015 but fail to progress towards long term carbon goals agreed at the UN Climate Summit COP26 Glasgow. Global weighted average carbon prices are forecast to rise slowly, at an average of 2.9% per year over the period to 2050, reaching US\$42 in 2030; but remain too low post-2030 to incentivise significant mitigation in industrial sectors resulting in flat global emissions post-2030.

At the UN Climate Summit in late 2022 (COP27), there was broad recognition that the pace of decarbonisation across the global economy is too slow to limit warming to 1.5°C and that current climate policies in many countries are not yet aligned with their stated ambitions. Consequently, neither of our two core scenarios is consistent with the expectation of climate policies required to accelerate the global transition to meet the stretch goal of the Paris Agreement. Although our operational emissions reduction targets align with the goals of the Paris Agreement, our two core scenarios do not. Consequently, we also assess our sensitivity and test the economic performance of our business against a scenario we have developed to reflect our view of the global actions required to meet the stretch goal of the Paris Agreement. We refer to this Paris-aligned scenario as the Aspirational Leadership scenario.

Importantly none of our three scenarios are considered a definitive representation for our assessment of the future impact of climate change on the Group. Scenario modelling has inherent limitations and by its nature allows a range of possible outcomes to be considered where it is impossible to predict which outcome is likely.

The Aspirational Leadership scenario reflects a world of high growth, significant social change and accelerated climate action. Global weighted average carbon prices rise rapidly – at an average of 9.3% per year over the next three decades – reaching \$59/tCO₂e in 2030 and incentivise rapid and deep reductions in industrial emissions post-2030. Despite geopolitical differences, major economies work together through multilateral frameworks and proactively work towards limiting temperature change to 1.5°C by 2050. The Aspirational Leadership scenario is a commodity sales price and carbon tax sensitivity, with all other inputs remaining equal to our Reference Case; and is built by design to reach net-zero emissions globally by 2050 and help us better understand the pathways to meet the Paris Agreement goal, and what this could mean for our business. It is used for strategy and risk discussions, including analysis of sensitivity to our view of a Paris-aligned pathway and comparison of relative economic performance to our core scenarios.

2. Basis of preparation and changes in accounting policies (continued)

We do not publish the commodity price forecasts associated with these scenarios as to do so would weaken our position in commercial negotiations and might give rise to concerns from other market participants.

Impacts of climate change pricing scenarios on our portfolio, low-carbon transition risks and opportunities

Through our strategy process we compare the economic performance of our portfolio under our two core scenarios and the Aspirational Leadership scenario and this indicates that overall the economic performance of our portfolio would be stronger in scenarios with proactive climate action, particularly in relation to aluminium, copper and higher-grade iron ore.

We anticipate that all our commodities are needed in the low-carbon transition, but estimate that the demand varies significantly between our scenarios. We expect that copper demand will rise from a 2020 base by 65-150% by 2050 across the three scenarios to support a rapid rise in renewable generation while lithium is expected to be a fundamental ingredient in electric vehicle batteries and grid-firming energy storage solutions. Demand for aluminium is expected to grow for use in energy-efficient lightweight vehicles with demand for aluminium semi-fabricated products more than doubling in the period 2021-50 in Aspirational Leadership and Competitive Leadership scenarios, with moderate demand growth in Fragmented Leadership. Our access to self-generated hydro power is a source of competitive advantage for our aluminium business in Canada.

We forecast that global iron ore demand will remain strong with a premium on higher grade ore needed for the production of green steel, such as that from our IOC products and the planned investment in Simandou, which increases in our Aspirational Leadership and Competitive Leadership scenarios. In our Aspirational Leadership scenario, accelerated switching to green steel and increasing scrap use reduces the relative value of low-grade iron ore in the Pilbara.

We will need to carefully monitor and manage transition risks linked to our operational Scope 1 and 2 emissions and value-chain Scope 3 emissions. In particular, we expect the decarbonisation of our assets to benefit from the implementation of new technologies. The pace of technological development is uncertain, which could delay or increase the cost of our decarbonisation efforts.

Our Aspirational Leadership scenario predicts the Group's overall economic performance would fall between the Fragmented Leadership and Competitive Leadership scenarios. This reflects higher estimated economic performance for our copper and aluminium businesses in the Aspirational Leadership scenario, based on their higher price profiles, offset by higher expected carbon penalties across our operating jurisdictions, and lower prices for lower grade iron ore products. Refer below for our assessment of the accounting implications of forecast commodity pricing in the Aspirational Leadership scenario.

Physical risk

In 2022, we launched the Physical Resilience Programme across the Group. During the year we commenced a physical risk and resilience assessment across prioritised risk areas: the entire Pilbara iron ore operation and the Saguenay aluminium operations focused on Lac Saint-Jean. Our ongoing review processes, including impairment assessments, have not identified any material accounting impacts to date. For example, in 2022, no write-offs are necessary in the Pilbara, where certain infrastructure assets, such as transmission lines, that have reached the end of their natural lives are being replaced with climate resilient infrastructure.

2. Basis of preparation and changes in accounting policies (continued)

In addition, we do not foresee the renewal of our contractual water rights in Canada that have been classified as indefinite-lived intangible assets to be at risk from climate change. Further, closure planning considers future climate change projections at each step of the process to support safe and appropriate final landform design. In 2023, we will progress a Group-wide top-down assessment to further understand the risks and opportunities associated with physical climate change and to quantify any financial impacts, in addition to the site-specific bottom-up assessments, which will continue in the foreseeable future.

Accounting judgments and estimates

Global decarbonisation and the world's energy transition continues to evolve, with the potential to materially impact our future financial results as our significant accounting judgments and key estimates are updated to reflect prevailing circumstances. In response, carrying values of assets and liabilities could be materially affected in future periods. Our current strategy and approach to decarbonise our operations and achieve our scope 1 and 2 emissions targets is considered in our significant judgments and key estimates reflected in these financial results.

Impacts from executing our climate change strategy - accounting for capital expenditure and operating costs underpinning our Climate Action Plan

Given the significant investment we are making to abate our carbon emissions, we have considered the potential for asset obsolescence, with a particular focus on our Pilbara operations where we are prioritising investment in renewables to switch away from natural gas power generation. No material changes to accounting estimates to useful economic lives have been necessary due to the anticipated use of these assets for firming support in the transition. As the renewable projects progress, it is possible that such adjustments may be identified in the future. The renewable assets in the Pilbara are our own built and operated arrangements and follow normal rules on capitalisation of directly attributable costs. The solar power purchase agreement for RBM is accounted for on an accrual basis as energy is produced.

There are no accounting impacts to date from the programme to develop renewable energy solutions for our Queensland aluminium assets as the work has not been completed and commercial terms have not been agreed. Large scale renewable power off-take arrangements may, in the future, require complex derivative measurement or lease accounting depending on contractual terms.

No adjustments to useful lives of the existing fleet have been identified to date as a result of planned fleet electrification in the Pilbara and the purchase of battery-powered locomotives. The solutions are still in development or pilot stages and the gradual fleet replacement is intended to be part of the normal lifecycle renewal of trucks. Depending on technological development, which is highly uncertain, this could lead to accelerated depreciation in the future. Similarly, our target to have net zero vessels in our portfolio by 2030 has not given rise to accounting adjustments to date, as the replacement is planned as part of the lifecycle renewal. The energy efficiency digestion project at Queensland Alumina refinery does not reduce the economic lives of the underlying alumina assets but could lower operating costs and improve margins. The expenditure on our own carbon abatement projects and technology advancements follows existing accounting policies on cost capitalisation, research and development costs.

2. Basis of preparation and changes in accounting policies (continued)

Use of sensitivities to Paris aligned accounting

The forecast commodity prices (including carbon prices) informed by a blend of our two scenarios are used pervasively in our financial processes from budgeting, forecasting, capital allocation and project evaluation to the determination of ore reserves. In turn, these prices are used to derive critical accounting estimates included as inputs to impairment testing, estimation of remaining economic life for units of production depreciation and discounting closure and rehabilitation provisions. These prices represent our best estimate of actual market outcomes based on the range of future economic conditions regarding matters largely outside our control, as required by IFRS. As neither of our core scenarios represents the Group's view of the goals of the Paris Agreement, our commodity price assumptions used in accounting estimates are not consistent with the expectation of climate policies required to accelerate the global transition to meet the goals of the Paris Agreement. As described above, we use our Aspirational Leadership scenario to understand the sensitivity of these estimates to Paris aligned assumptions.

Under the Aspirational Leadership scenario, which is not used in the preparation of these financial statements, nor for budgeting purposes, the economic performance of copper and aluminium is expected to be stronger under supply and demand forward pricing curves which we believe will be consistent with the Paris Agreement. It is possible therefore, under the right conditions, that historical impairments associated with these assets could reverse. We recognised an impairment of US\$202 million during the year for the Boyne smelter cash-generating unit, triggered by economic and operating performance of the smelter. When measuring the recoverable amount for this cash-generating unit we utilised net present value of cash flows to the end of the existing joint venture agreements in 2029, which also coincides with the Group's targeted carbon emission reductions by 2030. The Group continues to evaluate lower emission power solutions for the smelter that could extend its life to at least 2040. In such circumstances, the net present value of forecast future cash flows could support the reversal of past impairments. Both the recorded outcome and the sensitivity represent a reduction in emissions that we considered to be Paris-aligned.

In the Aspirational Leadership scenario the prices for lower-grade iron ore are supported in the medium term by an assumed underlying increase in GDP-driven demand. However, in the longer term we assume the pricing for lower grade iron ore to be weaker than in our core scenarios. This will depend on the development of low-emissions steel technology, the pace of which is uncertain, but is expected to be offset by higher prices for higher-grade iron ore. This is unlikely to give rise to impairment triggers for 2022 or in the foreseeable future due to the high returns on capital employed in the Pilbara.

We completed the divestments of our coal businesses in 2018 and no longer mine coal, but retained a contingent royalty from these divestments. Recent favourable coal prices exceeded contractual benchmark levels and resulted in the cash royalty receipt of US\$36 million during 2022. We also carry royalty receivables of US\$209 million on our balance sheet at 31 December 2022, measured at fair value. The fair value of this balance may be adversely impacted in the future by a faster pace of transition to a low carbon economy, but this impact is not expected to be material.

2. Basis of preparation and changes in accounting policies (continued)

Closure dates and cost of closure are also sensitive to climate assumptions, but no material changes have been identified in the year specific to climate change that would require a material revision to the provisions in 2022. For those commodities with higher forward price curves under the Aspirational Leadership scenario, it may be economical to mine lower mineral grades, which could result in the conversion of additional Mineral Resources to Ore Reserves and therefore longer dated closure.

Overall, based on the Aspirational Leadership scenario pricing outcomes, and with all other assumptions remaining consistent with those applied to our 2022 financial statements, we do not currently envisage a material adverse impact of the 1.5°C Paris-aligned sensitivity on asset carrying values, remaining useful life, or closure and rehabilitation provisions for the Group. It is possible that other factors may arise in the future, which are not known today, that may impact this assessment.

Alternative performance measures

The Group presents certain alternative performance measures (APMs), including underlying earnings, which are reconciled to directly comparable IFRS financial measures on pages 69 to 78 of this report. These APMs are used by management to assess the performance of the business and may therefore be useful to investors. They are not a substitute for the IFRS measures and should be considered supplementary to those measures.

Reconciliation with Australian Accounting Standards

Our financial statements have been prepared in accordance with IFRS 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). We are required to disclose the effect of the adjustments to our consolidated income statement, consolidated total comprehensive income/(loss) and consolidated shareholders' funds if our accounts were prepared under the version of IFRS that is applicable in Australia. This is in order to satisfy 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 16 July 2021.

Prior to 1 January 2004, our financial statements were prepared in accordance with UK GAAP. Under IFRS, 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\$380 million at 31 December 2022 (2021: US\$377 million).

Save for the exception described above, the Group's financial statements prepared in accordance with IFRS are consistent with the requirements of AAS.

3. Segmental information

Our management structure is based on principal product groups (PG) together with global support functions whose leaders make up the Executive Committee. The Executive Committee members each report directly to our Chief Executive who is the chief operating decision maker (CODM) and is responsible for allocating resources and assessing performance of the operating segments. The CODM's primary measure of profit is underlying EBITDA. Finance costs and net debt are managed on a Group-wide basis and are therefore excluded from the segmental results.

Our reportable segments are as follows:

Reportable segment	Principal activities
Iron Ore	Iron ore mining and salt and gypsum production in Western Australia.
Aluminium	Bauxite mining; alumina refining; aluminium smelting.
Copper	Mining and refining of copper, gold, silver, molybdenum and other by-products; exploration activities together with the Simandou iron ore project, which was the responsibility of the Copper product group chief executive during 2022.
Minerals	Includes businesses with products such as borates, titanium dioxide feedstock together with the Iron Ore Company of Canada (iron ore mining and iron concentrate/pellet production). Also includes diamond mining, sorting and marketing.

The Rio Tinto financial information by business unit provided on pages 65 to 68 provides additional voluntary business unit disclosure which the Group considers useful to the users of the financial statements.

3. Segmental information (continued)

	2022			2021		
	Segmental revenue ^(a) US\$m	Underlying EBITDA ^(b) US\$m	Capital expenditure ^(c) US\$m	Segmental revenue ^(a) US\$m	Underlying EBITDA ^(b) US\$m	(Adjusted) Capital expenditure ^(c) US\$m
Year ended 31 December						
Iron Ore	30,906	18,612	2,940	39,582	27,592	3,947
Aluminium	14,109	3,672	1,377	12,695	4,382	1,300
Copper	6,699	2,376	1,622	7,827	3,969	1,328
Minerals	6,754	2,419	679	6,481	2,603	644
Reportable segments total	58,468	27,079	6,618	66,585	38,546	7,219
Other Operations	192	(16)	53	251	(28)	(13)
Inter-segment transactions	(256)	24		(268)	42	
Share of equity accounted units ^(d)	(2,850)			(3,073)		
Central pension costs, share-based payments, insurance and derivatives		377			110	
Restructuring, project and one-off costs		(173)			(80)	
Central costs		(766)			(613)	
Central exploration and evaluation expenditures		(253)			(257)	
Proceeds from disposal of property, plant and equipment			—			61
Other items			79			117
Consolidated sales revenue/Capital expenditure	55,554		6,750	63,495		7,384
Underlying EBITDA		26,272			37,720	

- (a) Segmental revenue includes consolidated sales revenue plus the equivalent sales revenue of equity accounted units in proportion to our equity interest (after adjusting for sales to/from subsidiaries). Segmental revenue measures revenue on a basis that is comparable to our underlying EBITDA metric.
- (b) Underlying EBITDA (calculated on page 47) is reported to provide greater understanding of the underlying business performance of Rio Tinto's operations.
- (c) Capital expenditure for reportable segments includes 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. In 2022, we have excluded capitalised expenditure relating to equity accounted units and have adjusted prior year comparatives for this change in definition.
- (d) Consolidated sales revenue includes subsidiary sales of US\$50 million (2021: US\$44 million; 2020: US\$34 million) to equity accounted units which are not included in segmental revenue. Segmental revenue includes the Group's proportionate share of product sales by equity accounted units (after adjusting for sales to subsidiaries) of US\$2,900 million (2021: US\$3,117 million; 2020: US\$2,441 million) which are not included in consolidated sales revenue.

3. Segmental information (continued)

Reconciliation of profit after tax to underlying EBITDA

Underlying EBITDA represents profit before taxation, net finance items, depreciation and amortisation adjusted to exclude the EBITDA impact of items, which do not reflect the underlying performance of our reportable segments.

Items excluded from profit after tax are those gains and losses that, individually or in aggregate with similar items, are of a nature and size to require exclusion in order to provide additional insight into the underlying business performance. The following items are excluded from profit after tax in arriving at underlying EBITDA in each year irrespective of materiality:

- Depreciation and amortisation in subsidiaries and equity accounted units;
- Taxation and finance items in equity accounted units;
- Taxation and finance items relating to subsidiaries;
- Unrealised gains/(losses) on embedded derivatives not qualifying for hedge accounting;
- Net gains/(losses) on disposal of interests in subsidiaries;
- Impairment charges net of reversals;
- The underlying EBITDA of discontinued operations;
- Adjustments to closure provisions where the adjustment is associated with an impairment charge and for legacy sites where the disturbance or environmental contamination relates to the pre-acquisition period.

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. In 2022 this category included the gain recognised by Kitimat relating to LNG Canada's project and the gain recognised upon sale of the Cortez royalty. In 2021 the category included the changes in closure estimates at Energy Resources of Australia and Gove Refinery.

Year ended 31 December	2022 US\$m	2021 US\$m
Profit after tax for the year	13,076	22,575
Taxation	5,586	8,258
Profit before taxation	18,662	30,833
Depreciation and amortisation in subsidiaries excluding capitalised depreciation ^(a)	4,871	4,525
Depreciation and amortisation in equity accounted units	470	497
Finance items in subsidiaries	1,846	26
Taxation and finance items in equity accounted units	640	759
(Gains)/Losses on embedded commodity derivatives not qualifying for hedge accounting (including foreign exchange)	(6)	51
Impairment charges net of reversals ^(b)	52	269
Gain recognised by Kitimat relating to LNG Canada's project ^(c)	(116)	(336)
Change in closure estimates (non-operating and fully impaired sites) ^(d)	180	1,096
Loss on disposal of interests in subsidiary ^(b)	105	—
Gain on sale of the Cortez Royalty ^(e)	(432)	—
Underlying EBITDA	26,272	37,720

3. Segmental information (continued)

- (a) Depreciation and amortisation in subsidiaries for the year ended 31 December 2022 is net of capitalised depreciation of US\$139 million (31 December 2021: US\$172 million).
- (b) Refer to note 5
- (c) During the first half of 2022, LNG Canada elected to terminate their option to purchase additional land and facilities for expansion of their operations at Kitimat, Canada. The resulting gain has been excluded from underlying EBITDA consistent with prior years as it is part of a series of transactions that together were material. On 3 December 2021 we gained control over a new wharf at Kitimat, Canada that was built and paid for by LNG Canada. The gain on recognition was excluded from underlying EBITDA on the grounds of individual magnitude and consistency with the associated impairment charge in 2021, refer to Note 5.
- (d) In 2022 the charge relates to re-estimates of underlying closure cash flows for legacy sites where the environmental damage preceded ownership by Rio Tinto. On 2 February 2022, Energy Resources of Australia released preliminary findings from its reforecast of the total undiscounted cost schedule for the Ranger rehabilitation project. Information available from this study resulted in the Group recording an increase to the closure provision of US\$510 million at 31 December 2021. Other increases to closure estimates charged to the income statement in 2021 relate to Diavik, Gove refinery, and a number of the Group's legacy sites where the environmental damage preceded ownership by Rio Tinto. The adjustments at Energy Resources Australia and Gove refinery were recognised in the income statement as these are non-operating sites, and excluded from underlying earnings due to the magnitude of the individual updates and materiality when aggregated. In 2020 we recognised an increase in the Diavik closure provision based on preliminary Pre-Feasibility Study findings. On completion of the study in 2021 a true up was recorded in the income statement and excluded from underlying EBITDA in line with the treatment of the initial increase in 2020, which was excluded from underlying EBITDA as Diavik was fully impaired during the year.
- (e) On 2 August 2022, we completed the sale of a gross production royalty which was retained following the disposal of the Cortez Complex in 2008. The gain recognised on sale of the royalty has been excluded from underlying EBITDA on the grounds of individual magnitude.

4. Segmental information - additional information

Consolidated sales revenue by destination

	Year ended 31 December			
	2022 %	2021 % Adjusted	2022 US\$m	2021 US\$m Adjusted
Consolidated sales revenue by destination^(a)				
Greater China ^(b)	54.3 %	59.7 %	30,172	37,878
United States of America	15.9 %	12.6 %	8,823	8,012
Asia (excluding Greater China and Japan)	7.1 %	6.9 %	3,937	4,415
Japan	7.4 %	7.9 %	4,091	5,012
Europe (excluding UK)	6.5 %	5.2 %	3,618	3,271
Canada	3.1 %	2.6 %	1,743	1,677
Australia	1.9 %	1.8 %	1,047	1,122
UK	0.3 %	0.4 %	182	243
Other countries	3.5 %	2.9 %	1,941	1,865
Consolidated sales revenue	100.0 %	100.0 %	55,554	63,495

- (a) Consolidated sales revenue by geographical destination is based on the ultimate country of the product's destination, if known. Where the ultimate destination is not known, we have defaulted to the shipping address of the customer. Rio Tinto is domiciled in both the UK and Australia.
- (b) Consolidated sales revenue by destination has been adjusted to classify Taiwan and China together as 'Greater China'; previously Taiwan was included in Asia (excluding Greater China and Japan). This change has resulted in a decrease in 2021 revenue attributable to Asia (excluding Greater China and Japan) of: 2.5% and US\$1,570 million.

Consolidated sales revenue by product

	Year ended 31 December 2022			Year ended 31 December 2021		
	Revenue from contracts with customers 2022 US\$m	Other revenue ^(a) 2022 US\$m	Consolidated sales revenue 2022 US\$m	Revenue from contracts with customers 2021 US\$m	Other revenue ^(a) 2021 US\$m	Consolidated sales revenue 2021 US\$m
Consolidated sales revenue by product						
Iron ore	33,068	(267)	32,801	42,992	(796)	42,196
Aluminium, alumina and bauxite	13,955	(165)	13,790	12,336	103	12,439
Copper	3,276	(80)	3,196	3,229	96	3,325
Industrial minerals (comprising titanium dioxide slag, borates and salt)	2,685	(16)	2,669	2,114	3	2,117
Gold	564	9	573	1,075	2	1,077
Diamonds	816	—	816	501	—	501
Other products ^(b)	1,710	(1)	1,709	1,837	3	1,840
Consolidated sales revenue	56,074	(520)	55,554	64,084	(589)	63,495

- (a) Consolidated sales revenue includes both revenue from contracts with customers, accounted for under IFRS 15 and subsequent movements in provisionally priced receivables, accounted for under IFRS 9, and included in 'other revenue' above.
- (b) "Other products" includes metallic co-products, molybdenum, silver and other commodities. Individually the revenue from each of these products is less than 15% of the total Other products category.

5. Impairment charges net of reversals

	Pre-tax amount 2022 US\$m	Taxation 2022 US\$m	Non- controlling interest 2022 US\$m	Net amount 2022 US\$m	Pre-tax amount 2021 US\$m
Other operations - Roughrider	150	—	—	150	—
Aluminium – Pacific Aluminium	(202)	—	—	(202)	—
Aluminium – Kitimat	—	—	—	—	(269)
Total impairment charges net of reversals	(52)	—	—	(52)	(269)
Allocated as:					
Intangible assets	150				—
Property, plant and equipment	—				(269)
Investment in equity accounted units (“EAUs”)	(202)				—
Total impairment charges net of reversals	(52)				(269)
Comprising:					
Impairment reversal/(charges net of reversals)				150	(269)
Impairment charges related to EAUs (pre-tax)				(202)	—
Total impairment charges net of reversals in the financial information by business unit (page 65)				(52)	(269)
Taxation (including related to EAUs)				—	72
Total impairment charges net of reversals in the income statement				(52)	(197)

2022

Other operations - Roughrider, Canada

On 17 October 2022, we completed the sale of the Roughrider uranium undeveloped project located in the Athabasca Basin in Saskatchewan, Canada for US\$150 million (US\$80 million in cash and US\$70 million in shares of Uranium Energy Corp.). The project was fully impaired during the year ended 31 December 2017 due to significant uncertainty over whether commercially viable quantities of mineral resources could be identified at a future date. The sale therefore led to an impairment reversal in the current year. It also led to a loss on disposal being recognised of US\$105 million arising from the recycling of the currency translation reserve to the income statement.

5. Impairment charges net of reversals (continued)

Aluminium - Pacific Aluminium, Australia and New Zealand

The operating and economic performance of the Boyne Smelter in Queensland, Australia was below our expectations in 2022. The plant operated with reduced capacity and the economic performance suffered due to the high cost of energy from the coal-fired Gladstone Power Station. These conditions have been identified as an impairment trigger. We have calculated a recoverable amount for the cash-generating unit based on post-tax cash flows, expressed in real terms and discounted using a post-tax rate of 6.6% over the period to 2029. This date was chosen as it coincides with both the remaining term of the Boyne Smelter joint venture agreements and the Group's Paris-aligned commitment to reduce carbon emissions by 50% by 2030 relative to the 2018 baseline. Despite the recent implementation of temporary energy price caps by the Australian Government, this resulted in an impairment charge of US\$202 million, representing a full impairment of the carrying value of the Boyne Smelter investment in equity accounted unit. We are committed to the repowering of our aluminium smelter in Queensland with firmed renewable energy by 2030. For this reason, along with the coal price cap noted above, we have separated the Gladstone Power Station from the Boyne Smelter cash-generating unit. As a sensitivity we have considered the impact of a potential repowering of the smelter using commodity and energy price assumptions from our Aspirational Leadership scenario, with all other assumptions being unchanged. This would result in improved cash flows, including an extension of operations at the Boyne Smelter beyond current joint venture agreements through to 2040. The potential value uplift under this sensitivity is not part of our base valuation as it is dependent upon commercial agreements that are not currently in place, but could support the reversal of past impairments. Both the recorded outcome and the sensitivity, as described in "Impact of climate change on the Group" section in Note 2, are considered to be Paris-aligned.

2021

Aluminium – Kitimat, Canada

On 3 December 2021, we announced completion of the newly-constructed wharf at Kitimat. Construction spend was incurred by LNG Canada and therefore a gain of US\$336 million representing the estimated fair value of the cost of construction was recorded and the carrying value of the Kitimat cash-generating unit (CGU) increased accordingly. Output from the smelter was reduced to 25% as a result of a workforce strike in mid-2021 and ramp-up to full capacity was expected to extend through into 2022. As a previously impaired CGU, and therefore carrying limited headroom, these factors were identified as conditions that could indicate that the uplifted carrying value may not be supportable and therefore the CGU was tested for impairment.

Using the fair value less cost of disposal methodology and discounting real-terms post-tax cash flows at 6.6%, we recognised a post-tax impairment charge of US\$197 million (pre-tax US\$269 million) representing the difference between the recoverable amount (US\$3,126 million) and the carrying value (US\$3,323 million).

6. Taxation

Prima facie tax reconciliation

Year ended 31 December	2022 US\$m	2021 US\$m Adjusted ⁽ⁱ⁾
Profit before taxation ^(a)	18,662	30,833
Prima facie tax payable at UK rate of 19% (2021: 19%) ^(b)	3,546	5,858
Higher rate of taxation of 30% on Australian earnings (2021: 30%)	1,550	2,598
Other tax rates applicable outside the UK and Australia	(17)	103
Tax effect of profit from equity accounted units, related impairments and expenses ^(a)	(109)	(198)
Impact of changes in tax rates	(11)	—
Resource depletion allowances	(40)	(52)
Recognition of previously unrecognised deferred tax assets ^(c)	(261)	(212)
Write-down of previously recognised deferred tax assets ^(d)	820	—
Utilisation of previously unrecognised deferred tax assets ^(e)	(37)	(200)
Unrecognised current year operating losses ^(f)	212	107
Adjustments in respect of prior periods ^(g)	(222)	40
Other items ^(h)	155	214
Total taxation charge	5,586	8,258

- (a) The Group profit before tax includes profit after tax of equity accounted units. Consequently, the tax effect on the profit from equity accounted units is included as a separate reconciling item in this prima facie tax reconciliation.
- (b) As a UK headquartered and listed Group, the reconciliation of expected tax on accounting profit to tax charge uses the UK corporation tax rate to calculate the prima facie tax payable. Rio Tinto is also listed in Australia, and the reconciliation includes the impact of the higher tax rate in Australia where a significant proportion of the Group's profits are currently earned. The impact of other tax rates applicable outside the UK and Australia is also included. The weighted average statutory corporate tax rate on profit before tax is approximately 29% (31 December 2021: 29%).
- (c) The recognition of previously unrecognised deferred tax assets relates primarily to Oyu Tolgoi where ongoing progress towards sustainable underground production in the current and comparative periods reduces the risk of tax losses that expire if not recovered against taxable profits within eight years. In the comparative period to 31 December 2021 the recognition of previously unrecognised deferred tax assets also included the recognition of prior year deferred tax assets in our Australian Aluminium business.
- (d) The write-down of previously recognised deferred tax assets relates to deferred tax assets of our US businesses. The enactment of the US Inflation Reduction Act of 2022 in August included a new Corporate Alternative Minimum Tax (CAMT) regime which applies a minimum tax rate of 15% on accounting profits. As a result of the new legislation, which does not give relief for some Federal deferred tax assets, the deferred tax assets previously recognised have been written down.
- (e) In 2021, the utilisation of previously unrecognised deferred tax assets arose due to higher than forecast profits in the year at Oyu Tolgoi.

6. Taxation (continued)

- (f) Unrecognised current year operating losses include tax losses around the Group for which no tax benefit is currently recognised due to uncertainty regarding whether suitable taxable profits will be earned in future to obtain value for the tax losses.
- (g) In the year to 31 December 2022, adjustments in respect of prior periods includes amounts related to the settlement of all tax disputes with the Australian Tax Office for the years 2010 to 2021.
- (h) Other items include non-deductible costs and withholding taxes, and various adjustments to provisions for taxation, the most significant of which relate to transfer pricing matters, including issues previously under discussion with the Australian Tax Office.
- (i) The presentation of the prima facie tax reconciliation comparatives has been revised. We have allocated the tax relating to exclusions (historically shown separately in the financial statements) to the appropriate tax line items above. The presentation of the impact of including profit after tax from equity accounted units within the Group profit before tax has also been revised as described in note (a) above.

Future tax developments

We continue to monitor the Organisation for Economic Co-operation and Development's (OECD) Two Pillar Solution to address the Tax Challenges Arising from the Digitalisation of the Economy. Pillar Two of those proposals seeks to apply a 15% global minimum tax and is expected to be enacted in 2023 with application to the Group from 1 January 2024. We note the release in July by the UK Government of draft legislation to implement a "Multinational Top-up Tax" on a country-by-country basis in line with Pillar Two.

We are in the process of evaluating the cash tax and accounting implications of the Pillar Two global minimum tax rules under IAS 12. Recognition of any impact will only occur once legislation has been substantively enacted.

7. Acquisitions and disposals

Acquisitions

2022

Following approval from Australia's Foreign Investment Review Board (FIRB), on 29 March 2022 we completed the acquisition of Rincon Mining Pty Limited, the owner of a lithium project in Argentina. Total cash consideration was US\$825 million. In determining whether Rincon's set of activities is a business, we have assessed whether it has inputs and substantive processes which together significantly contribute to the ability to create outputs. Based on this assessment, we have concluded that Rincon does not meet the definition of a business as defined by IFRS 3 "Business Combinations" and therefore no goodwill has been recorded. The transaction has therefore been treated as an asset purchase with US\$822 million of capitalised exploration and evaluation recorded for the principal economic resource. The balance of total consideration has been allocated to property, plant & equipment and other assets/liabilities. For the Group cash flow statement we determined that, since Rincon constitutes a group of companies, it is appropriate to present the cash outflow as "Acquisitions of subsidiaries, joint ventures and associates" rather than as separate asset purchases even though it did not meet the definition of a business combination.

7. Acquisitions and disposals (continued)

On 31 August 2022 we made a US\$25 million investment in McEwen Copper Inc. through our copper leaching technology venture, Nuton. We accounted for our holding in McEwen Copper Inc as an investment in associate, given our representation on the board.

On 16 December 2022 we acquired the remaining 49% share of Turquoise Hill Resources for expected consideration of US\$3.2 billion, inclusive of transaction costs. This transaction was not classified as a business combination as it related to the purchase of non-controlling interests in an entity already consolidated as a subsidiary. Accordingly the transaction did not result in the remeasurement of assets or liabilities and has been accounted for in the statement of equity as an adjustment to non-controlling interests and retained earnings.

At 31 December 2022 consideration paid amounted to US\$2,961 million (including US\$33 million of transaction costs, with further transaction costs of US\$41 million expected to be paid in 2023). Certain shareholders exercised their right to dissent to the transaction. In accordance with the terms of the circular, those dissenting shareholders have received initial consideration of C\$34.4 per share, with final consideration depending on the outcome and timing of dissent proceedings. We have included within other provisions (note 9) US\$211 million for additional consideration to be paid to the dissenting shareholders representing the difference between their initial consideration and C\$43 per share paid to all other shareholders.

2021

On 18 November 2021, we announced that we had completed the acquisition of the 40% share in the Diavik Diamond Mine in the Northwest Territories of Canada held by Dominion Diamond Mines, becoming the sole owner as a result. The transaction did not meet the definition of a business combination and therefore the incremental assets and liabilities were treated as an asset purchase. Prior to purchase, we recognised our existing 60% share of assets, revenues and expenses, with liabilities recognised according to its contractual obligations, and a corresponding 40% receivable or contingent asset representing the co-owner's share where applicable. Receivables relating to the co-owner's share were de-recognised and treated as part of the net purchase consideration on completion.

Disposals

As summarised in note 5, we sold our Roughrider uranium undeveloped project on 17 October 2022 for consideration of US\$150 million (US\$80 million in cash and US\$70 million in shares of Uranium Energy Corp). There were no other material disposals in 2022 or 2021.

8. Cash and cash equivalents

Closing cash and cash equivalents less overdrafts for the purposes of the cash flow statement differs from cash and cash equivalents on the Group balance sheet as per the following reconciliation:

	31 December 2022	31 December 2021
	US\$m	US\$m
Closing cash and cash equivalents less overdrafts		
Balance per Group balance sheet	6,775	12,807
Bank overdrafts repayable on demand (unsecured)	(1)	(2)
Balance per Group cash flow statement	6,774	12,805

9. Provisions including post-retirement benefits

	Post-retirement benefits and other employee entitlements ^(a)	Close-down, restoration and environmental ^(b)	Other provisions	Total 2022	Total 2021
	US\$m	US\$m	US\$m	US\$m	US\$m
Opening Balance	2,492	14,542	1,002	18,036	17,665
Change in accounting policy ^(c)	—	—	17	17	—
Revision to opening balance	2,492	14,542	1,019	18,053	17,665
Adjustment on currency translation	(99)	(699)	(43)	(841)	(546)
Adjustments to mining properties/right of use assets:					
– increases to existing and new provisions	—	520	4	524	521
Charged/(credited) to profit:					
– increases to existing and new provisions	231	541	365	1,137	2,130
– unused amounts reversed	(12)	(72)	(66)	(150)	(250)
– exchange losses on provisions	—	17	—	17	23
– amortisation of discount ^(d)	—	1,517	2	1,519	418
Utilised in the period	(254)	(609)	(176)	(1,039)	(900)
Re-measurement gains recognised in other comprehensive income	(701)	—	—	(701)	(687)
Transfers and other movements ^(e)	1	2	193	196	(338)
Closing balance	1,658	15,759	1,298	18,715	18,036
Balance sheet analysis:					
Current	353	1,142	554	2,049	2,106
Non-current	1,305	14,617	744	16,666	15,930
Total	1,658	15,759	1,298	18,715	18,036

(a) The provision for post-retirement benefits and other employee entitlements includes a provision for long service leave of US\$271 million (31 December 2021: US\$272 million), based on the relevant entitlements in certain Group operations and includes US\$32 million (31 December 2021: US\$60 million) of provision for redundancy and severance payments.

9. Provisions including post-retirement benefits (continued)

- (b) Close-down, restoration and environmental liabilities at 31 December 2022 have not been adjusted for closure-related receivables amounting to US\$351 million (31 December 2021: US\$410 million) due from the ERA trust fund and other financial assets held for the purposes of meeting closure obligations. These are included within “Receivables and other assets” on the balance sheet.
- (c) The way we calculate the cost of fulfilling a contract when assessing whether it is onerous has changed with the adoption of the amendments of IAS 37 (refer to note 2). This has led to an increase in the opening provision by US\$17 million.
- (d) The present value of close-down, restoration and environmental liabilities has been uplifted due to the re-measurement of underlying cash flows for inflation in the year. The amortisation of discount US\$1,517 million (31 December 2021: US\$415 million) is used to systematically uplift cash-flows including a forecast of full year inflation at the start of each reporting period. At the end of each half-year we updated the underlying cash-flows for the latest estimate of experienced inflation for the current financial year and recorded this as “changes to existing provisions”. For operating sites this adjustment usually results in a corresponding adjustment to Property, Plant and Equipment and for closed and fully impaired sites the adjustment is charged or credited to the income statement.
- (e) Transfers and other movements includes US\$211 million consideration to be paid to the dissenting shareholders of the Turquoise Hill Resources transaction. It represents the difference between their initial consideration of C\$34.4 per share and C\$43 per share paid to all other shareholders, with the final amount and timing to be determined by dissent proceedings. As a transaction with shareholders of a subsidiary in their capacity as owners, this adjustment has been made through equity.

10. Financial Instruments

Valuation hierarchy of financial instruments carried at fair value on a recurring basis

The table below shows the classifications of our financial instruments by valuation method in accordance with IFRS 13 at 31 December 2022 and 31 December 2021.

All instruments shown as being held at fair value have been classified as fair value through the profit and loss unless specifically footnoted.

	At 31 December 2022					At 31 December 2021				
	Held at fair value					Held at fair value				
	Total US\$m	Level 1 ^(a) US\$m	Level 2 ^(b) US\$m	Level 3 ^(c) US\$m	Held at amortised cost US\$m	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)	6,775	2,725	—	—	4,050	12,807	4,138	—	—	8,669
Investments in equity shares and funds ^(e)	222	147	—	75	—	117	64	—	53	—
Other investments, including loans ^(f)	2,275	2,018	—	229	28	2,682	2,422	—	238	22
Trade and other financial receivables ^(g)	2,765	18	1,306	—	1,441	2,762	1	1,163	—	1,598
Forward, option and embedded derivatives contracts, not designated as hedges ^(h)	67	—	16	51	—	133	—	48	85	—
Derivatives related to net debt ⁽ⁱ⁾	2	—	2	—	—	139	—	139	—	—
Liabilities										
Trade and other financial payables ^(j)	(6,485)	—	(30)	—	(6,455)	(6,356)	—	(67)	—	(6,289)
Forward, option and embedded derivatives contracts, designated as hedges ^(h)	(189)	—	—	(189)	—	(125)	—	—	(125)	—
Forward, option and embedded derivatives contracts, not designated as hedges ^(h)	(92)	—	(57)	(35)	—	(253)	—	(179)	(74)	—
Derivatives related to net debt ⁽ⁱ⁾	(692)	—	(692)	—	—	(240)	—	(240)	—	—

10. Financial Instruments (continued)

- (a) Valuation is based on unadjusted quoted prices in active markets for identical financial instruments.
- (b) Valuation is based on inputs that are observable for the financial instruments, which include quoted prices for similar instruments or identical instruments in markets which are not considered to be active, or inputs, either directly or indirectly based on observable market data.
- (c) Valuation is based on inputs that cannot be observed using market data (unobservable inputs). The change in valuation of our level 3 instruments for the year to 31 December 2022 is below:

	31 December 2022	31 December 2021
Level 3 financial assets and liabilities	US\$m	US\$m
Opening balance	177	395
Currency translation adjustments	(4)	(6)
Total realised gains/(losses) included in:		
– consolidated sales revenue	16	27
– net operating costs	365	(50)
Total unrealised gains included in:		
– net operating costs	124	68
Total unrealised losses transferred into other comprehensive income through cash flow hedges	(110)	(212)
Additions to financial assets/(liabilities)	41	(21)
Disposals/maturity of financial instruments	(478)	(6)
Transfers	—	(18)
Closing balance	131	177
Net gains included in the income statement for assets and liabilities held at year end	103	20

- (d) Our "cash and cash equivalents" of US\$6,775 million (31 December 2021:US\$12,807 million), includes US\$2,725 million (31 December 2021:US\$4,138 million) relating to money market funds which are treated as fair value through profit or loss (FVPL) under IFRS 9 with the fair value movements going into finance income.
- (e) Investments in equity shares and funds include US\$153 million (31 December 2021: US\$98 million) of equity shares, not held for trading, where we have irrevocably elected to present fair value gains and losses on revaluation in other comprehensive income (FVOCI). The election is made at an individual investment level.
- (f) Other investments, including loans, covers: cash deposits in rehabilitation funds, government bonds, managed investment funds and royalty receivables.
- (g) Trade receivables include provisionally priced invoices. The related revenue is initially based on forward market selling prices for the quotation periods stipulated in the contracts with changes between the provisional price and the final price recorded separately within "Other revenue". The selling price can be measured reliably for the Group's products, as it operates in active and freely traded commodity markets. At 31 December 2022, US\$1,234 million (31 December 2021: US\$1,114 million) of provisionally priced receivables were recognised.

10. Financial Instruments (continued)

- (h) Level 3 derivatives consist of derivatives embedded in electricity purchase contracts linked to the LME, midwest premium and billet premium with terms expiring between 2025 and 2036 (31 December 2021: 2025 and 2036).
- (i) Net debt derivatives include interest rate swaps and cross-currency swaps.
- (j) Trade and other financial payables comprise trade payables, other financial payables, accruals and amounts due to equity accounted units.

There were no material transfers between level 1 and level 2, or between level 2 and level 3 in the period ended 31 December 2022 or in the year ended 31 December 2021.

Valuation techniques and inputs

The techniques used to value our more significant fair value assets/(liabilities) categorised under Level 2 and Level 3 are summarised below:

Description	Fair Value US\$m	Valuation technique	Significant Inputs
Level 2			
Interest rate swaps	(356)	Discounted cash flows	Applicable market quoted swap yield curves Credit default spread
Cross currency interest rate swaps	(334)	Discounted cash flows	Applicable market quoted swap yield curves Credit default spread Market quoted FX rate
Provisionally priced receivables	1,234	Closely related listed product	Applicable forward quoted metal price

Level 3			
Derivatives embedded in electricity contracts	(208)	Option pricing model	LME forward aluminium price Midwest premium and billet premium
Royalty receivables	209	Discounted cash flows	Forward commodity price Mine production

Sensitivity analysis in respect of level 3 financial instruments

For assets/(liabilities) classified under level 3, the effect of changing the significant unobservable inputs on carrying value has been calculated using a movement that we deem to be reasonably probable.

To value the long-term aluminium embedded power derivatives, we use unobservable inputs when the term of the derivative extends beyond observable market prices. 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 for either reported period. The fair value of these derivatives is a net liability of US\$208 million at 31 December 2022 (31 December 2021: US\$146 million).

10. Financial Instruments (continued)

Royalty receivables include amounts arising from our divested coal businesses with a carrying value of US\$209 million (31 December 2021: US\$136 million). These are classified as "Other investments, including loans" within "Other financial assets". The fair values are determined using level 3 unobservable inputs. These royalty receivables include US\$81 million from forecast production beyond 2030. These have not been adjusted for potential changes in production rates that could occur due to climate change targets impacting the operator.

The main unobservable input is the long-term coal price used over the life of these royalty receivables. A 15% increase in the coal spot price would result in a US\$68 million increase (31 December 2021: US\$63 million increase) in the carrying value. A 15% decrease in the coal spot price would result in a US\$18 million decrease (31 December 2021: US\$53 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).

Fair values disclosure of financial instruments

The following table shows the carrying amounts and fair values of our borrowings including those which are not carried at an amount which approximates their fair value at 31 December 2022 and 31 December 2021. The fair values of our remaining financial instruments approximate their carrying values because of their short maturity, or because they carry floating rates of interest.

	31 December 2022		31 December 2021	
	Carrying value US\$m	Fair value US\$m	Carrying value US\$m	Fair value US\$m
Borrowings (including overdrafts)	11,071	11,192	12,168	13,904

Total borrowings with a carrying value of US\$6.6 billion (31 December 2021: US\$7.3 billion) relate to listed bonds with a fair value of US\$6.6 billion (31 December 2021: US\$8.7 billion) and are categorised as level 1 in the fair value hierarchy. Borrowings with a carrying value of US\$3.8 billion (31 December 2021: US\$4.2 billion) relate to project finance drawn down by Oyu Tolgoi, with a fair value of US\$3.9 billion (31 December 2021: US\$4.4 billion) using a number of level 3 valuation inputs. Our remaining borrowings have a fair value measured by discounting estimated cash flows with an applicable market quoted yield, and are categorised as level 2 in the fair value hierarchy.

11. Commitments and contingencies

Contingent liabilities (subsidiaries, joint operations, joint ventures and associates)

Contingent liabilities, 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 contingent liabilities, guarantees or indemnities being called is assessed as possible rather than probable or remote.

11. Commitments and contingencies (continued)

Contingent liabilities, indemnities and other performance guarantees were US\$498 million at 31 December 2022 (31 December 2021: US\$441 million).

There were no material contingent liabilities arising in relation to the Group's joint ventures and associates. We have 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 our 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 judgments may at times occur. The Group may in the future incur judgments 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.

Contingent liabilities - not quantifiable

The current status of contingent liabilities where it is not practicable to provide a reliable estimate of possible financial exposure is:

Litigation disputes

Litigation matter	Latest update
Timing of the impairment of Rio Tinto Coal Mozambique (US securities and exchange commission)	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 trial court dismissed an associated US class action on behalf of securities holders. In August 2020, the appeals court partially overturned the court's dismissal and the trial court dismissed the case again in 2022. The securities holders have appealed further to reinstate their claims, and the court has requested briefing in 2023. No provision has been recognised for this case.
2011 Contractual payments in Guinea	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. No provision has been recognised for this case.

11. Commitments and contingencies (continued)

At 31 December 2022, the outcomes of the matters remain uncertain, but they could ultimately expose the Group to material financial cost. We believe these cases are unwarranted and will defend the allegations vigorously. A dedicated Board committee continues to monitor the progress of these matters, as appropriate.

On 6 March 2022 we reached a settlement with ASIC regarding the disclosure of the impairment of Rio Tinto Coal Mozambique (RTCM), which was reflected in Rio Tinto's 2012 year-end accounts. This was previously disclosed as a contingent liability at 31 December 2021. As part of the court approved settlement, we paid a A\$750,000 penalty for a single contravention of our continuous disclosure obligations in the period 21 December 2012 to 17 January 2013, immediately preceding the impairment announcement. As part of this court approved settlement between ASIC and Rio Tinto, there were no findings of fraud or any systemic or widespread failure by Rio Tinto. The case against Tom Albanese and Guy Elliott brought by ASIC has been wholly dismissed.

Other contingent liabilities

We are modernising agreements with Traditional Owner groups in response to the Juukan Gorge incident. We have created provisions, within "Other provisions", based on our best estimate of historical claims; however, the process is incomplete and it is possible that further claims could arise relating to past events.

Close-down and restoration provisions are not recognised for those operations that have no known restrictions on their lives as the date of closure cannot be reliably estimated. This applies primarily to our Canadian aluminium smelters, which are not dependent upon a specific orebody and have access to indefinite-lived power from owned hydro-power stations with water rights permitted by local governments. In these instances, a closure obligation may exist at the reporting date; however, due to the indefinite nature of asset lives it is not possible to arrive at a sufficiently reliable estimate for the purposes of recognising a provision. Close-down and restoration provisions are recognised at these operations for separately identifiable closure activities which can be reasonably estimated, such as the demolition and removal of fixed structures after a pre-determined period. Any contingent liability for these assets will crystallise into a closure provision if and when a decision is taken to cease operations.

Capital commitments at 31 December 2022

Capital commitments, excluding the Group's share of joint venture capital commitments, were US\$3,354 million (31 December 2021: US\$2,551 million). 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. It does not include the estimated incremental capital expenditure relating to decarbonisation projects of US\$7.5 billion between 2022 and 2030 unless otherwise contractually committed. On a legally enforceable basis, capital commitments would be approximately US\$1.0 billion (2021: US\$1.1 billion) as many of the contracts relating to the Group's projects have various cancellation clauses.

The Group's share of joint venture capital commitments was US\$15 million at 31 December 2022 (31 December 2021: US\$11 million).

12. Purchase of Turquoise Hill Resources Ltd

On 16 December 2022, we purchased the remaining 49% share of Turquoise Hill Resources Ltd. The Group now holds a 66% direct interest in Oyu Tolgoi LLC (OT). Up until December 2022 the Group had a 50.79% interest in Turquoise Hill Resources Ltd, which held a 66% interest in OT. The Group therefore had a 33.5% indirect interest in OT.

Summarised below is the financial information of Oyu Tolgoi 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.

	Oyu Tolgoi 2022 US\$m	Oyu Tolgoi 2021 US\$m
Income statement summary for the year ended 31 December		
Revenue	1,424	1,971
(Loss)/profit after tax	(224)	465
– attributable to non-controlling interests	(159)	285
– attributable to Rio Tinto	(65)	180
Total comprehensive (loss)/income	(224)	465
Balance sheet summary as at 31 December		
Non-current assets	13,662	12,199
Current assets	753	523
Current liabilities	(4,253)	(3,172)
Non-current liabilities	(10,731)	(9,874)
Net assets	(569)	(324)
– attributable to non-controlling interests	(210)	(89)
– attributable to Rio Tinto	(359)	(235)
Cash flow statement summary for the year ended 31 December		
Cash flow from operations	406	851

Oyu Tolgoi: approval for commencement of underground operations

On 25 January 2022, Rio Tinto, Turquoise Hill Resources Ltd (Turquoise Hill) and the Government of Mongolia announced their agreement, and unanimous approval by the Board of Oyu Tolgoi, to commence the underground operations.

As part of a comprehensive project budget and funding package undertaken between the parties in reaching this agreement, Turquoise Hill agreed to waive in full, funding balances arising from a carry account loan with Erdenes Oyu Tolgoi (Erdenes) of US\$2.4 billion. This comprised the amount of common share investments in Oyu Tolgoi LLC funded by Turquoise Hill on behalf of Erdenes to build the project to date, plus US\$1.0 billion of accrued interest. The waiver took effect on 25 January 2022. Rio Tinto and Turquoise Hill also agreed a plan to deliver the funding required until sustainable underground production is reached.

12. Purchase of Turquoise Hill Resources Ltd (continued)

Prior to the waiver agreement, the funding balances owing from Erdenes to Turquoise Hill were expected to be repaid via a pledge over Erdenes' share of future Oyu Tolgoi common share dividends. For this reason, and because the arrangement was between Turquoise Hill and Erdenes rather than with Oyu Tolgoi LLC itself, both the principal and interest were treated as transactions with owners acting in their capacity as owners. Consequently, at 31 December 2021, related amounts were recorded as a reduction in the share of equity attributable to non-controlling interests, resulting in an increase to the effective interest in Oyu Tolgoi attributable to owners of Rio Tinto.

Funding balances owing from Erdenes to Turquoise Hill were not classified as loan receivables in the Group Balance Sheet, and there was no interest income shown in the Group Income Statement. Accumulation of interest on the funding balances increased the share of retained earnings attributable to Rio Tinto as it accrued.

Waiving the funding balances owing from Erdenes to Turquoise Hill increases Erdenes' economic share arising through entitlement to cash flows from future dividends of Oyu Tolgoi. In the 2022 Group results, there is no Income Statement charge for loan forgiveness or write-off as a result of the waiver, and net assets and liabilities for Oyu Tolgoi included in the Group Balance sheet remained unchanged as a result of this transaction. There was no exchange of cash or other financial assets between parties and there has been no change to the underlying free cash flows of the Oyu Tolgoi operations and development project. The waiver did not have an impact on the Group's assessment of impairment indicators for either 2021 or 2022, since it related to the project shareholders' funding arrangements rather than the economic capability of the Cash Generating Unit itself. A reallocation of the net asset value allocation between the owners of Oyu Tolgoi has been recorded in the Group Statement of Changes in Equity for 2022 by reducing equity attributable to owners of Rio Tinto and increasing equity attributable to non-controlling interests.

13. Events after the balance sheet date

On 16 February 2023, we re-financed the US\$3.9 billion Oyu Tolgoi project finance facility with a syndicate of international financial institutions, export credit agencies and commercial lenders. The lenders have agreed to a deferral of the principal repayments by three years to June 2026 and to an extension of the final maturity date by five years from 2030 to 2035. The terms and conditions are broadly unchanged and lenders continue to benefit from the Debt Service Undertaking from Turquoise Hill Resources Limited and the Completion Support Undertaking from Rio Tinto plc.

There were no other significant events after the balance sheet date requiring disclosure.

Rio Tinto financial information by business unit

		Segmental revenue ^(a)		Underlying EBITDA ^(a)		Depreciation and amortisation		Underlying earnings ^(a)	
Year ended 31 December	Rio Tinto interest %	2022 US\$m	2021 US\$m	2022 US\$m	2021 US\$m	2022 US\$m	2021 US\$m	2022 US\$m	2021 US\$m
Iron Ore									
Pilbara	(b)	29,313	39,111	18,474	27,837	2,011	2,003	11,075	17,544
Dampier Salt	68.4	352	298	56	39	19	20	19	10
Evaluation projects/other	(c)	2,711	2,147	33	(81)	—	—	53	(79)
Intra-segment	(c)	(1,470)	(1,974)	49	(203)	—	—	35	(152)
Total Iron Ore Segment		30,906	39,582	18,612	27,592	2,030	2,023	11,182	17,323
Aluminium									
Bauxite		2,396	2,203	618	619	361	328	83	174
Alumina		3,215	2,743	289	569	200	165	17	306
Primary Metal		7,561	6,706	2,426	2,592	704	694	1,266	1,454
Pacific Aluminium		3,102	2,947	497	693	135	103	248	426
Intra-segment and other		(3,138)	(2,718)	12	14	—	(1)	(8)	192
Integrated operations		13,136	11,881	3,842	4,487	1,400	1,289	1,606	2,552
Other product group items		973	814	25	26	—	—	15	17
Product group operations		14,109	12,695	3,867	4,513	1,400	1,289	1,621	2,569
Evaluation projects/other		—	—	(195)	(131)	—	—	(149)	(101)
Total Aluminium Segment		14,109	12,695	3,672	4,382	1,400	1,289	1,472	2,468
Copper									
Kennecott	100.0	1,923	2,528	857	1,142	624	538	(9)	513
Escondida	30.0	2,628	2,935	1,641	2,013	330	348	798	1,003
Oyu Tolgoi and Turquoise Hill	(d)	1,424	1,971	449	1,213	194	213	130	325
Product group operations		5,975	7,434	2,947	4,368	1,148	1,099	919	1,841
Simandou iron ore project	(e)	—	—	(189)	(58)	—	—	(145)	(43)
Evaluation projects/other		724	393	(382)	(341)	5	4	(253)	(219)
Total Copper Segment		6,699	7,827	2,376	3,969	1,153	1,103	521	1,579
Minerals									
Iron Ore Company of Canada	58.7	2,818	3,526	1,381	2,026	207	197	475	734
Rio Tinto Iron & Titanium	(f)	2,366	1,791	799	470	224	213	369	176
Rio Tinto Borates	100.0	742	592	155	89	54	51	80	32
Diamonds	(g)	816	501	330	180	45	12	151	99
Product group operations		6,742	6,410	2,665	2,765	530	473	1,075	1,041
Evaluation projects/other		12	71	(246)	(162)	1	1	(226)	(153)
Total Minerals Segment		6,754	6,481	2,419	2,603	531	474	849	888
Reportable segments total		58,468	66,585	27,079	38,546	5,114	4,889	14,024	22,258
Other operations	(h)	192	251	(16)	(28)	272	199	(340)	(84)
Inter-segment transactions		(256)	(268)	24	42			26	19
Central pension costs, share-based payments, insurance and derivatives				377	110			374	133
Restructuring, project and one-off costs				(173)	(80)			(87)	(51)
Central costs				(766)	(613)	94	106	(651)	(585)
Central exploration and evaluation				(253)	(257)			(209)	(215)
Net interest								138	(95)
Underlying EBITDA/earnings				26,272	37,720			13,275	21,380
Items excluded from underlying EBITDA/earnings				269	(811)			(855)	(286)
Reconciliation to Group income statement									
Share of equity accounted unit sales and intra-subsidiary/equity accounted unit sales		(2,850)	(3,073)						
Impairment charges net of reversals				(52)	(269)				
Depreciation and amortisation in subsidiaries excluding capitalised depreciation				(4,871)	(4,525)				
Depreciation and amortisation in equity accounted units				(470)	(497)	(470)	(497)		
Taxation and finance items in equity accounted units				(640)	(759)				
Finance items				(1,846)	(26)				
Consolidated sales revenue/profit before taxation/ depreciation and amortisation/net earnings		55,554	63,495	18,662	30,833	5,010	4,697	12,420	21,094

Rio Tinto financial information by business unit (continued)

	Rio Tinto interest %	Capital expenditure ⁽ⁱ⁾ for the year ended 31 December		Operating assets ⁽ⁱ⁾ as at	
		2022 US\$m	Adjusted 2021 US\$m	31 December 2022 US\$m	31 December 2021 US\$m
Iron Ore					
Pilbara	(b)	2,906	3,928	17,510	16,850
Dampier Salt	68.4	34	19	153	159
Evaluation projects/other	(c)	—	—	835	1,283
Intra-segment	(c)	—	—	(220)	(255)
Total Iron Ore Segment		2,940	3,947	18,278	18,037
Aluminium					
Bauxite		161	155	2,395	2,542
Alumina		356	362	2,372	2,258
Primary Metal		752	690	9,343	9,734
Pacific Aluminium		108	93	155	228
Intra-segment and other		—	—	629	839
Total Aluminium Segment		1,377	1,300	14,894	15,601
Copper					
Kennecott	100.0	563	411	2,006	2,404
Escondida	30.0	—	—	2,792	2,515
Oyu Tolgoi and Turquoise Hill	(d)	1,056	911	13,477	8,998
Product group operations		1,619	1,322	18,275	13,917
Simandou iron ore project	(e)	—	—	(22)	13
Evaluation projects/other		3	6	165	210
Total Copper Segment		1,622	1,328	18,418	14,140
Minerals					
Iron Ore Company of Canada	58.7	366	377	1,146	1,077
Rio Tinto Iron & Titanium	(f)	217	184	3,348	3,369
Rio Tinto Borates	100.0	34	43	496	487
Diamonds	(g)	48	25	(106)	(19)
Product group operations		665	629	4,884	4,914
Evaluation projects/other		14	15	874	43
Total Minerals Segment		679	644	5,758	4,957
Reportable segments total		6,618	7,219	57,348	52,735
Other operations	(h)	53	(13)	(1,883)	(1,533)
Inter-segment transactions				12	(12)
Other items		79	117	(1,114)	(1,334)
Total		6,750	7,323	54,363	49,856
Add back: Proceeds from disposal of property, plant and equipment		—	61		
Total purchases of property, plant & equipment and intangibles as per cash flow statement		6,750	7,384		
Add: Net (debt)/cash				(4,188)	1,576
Equity attributable to owners of Rio Tinto				50,175	51,432

Notes to financial information by business unit

Business units are classified according to the Group's management structure.

- (a) Segmental revenue, Underlying EBITDA and Capital expenditure are defined and calculated in note 3 from pages 45 to 49. Underlying Earnings is defined and calculated within the Alternative performance measures section on pages 69 to 78.
- (b) 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.
- (c) Segmental revenue, Underlying EBITDA, Underlying earnings and Operating assets within Evaluation projects/other include activities relating to the shipment and blending of Pilbara and Iron Ore Company of Canada (IOC) iron ore inventories held at portside in China and sold to domestic customers. Transactions between Pilbara and our portside trading business are eliminated through the Iron Ore "intra-segment" line and transactions between IOC and the portside trading business are eliminated through "inter-segment transactions".
- (d) Until 16 December 2022, our interest in Oyu Tolgoi was held indirectly through our 50.8% investment in Turquoise Hill Resources Ltd (TRQ), where TRQ's principal asset was its 66% investment in Oyu Tolgoi LLC, which owned the Oyu Tolgoi copper-gold mine. Following the purchase of TRQ we now directly hold a 66% investment in Oyu Tolgoi LLC.
- (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 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.
- (f) Includes our interests in Rio Tinto Iron and Titanium Quebec Operations (100%), QIT Madagascar Minerals (QMM, 80%) and Richards Bay Minerals (attributable interest of 74%).
- (g) Includes our interests in Argyle (100%) residual operations which relates to the sale of remaining inventory and Diavik. Until 18 November 2021 we recognised our 60% share of assets, revenue and expenses relating to the Diavik joint venture. Liabilities were recognised according to Diavik Diamond Mine Inc's contractual obligations at 100%, with a corresponding 40% receivable or contingent asset representing the co-owner's share where applicable. Post acquisition, we now consolidate (100%) of the Diavik Diamond Mine. From 1 June 2021, management responsibility for rehabilitation of the Argyle site moved from Minerals to Rio Tinto Closure (RTC), hence the Argyle closure is reported in Other operations effective from 1 January 2021. Refer to (h).
- (h) Other operations include our 100% interest in the Gove alumina refinery (under rehabilitation), Rio Tinto Marine, and the remaining legacy liabilities of Rio Tinto Coal Australia. These include provisions for onerous contracts, in relation to rail infrastructure capacity, partly offset by financial assets and receivables relating to contingent royalties and disposal proceeds. From 16 June 2022, Commercial Treasury and related central costs are reported as part of 'Other operations' instead of 'Other items' in previous periods. We have not restated prior year balances as the impact was not significant. From 1 January 2021, Uranium moved from Minerals to Other operations and Argyle closure has been included in Other operations.

Notes to financial information by business unit (continued)

- (i) 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 as derived from the Group cash flow statement. The details provided include 100% of subsidiaries' capital expenditure and Rio Tinto's share of the capital expenditure of joint operations but exclude equity accounted units. We have adjusted the comparatives for this change in definition.
- (j) Operating assets of the Group represents equity attributable to Rio Tinto adjusted for net (debt)/cash. Operating assets of subsidiaries, joint operations and the Group's share relating to equity accounted units are made up of net assets adjusted for net (debt)/cash and post-retirement assets and liabilities, net of tax. Operating assets are stated after the deduction of non-controlling interests; these are calculated by reference to the net assets of the relevant companies (i.e. inclusive of such companies' debt and amounts due to or from Rio Tinto Group companies).

Alternative performance measures

The Group presents certain alternative performance measures (APMs) which are reconciled to directly comparable IFRS financial measures below. These APMs are used by management to assess the performance of the business and provide additional information, which investors may find useful. APMs are presented in order to give further insight into the underlying business performance of the Group's operations.

APMs are not consistently defined and calculated by all companies, including those in the Group's industry. Accordingly, these measures used by the Group may not be comparable with similarly titled measures and disclosures made by other companies. Consequently, these APMs should not be regarded as a substitute for the IFRS measures and should be considered supplementary to those measures.

The following tables present the Group's key financial measures not defined according to IFRS and a reconciliation between those APMs and their nearest respective IFRS measures.

APMs derived from the income statement

The following income statement measures are used by the Group to provide greater understanding of the underlying business performance of its operations and to enhance comparability of reporting periods. They indicate the underlying commercial and operating performance of our assets including revenue generation, productivity and cost management.

Segmental revenue

Segmental revenue includes consolidated sales revenue plus the equivalent sales revenue of equity accounted units in proportion to our equity interest (after adjusting for sales to/from subsidiaries). The reconciliation can be found in Note 3.

Underlying EBITDA

Underlying EBITDA represents profit before tax, net finance items, depreciation and amortisation adjusted to exclude the EBITDA impact of items that do not reflect the underlying performance of our reportable segments. The reconciliation of profit after tax to underlying EBITDA can be found in the segmental information note on page 47.

Alternative performance measures (continued)

Underlying EBITDA margin

Underlying EBITDA margin is defined as Group underlying EBITDA divided by the aggregate of consolidated sales revenue and our share of equity account unit sales after eliminations.

	2022 US\$m	2021 US\$m
Underlying EBITDA	26,272	37,720
Consolidated sales revenue	55,554	63,495
Share of equity accounted unit sales and inter-subsiary/equity accounted unit sales eliminations	2,850	3,073
	58,404	66,568
Underlying EBITDA margin	45 %	57 %

Pilbara underlying FOB EBITDA margin

The Pilbara underlying free on board (FOB) EBITDA margin is defined as Pilbara underlying EBITDA divided by Pilbara segmental revenue, excluding freight revenue.

	2022 US\$m	2021 US\$m
Pilbara		
Underlying EBITDA	18,474	27,837
Pilbara segmental revenue	29,313	39,111
Less: Freight revenue	(2,206)	(2,707)
Pilbara segmental revenue, excluding freight revenue	27,107	36,404
Pilbara underlying FOB EBITDA margin	68 %	76 %

Underlying EBITDA margin from Aluminium integrated operations

Underlying EBITDA margin from integrated operations is defined as underlying EBITDA divided by segmental revenue.

	2022 US\$m	2021 US\$m
Aluminium		
Underlying EBITDA - integrated operations	3,842	4,487
Segmental revenue - integrated operations	13,136	11,881
Underlying EBITDA margin from integrated operations	29 %	38 %

Alternative performance measures (continued)

Underlying EBITDA margin (product group operations)

Underlying EBITDA margin (product group operations) is defined as underlying EBITDA divided by segmental revenue.

	2022 US\$m	2021 US\$m
Copper		
Underlying EBITDA - product group operations	2,947	4,368
Segmental revenue - product group operations	5,975	7,434
Underlying EBITDA margin - product group operations	49 %	59 %
	2022 US\$m	2021 US\$m
Minerals		
Underlying EBITDA - product group operations	2,665	2,765
Segmental revenue - product group operations	6,742	6,410
Underlying EBITDA margin - product group operations	40 %	43 %

Underlying earnings

Underlying earnings represents net earnings attributable to the owners of Rio Tinto, adjusted to exclude items that do not reflect the underlying performance of the Group's operations.

Exclusions from underlying earnings are those gains and losses that, individually or in aggregate with similar items, are of a nature and size to require exclusion in order to provide additional insight into underlying business performance.

The following items are excluded from net earnings in arriving at underlying earnings in each year irrespective of materiality:

- Net gains/(losses) on disposal of interests in subsidiaries.
- 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.
- Adjustments to closure provisions where the adjustment is associated to an impairment charge, for legacy sites where the disturbance or environmental contamination relates to the pre-acquisition period.

Alternative performance measures (continued)

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.

Exclusions from underlying earnings relating to equity accounted units are stated after tax and included in the column "Pre-tax".

Reconciliation of underlying earnings to net earnings

	Pre-tax 2022 US\$m	Taxation 2022 US\$m	Non- controlling interests 2022 US\$m	Net amount 2022 US\$m	Net amount 2021 US\$m
Underlying earnings	18,613	(4,684)	(654)	13,275	21,380
Items excluded from underlying earnings					
Impairment charges net of reversals ^(a)	(52)	—	—	(52)	(197)
Loss on disposal of interest in subsidiary ^(b)	(105)	—	—	(105)	—
Foreign exchange and derivative (losses)/gains:					
– Foreign exchange gains on external net debt, intragroup balances and derivatives ^(c)	244	(25)	(3)	216	726
– Losses on currency and interest rate derivatives not qualifying for hedge accounting ^(d)	(435)	60	2	(373)	(127)
– Gains/(losses) on embedded commodity derivatives not qualifying for hedge accounting ^(e)	29	(8)	(1)	20	(53)
Gain recognised by Kitimat relating to LNG Canada's project ^(f)	116	(10)	—	106	336
Change in closure estimates (non-operating and fully impaired sites) ^(g)	(180)	2	—	(178)	(971)
Gain on sale of the Cortez Royalty ^(h)	432	(101)	—	331	—
Write-off of Federal deferred tax assets in the United States ⁽ⁱ⁾	—	(820)	—	(820)	—
Total excluded from underlying earnings	49	(902)	(2)	(855)	(286)
Net earnings	18,662	(5,586)	(656)	12,420	21,094

(a) Refer to Note 5

(b) Relates to the recycling of currency translation reserve on sale of the Roughrider deposit, refer to Note 5.

(c) Exchange gains on external net debt and intragroup balances included post-tax foreign exchange losses on net debt of US\$262 million offset by post-tax gains of US\$478 million on intragroup balances, primarily as a result of the Australian dollar weakening against the US dollar. In 2021, exchange gains on external net debt and intragroup balances included post-tax foreign exchange gains on intragroup balances of US\$913 million partially offset by post-tax losses of US\$187 million on external net debt/cash, primarily as a result of a weakening Australian dollar against the US dollar during the year.

Alternative performance measures (continued)

- (d) 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.
- (e) 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. 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.
- (f) During the first half of 2022, LNG Canada elected to terminate their option to purchase additional land and facilities for expansion of their operations at Kitimat, Canada. The resulted gain has been excluded from underlying earnings consistent with prior years as it is part of a series of transactions that together were material. On 3 December 2021 we gained control over a new wharf at Kitimat, Canada that was built and paid for by LNG Canada. The gain on recognition was excluded from underlying earnings on the grounds of individual magnitude and consistency with the associated impairment charge, refer to note 5.
- (g) In 2022 the charge relates to inflationary increases to the closure provision for non-operating and fully impaired sites in excess of the unwind of the discount. On 2 February 2022, Energy Resources of Australia released preliminary findings from its reforecast of the total undiscounted cost schedule for the Ranger rehabilitation project. Information available from this study resulted in the Group recording an increase to the closure provision of US\$510 million at 31 December 2021. Other increases to closure estimates charged to the income statement in 2021 related to Diavik, Gove refinery, and a number of the Group's legacy sites where the environmental damage preceded ownership by Rio Tinto. The adjustments at Energy Resources Australia and Gove refinery were recognised in the income statement as these are non-operating sites, and excluded from underlying earnings due to the magnitude of the individual updates and materiality when aggregated.
- (h) On 2 August 2022, we completed the sale of a gross production royalty which was retained following the disposal of the Cortez Complex in 2008. The gain recognised on sale of the royalty has been excluded from underlying earnings on the grounds of individual magnitude.
- (i) In 2022 we wrote off US\$0.8 billion of our deferred tax assets in the United States following the introduction of the Corporate Alternative Minimum Tax legislation, refer to Note 6.

Alternative performance measures (continued)

Basic underlying earnings per share

Basic underlying earnings per share is calculated as underlying earnings divided by the weighted average number of shares outstanding during the year.

Year ended 31 December	2022	2021
Net earnings (US\$ million)	12,420	21,094
Weighted average number of shares (millions)	1,619.8	1,618.4
Basic earnings per ordinary share (cents)	766.8	1,303.4
Items excluded from underlying earnings per share (cents) ^(a)	52.8	17.7
Basic underlying earnings per ordinary share (cents)	819.6	1,321.1

(a) Calculation of items excluded from underlying earnings per share	2022	2021
Income excluded from underlying earnings (refer to page 72)	855	286
Weighted average number of shares (millions)	1,619.8	1,618.4
Items excluded from underlying earnings per share (cents)	52.8	17.7

We have provided basic underlying earnings per share as this allows the comparability of underlying financial performance adjusted to exclude items, that do not reflect the underlying performance of the Group's operations.

Interest cover

Interest cover is a financial metric used when managing our risk. It represents the number of times finance income and finance costs (including amounts capitalised) are covered by profit before taxation before finance income, finance costs, share of profit after tax of equity accounted units and items excluded from underlying earnings, plus dividends from equity accounted units.

Year ended 31 December	2022 US\$m	2021 US\$m
Profit before taxation	18,662	30,833
Add back		
Finance income	(179)	(64)
Finance costs	335	243
Share of profit after tax of equity accounted units	(777)	(1,042)
Items excluded from underlying earnings	(49)	508
Add: Dividends from equity accounted units	879	1,431
Calculated earnings	18,871	31,909
Finance income	179	64
Finance costs	(335)	(243)
Add: Amounts capitalised	(416)	(358)
Total finance income/costs before capitalisation	(572)	(537)
Interest cover	33	59

Alternative performance measures (continued)

Payout ratio

The payout ratio is used by us to guide the dividend policy we implemented in 2016, under which we have sought to return 40-60% of underlying earnings, on average through the cycle to shareholders as dividends. It is calculated as total equity dividends per share to owners of Rio Tinto declared in respect of the financial year divided by underlying earnings per share (as defined above). Dividends declared usually include an interim dividend paid in the year, and a final dividend paid after the end of the year. Any special dividends declared in respect of the financial year are also included.

For year ended 31 December	2022 (cents)	2021 (cents)
Interim dividend declared per share	267.0	376.0
Interim special dividend declared per share	—	185.0
Final dividend declared per share	225.0	417.0
Final special dividend declared per share	—	62.0
Total dividend declared per share for the year	492.0	1,040.0
Underlying earnings per share	819.6	1,321.1
Payout ratio	60 %	79 %

APMs derived from cash flow statement

Capital expenditure

Capital expenditure includes the net sustaining and development expenditure on property, plant and equipment and on intangible assets. This is equivalent to "Purchases of property, plant and equipment and intangible assets" in the cash flow statement less "Sales of property, plant and equipment and intangible assets".

This measure is used to support management's objective of effective and efficient capital allocation as we need to invest in existing assets in order to maintain and improve productive capacity, and in new assets to grow the business.

Rio Tinto share of capital investment

Rio Tinto's share of capital investment represents the Group's economic investment in capital projects. It has been newly introduced during the year to better represent the Group's share of funding for capital projects which are jointly funded with other shareholders, and which may differ from the consolidated basis included in the Capital expenditure APM. This better reflects the Group's approach to capital allocation.

Alternative performance measures (continued)

The measure is based upon the Capital expenditure APM, adjusted to deduct equity or shareholder loan financing provided to partially owned subsidiaries by non-controlling interests in respect of major capital projects in the period. Where funding which would otherwise be provided directly by shareholders is replaced with project financing, an adjustment is also made to deduct the share of project financing attributable to the non-controlling interest. This adjustment is not made in cases where Rio Tinto has unilaterally guaranteed this project financing. Lastly, funding contributed by the Group to Equity Accounted Units for its share of investment in their major capital projects is added to the measure. No adjustment is made to the Capital expenditure APM where capital expenditure is funded from the operating cash flows of the subsidiary or Equity Accounted Unit.

In the current and prior years the Capital expenditure APM and Rio Tinto share of capital investment are identical. However, the capital guidance on page 6 has been provided on this new basis and a reconciliation of the measure will be published in future periods when the two measures differ.

Free cash flow

Free cash flow is defined as net cash generated from operating activities minus purchases of property, plant and equipment and intangibles and payments of lease principal, plus proceeds from the sale of property, plant and equipment and intangible assets.

This measures the net cash returned by the business after the expenditure of sustaining and development capital. This cash can be used for shareholder returns, reducing debt and other investing/financing activities.

Year ended 31 December	2022 US\$m	2021 US\$m
Net cash generated from operating activities	16,134	25,345
Less: Purchase of property, plant and equipment and intangible assets	(6,750)	(7,384)
Less: Lease principal payments	(374)	(358)
Add: Sales of property, plant and equipment and intangible assets	—	61
Free cash flow	9,010	17,664

Alternative performance measures (continued)

APMs derived from the balance sheet

Consolidated net (debt)/cash

Net (debt)/cash is total borrowings plus lease liabilities less cash and cash equivalents and other liquid investments, adjusted for derivatives related to net (debt)/cash.

Net (debt)/cash measures how we are managing our balance sheet and capital structure.

	Financing liabilities			Other assets		Net (debt)/cash US\$m
	Borrowings excluding overdrafts ^(a) US\$m	Lease liabilities ^(b) US\$m	Net debt related derivatives ^(c) US\$m	Cash and cash equivalents including overdrafts ^(a) US\$m	Other investments ^(d) US\$m	
Year ended 31 December						
Analysis of changes in consolidated net (debt)/cash						
Opening balance	(12,166)	(1,363)	(101)	12,805	2,401	1,576
Foreign exchange adjustment	118	69	(92)	15	—	110
Cash movements excluding exchange movements	470	374	(3)	(6,046)	(352)	(5,557)
Other non-cash movements	508	(280)	(494)	—	(51)	(317)
Closing balance	(11,070)	(1,200)	(690)	6,774	1,998	(4,188)

(a) Borrowings excluding overdrafts, of US\$11,070 million (2021:US\$12,166 million) differs from Borrowings on the balance sheet as it excludes bank overdrafts of US\$1 million (2021: US\$2 million) which has been included in cash and cash equivalents for the net (debt)/cash reconciliation.

(b) Other non-cash movements in lease liabilities include the net impact of additions, modifications and terminations during the year.

(c) Included within “Net (debt)/cash-related derivatives” are interest rate and cross currency interest rate swaps that are in hedge relationships with the Group's debt.

(d) Other investments includes US\$1,998 million (2021: US\$2,401 million) of highly liquid financial assets held in managed investment funds classified as held for trading.

Alternative performance measures (continued)

Net gearing ratio

Net gearing ratio is defined as net (debt)/cash divided by the sum of net (debt)/cash and total equity at the end of each year. It demonstrates the degree to which the Group's operations are funded by debt versus equity.

	31 December 2022 US\$m	31 December 2021 US\$m
Net (debt)/cash	(4,188)	1,576
Net (debt)/cash	(4,188)	1,576
Total equity	(52,274)	(56,590)
Net (debt)/cash plus total equity	(56,462)	(55,014)
Net gearing ratio	7%	(3%)

Underlying return on capital employed

Underlying return on capital employed ("ROCE") is defined as underlying earnings excluding net interest divided by average capital employed (operating assets).

Underlying ROCE measures how efficiently we generate profits from investment in our portfolio of assets.

	2022 US\$m	2021 US\$m
Profit after tax attributable to owners of Rio Tinto (net earnings)	12,420	21,094
Items added back to derive underlying earnings (refer to page 72)	855	286
Underlying earnings	13,275	21,380
Add/(deduct):		
Finance income per the income statement	(179)	(64)
Finance costs per the income statement	335	243
Tax on finance cost	(238)	(52)
Non-controlling interest share of net finance costs	(98)	(64)
Net interest cost in equity accounted units (Rio Tinto share)	42	32
Net interest	(138)	95
Adjusted underlying earnings	13,137	21,475
Equity attributable to owners of Rio Tinto - beginning of the year	51,432	47,054
Net (cash)/debt - beginning of the year	(1,576)	664
Operating assets - beginning of the year	49,856	47,718
Equity attributable to owners of Rio Tinto - end of the year	50,175	51,432
Net debt/(cash) - end of the year	4,188	(1,576)
Operating assets - end of the year	54,363	49,856
Average operating assets	52,110	48,787
Underlying return on capital employed	25 %	44 %

Metal prices and exchange rates

		2022	2021	Increase/ (Decrease)
Metal prices - average for the period				
Copper	- US cents/lb	398	422	(6)%
Aluminium	- US\$/tonne	2,703	2,480	9 %
Gold	- US\$/troy oz	1,800	1,799	0 %

	Full-year average			Year-end		
Exchange rates against the US dollar	2022	2021	Increase/ (Decrease)	2022	2021	Increase/ (Decrease)
Pound sterling	1.24	1.38	(10)%	1.21	1.35	(10)%
Australian dollar	0.69	0.75	(8)%	0.68	0.73	(7)%
Canadian dollar	0.77	0.80	(4)%	0.74	0.78	(5)%
Euro	1.05	1.18	(11)%	1.07	1.13	(5)%
South African rand	0.061	0.068	(10)%	0.059	0.063	(6)%

Forward-looking statements

This report includes “forward-looking statements” within the meaning of the Private Securities Litigation Reform Act of 1995. All statements other than statements of historical facts included in this report, including, without limitation, those regarding Rio Tinto’s financial position, business strategy, plans and objectives of management for future operations (including development plans and objectives relating to Rio Tinto’s products, production forecasts and reserve and resource positions), are forward-looking statements. The words “intend”, “aim”, “project”, “anticipate”, “estimate”, “plan”, “believes”, “expects”, “may”, “should”, “will”, “target”, “set to” or similar expressions, commonly identify such forward-looking statements.

Such forward-looking statements involve known and unknown risks, uncertainties and other factors which may cause the actual results, performance or achievements of Rio Tinto, or industry results, to be materially different from any future results, performance or achievements expressed or implied by such forward-looking statements. Such forward-looking statements are based on numerous assumptions regarding Rio Tinto’s present and future business strategies and the environment in which Rio Tinto will operate in the future. Among the important factors that could cause Rio Tinto’s actual results, performance or achievements to differ materially from those in the forward-looking statements include, but are not limited to: an inability to live up to Rio Tinto’s values and any resultant damage to its reputation; the impacts of geopolitics on trade and investment; the impacts of climate change and the transition to a low-carbon future; an inability to successfully execute and/or realise value from acquisitions and divestments; the level of new ore resources, including the results of exploration programmes and/or acquisitions; disruption to strategic partnerships that play a material role in delivering growth, production, cash or market positioning; damage to Rio Tinto’s relationships with communities and governments; an inability to attract and retain requisite skilled people; declines in commodity prices and adverse exchange rate movements; an inability to raise sufficient funds for capital investment; inadequate estimates of ore resources and reserves; delays or overruns of large and complex projects; changes in tax regulation; safety incidents or major hazard events; cyber breaches; physical impacts from climate change; the impacts of water scarcity; natural disasters; an inability to successfully manage the closure, reclamation and rehabilitation of sites; the impacts of civil unrest; the impacts of the Covid-19 pandemic; breaches of Rio Tinto’s policies, standard and procedures, laws or regulations; trade tensions between the world’s major economies; increasing societal and investor expectations, in particular with regard to environmental, social and governance considerations; the impacts of technological advancements; and such other risks identified in Rio Tinto’s most recent Annual Report and accounts in Australia and the United Kingdom and the most recent Annual Report on Form 20-F filed with the United States Securities and Exchange Commission (the “SEC”) or Form 6-Ks furnished to, or filed with, the SEC. Forward-looking statements should, therefore, be construed in light of such risk factors and undue reliance should not be placed on forward-looking statements. These forward-looking statements speak only as of the date of this report. Rio Tinto expressly disclaims any obligation or undertaking (except as required by applicable law, the UK Listing Rules, the Disclosure Guidance and Transparency Rules of the Financial Conduct Authority and the Listing Rules of the Australian Securities Exchange) to release publicly any updates or revisions to any forward-looking statement contained herein to reflect any change in Rio Tinto’s expectations with regard thereto or any change in events, conditions or circumstances on which any such statement is based.

Nothing in this report should be interpreted to mean that future earnings per share of Rio Tinto plc or Rio Tinto Limited will necessarily match or exceed its historical published earnings per share.

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This announcement is authorised for release to the market by Rio Tinto's Group Company Secretary.

LEI: 213800YOE05OQ72G2R82

Classification: 3.1 Additional regulated information required to be disclosed under the laws of a Member State