

Rio Tinto releases second quarter production results

19 July 2023

Rio Tinto Chief Executive Jakob Stausholm said: "We built further momentum in our Pilbara iron ore business for the quarter, and now expect to deliver shipments in the upper half of our guidance range for the year. The ramp-up of the Oyu Tolgoi underground mine progressed ahead of plan, and we remain on track to more than triple its copper production by the end of the decade. Production downgrades during the quarter highlight that we still have much more to do elsewhere, as we roll out the Safe Production System to create stability and achieve excellence across our global portfolio.

"We continued to take disciplined measures to grow in the materials the world needs for the energy transition, also with investments to expand our low carbon aluminium production and underground copper production at Kennecott.

"We are taking practical steps and making investments to decarbonise, being the first to convert an open pit mine to renewable diesel at our Boron operations, signing a memorandum of understanding with Baowu to explore decarbonisation of the steel value chain and delivering first production from our ground-breaking BlueSmelting demonstration plant at Sorel-Tracy in Quebec in July."

Production*		Q2 2023	vs Q2 2022	vs Q1 2023	H1 2023	vs H1 2022
Pilbara iron ore shipments (100% basis)	Mt	79.1	-1%	-4%	161.7	+7%
Pilbara iron ore production (100% basis)	Mt	81.3	+3%	+2%	160.5	+7%
Bauxite	Mt	13.5	-5%	+12%	25.6	-8%
Aluminium	kt	814	+11%	+4%	1,598	+9%
Mined copper (consolidated basis)	kt	145	-1%	0%	290	-1%
Titanium dioxide slag	kt	303	+4%	+6%	589	+4%
IOC** iron ore pellets and concentrate	Mt	2.1	-21%	-18%	4.6	-8%

*Rio Tinto share unless otherwise stated

**Iron Ore Company of Canada

Q2 2023 operational highlights and other key announcements

- Our all-injury frequency rate of 0.36 was a small increase from the second quarter of 2022 (0.35), and from the prior quarter (0.35). Investigations are underway following significant process safety incidents. There were two incidents at our Rio Tinto Iron and Titanium (RTIT) Sorel-Tracy complex which did not result in injuries. The Kennecott operation experienced an escape of furnace gas during the maintenance shut, where all treated people have been cleared. We are heightening our focus on managing these risks and continue to prioritise the safety, health and wellbeing of our workforce, and communities where we operate.
- Pilbara operations produced 81.3 million tonnes (100% basis) in the second quarter, 3% higher than the second quarter of 2022 as Gudai-Darri achieved sustained nameplate capacity during the period. Shipments were 79.1 million tonnes (100% basis), 1% lower than the corresponding period of 2022, reflecting the impact of planned major maintenance at the Dampier port and a train derailment. With continued operational improvements across the Pilbara system, and the implementation of the Safe Production System, full year shipments are now expected to be in the upper half of the original 320 to 335 million tonne range.
- Bauxite production of 13.5 million tonnes was 5% lower than the second quarter of 2022 as our Weipa operations were impacted by the higher-than-average first quarter rainfall, which continued to reduce pit access and led to longer haul distances. Production was further affected by equipment downtime at both Weipa and Gove. As a result, our bauxite full year production is expected to be at the lower end of our 54 to 57 million tonne range, as we implement plans to recover lost production at both operations through the remainder of the year.
- Aluminium production of 0.8 million tonnes was 11% higher than the second quarter of 2022 as we benefited from the continued ramp-up of the Kitimat smelter. Recovery at the Boyne and Kitimat smelters is progressing to plan with full ramp-up expected to be completed later in the year. All our other smelters continued to demonstrate stable performance during the quarter.

- On 12 June, we [announced](#) an investment of \$1.1 billion to expand our AP60 aluminium smelter equipped with low-carbon technology at Complexe Jonquière in Canada. The total investment includes up to \$113 million of financial support from the Quebec government. This expansion will coincide with the gradual closure of potrooms at the Arvida smelter on the same site. While at our Alma smelter in Lac-Saint-Jean, Quebec, we [commenced](#) construction to increase our capacity to cast low-carbon, high-value aluminium billets.
- Mined copper production of 145 thousand tonnes (on a consolidated basis), was 1% lower than the second quarter of 2022. We benefited from the continued ramp-up of the high grade underground mine at Oyu Tolgoi. However, this benefit was more than offset by the continued operation of Kennecott's concentrator at reduced rates, as we recovered from a conveyor failure in March 2023, and unplanned maintenance, and lower crusher and conveyor availability, at Escondida.
- Refined copper guidance has been reduced to 160 to 190 thousand tonnes (previously 180 to 210 thousand tonnes) and our copper C1 unit cost guidance has been raised to 180 to 200 US cents/lb (from 160 to 180 US cents/lb) as completion of the rebuild of the Kennecott smelter is now expected in September 2023 (previously August 2023). The extension of the rebuild is due to the addition of a full rebuild of the flash converting furnace to the scope, which is expected to further improve asset stability and process safety management.
- On 20 June, we [announced](#) \$498 million of funding to deliver underground development and infrastructure for an area known as the North Rim Skarn¹ (NRS) at Kennecott. Production from the NRS will commence in 2024 and is expected to ramp up over two years, to deliver ~250 thousand tonnes of additional mined copper over the next 10 years² alongside open cut operations.
- Titanium dioxide slag production of 303 thousand tonnes was 4% higher than the second quarter of 2022, due to improved operational performance at our smelters. Notwithstanding, our RTIT Quebec Operations experienced two incidents in separate furnaces in June and July which we are investigating. Given these investigations and weaker market conditions, our full year production is expected to be at the lower end of the 1.1 to 1.4 million tonne range.
- IOC production was 21% lower than the second quarter of 2022 as we lost ~3.5 weeks of production in June, primarily due to wildfires in Northern Quebec, together with a slightly extended shutdown. Operations have resumed, however our full year production guidance has been reduced to 10.0 to 11.0 million tonnes (previously 10.5 to 11.5 million tonnes), and remains subject to further disruption from fire conditions.
- At our Rincon lithium project in Argentina, our \$140 million estimate and schedule to develop the starter plant remains under review in response to cost escalation.
- In the second quarter, we commenced deployment of the Safe Production System at a further two sites, taking the total to 20 sites. The Safe Production System focuses on continuously improving safety, strengthening employee engagement and sustainably lifting operational performance across our global portfolio. While we still have a lot to do to see sustainable improvement, site deployments are rolling out according to plan and we expect to be at the upper end of our range of four to eight new sites in 2023.
- On 13 June, we [announced](#) that Ivan Vella, Chief Executive, Aluminium, has accepted a new position outside of Rio Tinto and will leave in December 2023. He will continue to lead Aluminium while a robust process to identify his successor is undertaken but has stepped down from the Group's executive committee.
- We saw a cash outflow from an increase in working capital of circa \$0.9 billion in the first half of 2023, reflecting a build in blasted and mine stocks in the Pilbara to support overall system health, and higher spares and stores (including seasonality due to the Diavik winter road). Payables were also lower due to the timing of spend, and normal volatility in amounts due to JV partners and employees. Operating cash flow was also impacted by lower dividends from Escondida during the first half (\$0.3 billion in H1 2023; \$0.6 billion in H1 2022).

All figures in this report are unaudited. All currency figures in this report are US dollars, and comments refer to Rio Tinto's share of production, unless otherwise stated.

¹The NRS Mineral Resources and Ore Reserves, together with the Lower Commercial Skarn (LCS) Mineral Resources and Ore Reserves, form the Underground Skarns Mineral Resources and Ore Reserves.

²This production target for 2023 to 2033 is underpinned 25% by Probable Ore Reserves, 9% by Indicated Resources, and 66% by Inferred Resources. Mined copper is reported as total recoverable metal. These estimates of Mineral Resources and Ore Reserves were reported in a release dated 20 June 2023 titled "Rio Tinto Kennecott Mineral Resources and Ore Reserves" (Table 1 Release) which is available on Rio Tinto's website at [resources & reserves \(riotinto.com\)](https://resources.riotinto.com), and have been prepared by Competent Persons in accordance with the requirements of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, 2012 (JORC Code) and the ASX Listing Rules.

2023 guidance

Rio Tinto production share, unless otherwise stated	2022 Actuals	H1 2023 Actuals	2023 Previous	2023 Current
Pilbara iron ore (shipments, 100% basis) (Mt)	322	161.7	320 to 335	320 to 335 ¹
Bauxite (Mt)	55	25.6	54 to 57	54 to 57 ²
Alumina (Mt)	7.5	3.7	7.7 to 8.0	7.4 to 7.7
Aluminium (Mt)	3.0	1.6	3.1 to 3.3	Unchanged
Mined copper (kt) ³	521	290	590 to 640	Unchanged
Refined copper (kt)	209	95	180 to 210	160 to 190
Diamonds (M carats)	4.7	1.9	3.0 to 3.8	Unchanged
Titanium dioxide slag (Mt)	1.2	0.6	1.1 to 1.4	1.1 to 1.4 ²
IOC ⁴ iron ore pellets and concentrate (Mt)	10.3	4.6	10.5 to 11.5	10.0 to 11.0
Boric oxide equivalent (Mt)	0.5	0.3	~0.5	Unchanged

¹In the upper half of the range.

²In the lower end of the range.

³Mined copper for 2023 guidance and actuals includes Oyu Tolgoi on a 100% consolidated basis following Rio Tinto's acquisition of Turquoise Hill Resources Ltd, which completed on 16 December 2022. Mined copper for 2022 includes Oyu Tolgoi on a 33.52% Rio Tinto share basis.

⁴Iron Ore Company of Canada continues to be reported at Rio Tinto share.

- Guidance for 2023 alumina production has been reduced to 7.4 to 7.7 million tonnes (previously 7.7 to 8.0 million tonnes), as Queensland Alumina Limited (QAL) implements initiatives to improve plant stability and production rates.
- Guidance for 2023 refined copper has been reduced to 160 to 190 thousand tonnes (previously 180 to 210 thousand tonnes) due to the extension of the Kennecott smelter rebuild.
- Guidance for 2023 IOC production has been reduced to 10.0 to 11.0 million tonnes (previously 10.5 to 11.5 million tonnes) due to the impact of wildfires in Northern Quebec, and remains subject to further disruption from fire conditions.
- Iron ore shipments and bauxite production guidance remain subject to weather impacts.

Operating costs

- Guidance for 2023 Pilbara iron ore unit cash costs is unchanged at \$21.0 to \$22.5 per tonne, based on A\$:US\$ exchange rate of 0.70.
- Guidance for 2023 Copper C1 unit costs has been increased to 180 to 200 US cents/lb (from 160 to 180 US cents/lb) due to lower refined copper production following extension of the Kennecott smelter rebuild.

Aluminium modelling

As reported in 2022, to assist with the modelling of aluminium operating costs during a volatile price environment for raw materials, we provide the following breakdown and sensitivities for the alumina and aluminium metal segments (Primary Metal and Pacific Aluminium). This excludes the effect of intra and inter segment eliminations on group profit.

We have observed a reduction in index prices for many of the raw material prices for our alumina and aluminium metal segments during the first half of 2023, when compared to the second half of 2022. Despite this, there has been limited impact to our operating costs in the current half given the lag effect associated with the utilisation of higher cost inventory, with the benefit to costs expected in the second half of 2023.

Alumina refining

Production cash cost (%)	FY 22	H1 23
Bauxite	31	31
Conversion	32	32
Caustic	23	24
Energy	14	13
Total	100	100

Input costs (nominal)	H1 22 Index price	H2 22 Index price	H1 23 Index price	FY 23 Annual cost sensitivity impact on underlying EBITDA
Caustic soda ¹ (\$/t)	675	595	432	\$10m per \$10/t
Natural gas ² (\$/mmbtu)	6.02	7.01	2.61	\$4m per \$0.10/GJ
Brent oil (\$/bbl)	105.9	93.8	79.2	\$2m per \$10/bbl

¹North East Asia FOB | ²Henry Hub

Aluminum smelting

Production cash cost (%)	FY 22	H1 23
Alumina	41	37
Power	19	18
Conversion	17	20
Carbon	21	23
Materials	2	2
Total	100	100

Input costs (nominal)	H1 22 Index price	H2 22 Index price	H1 23 Index price	FY 23 Annual cost sensitivity impact on underlying EBITDA
Alumina ¹ (\$/t)	395	328	349	\$64m per \$10/t
Petroleum coke ² (\$/t)	695	719	636	\$11m per \$10/t
Coal tar pitch ³ (\$/t)	1,103	1,476	1,399	\$2m per \$10/t

¹LME Australia | ²US Gulf FOB | ³North America FOB

Investments, growth and development projects

- Exploration and evaluation expense in the first half of 2023 was \$710 million, \$343 million (94%) higher than the first half of 2022, with continued ramp-up of early works at Simandou (included on a 100% basis¹) and in Argentina.

Pilbara mine projects

- The ramp-up of Gudai-Darri continued to plan with the mine reaching its nameplate capacity on a sustained basis during the second quarter.
- Construction of our Western Range mine continued in line with the schedule during the quarter with site facilities completed and contractors mobilised, while we progressed bulk earthworks for the fixed plant and pre-strip earthworks for the mine.
- We continue to progress our next tranche of Pilbara mine projects after Western Range, progressing studies for Hope Downs 1 Sustaining (Hope Downs 2 and Bedded Hilltop), Brockman 4 sustaining (Brockman Syncline 1), Greater Nammuldi Sustaining and West Angelas Sustaining. We continue to work closely with local communities, Traditional Owners and governments to progress approvals required for the new mining projects.

Oyu Tolgoi underground project

- In early July, we hosted a site tour of the Oyu Tolgoi operations for investors and analysts. Presentation materials for this visit are available on our [website](#).
- We continue to see strong performance from the underground mine, with a total of 54 drawbells opened from Panel 0, including 18 drawbells during the quarter. To date we are yet to lose a drawbell or draw point from the underground mine.
- Shaft sinking rates improved during the quarter and at the end of June, shafts 3 and 4 reached 627 metres and 740 metres below ground level, respectively. Final depths required for shafts 3 and 4 are 1,148 and 1,149 metres below ground level, respectively. As reported in our presentation materials for the Oyu Tolgoi site tour, we now expect both shafts to be commissioned in the second half of 2024 (previously first half of 2024) with shaft sinking rates now meeting those required for completion.
- Construction of conveyor to surface works continued to plan and are now approaching 60% completion as at the end of the quarter. Construction works for the concentrator conversion also progressed during the period, with the main contractor mobilised and the commencement of major site works in May.
- Technical studies for mine design and schedule optimisation for Panels 1 and 2 were completed during the second quarter². The operation is expected to ramp up to deliver average mined copper production of ~500ktpa (100% basis) between 2028 and 2036³.
- During the quarter, Rio Tinto, Oyu Tolgoi and the Government of Mongolia continued to work together towards the implementation of Mongolian Parliamentary Resolution 103.

Other key projects and exploration and evaluation

- At Complexe Jonquière in Canada, we [announced](#) an investment of \$1.1 billion to expand our AP60 aluminium smelter equipped with low-carbon technology. The total investment includes up to \$113 million of financial support from the Quebec government. This expansion will coincide with the gradual closure of potrooms at the Arvida smelter on the same site. The investment will add 96 new AP60 pots, increasing capacity by approximately 160,000 metric tonnes of primary aluminium per year. As a result, there will be a total of 134 AP60 pots and a capacity of approximately 220,000 tonnes per annum. This new capacity, in addition to 30,000 tonnes of new recycling capacity at Arvida expected to open in the first quarter of 2025, will offset the 170,000 tonnes of capacity lost through the gradual closure of potrooms at the Arvida smelter from 2024.
- At our Alma smelter in Lac-Saint-Jean, Quebec, we [commenced](#) construction to increase our capacity to cast low-carbon, high-value aluminium billets by 202,000 metric tonnes. The existing casting centre will be expanded to include new state-of-the-art equipment such as furnaces, a casting pit, coolers, handling, inspection, sawing and packaging systems. Commissioning is scheduled for the first half of 2025. The \$188 million investment will allow more of Rio Tinto's aluminium production to be used to make billets from renewable hydroelectric power.

- At Kennecott, we [announced](#) \$498 million of funding to deliver underground development and infrastructure for an area known as the North Rim Skarn⁴ (NRS). Production from the NRS will commence in 2024 and is expected to ramp up over two years, to deliver around 250 thousand tonnes of additional mined copper over the next 10 years⁵ alongside open cut operations.
- At the Resolution Copper project in Arizona, the United States Forest Service (USFS) continued work to progress the Final Environmental Impact Statement (FEIS) 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. We are also monitoring the Apache Stronghold versus USFS case held in the US Ninth Circuit Court of Appeals. While there is significant local support for the project, we respect the views of groups who oppose it and will continue our efforts to address and mitigate these concerns. Costs attributable to the Resolution project in the first half of 2023 were \$68 million⁶.
- At the Winu copper-gold project in Western Australia, we continued to strengthen our relationships and advanced agreement making over the quarter with host Traditional Owners, the Martu and Nyangumarta groups. Drilling, fieldwork and study activities continued over the period strengthening the development pathway ahead of applications for regulatory and other required approvals. Costs attributable to the Winu project in the first half of 2023 were \$32 million⁶.
- At the Simandou iron ore project in Guinea, negotiations continued to progress to enable the co-development of rail and port infrastructure by Simfer, Winning Consortium Simandou and the Guinean State. The legal framework for the construction and operations phases will establish access rights, fiscal regime and schedule, as well as joint venture arrangements. We also continued to progress early works, including establishing accommodation camps to support continued mobilisation on both our mine and rail scope, earthworks and geotechnical drilling. Costs attributable to the Simandou project in the first half of 2023 were \$318 million (100% basis)⁶. Management responsibility for Simandou transferred from the Copper product group to the Chief Technical Officer during the period, with the exploration and evaluation expense now shown separately in Other operations.
- NutonTM, our proprietary copper heap leaching technology, made further progress during the quarter, with associated results reported by Arizona Sonoran Copper Company on [5 June](#), McEwen Mining Inc. on [20 June](#) and Regulus Resources Inc. on [6 July](#).
- We continue to believe that the Jadar lithium-borate project in Serbia has the potential to be a world-class asset, that will support the development of other future industries in Serbia, acting as a catalyst for tens of thousands of jobs for current and future generations, and sustainably producing materials critical to the energy transition. We are focused on consultation with all stakeholders to explore options related to the project's future.
- At the Rincon lithium project in Argentina, development of the three thousand tonne per annum lithium carbonate starter plant is ongoing. Construction activities progressed on the camp and airstrip for the project, while enabling works for the process plant continued. Our \$140 million estimate and schedule to develop the starter plant remains under review in response to cost escalation. Studies for the full scale operation are ongoing, and the exploration campaign progressed to further understand Rincon's basin, brine and water reservoirs. We continue to engage with communities, the province of Salta and the Government of Argentina to ensure an open and transparent dialogue with stakeholders about the works underway.
- Costs attributable to Battery Materials in the first half of 2023 were \$112 million⁶.

¹Costs relating to 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%).

²Mine design and plans will be reviewed by regulatory bodies as part of the OTFS23 process.

³The 500kpta copper target (stated as recoverable metal) for the Oyu Tolgoi underground and open pit mines for the years 2028 to 2036 is underpinned 13% by Proved Ore Reserves and 87% by Probable Ore Reserves. This production target has been scheduled from mine designs based on the Oyu Tolgoi Feasibility Study 2020 (OTFS20), which are not materially different to 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).

⁴The NRS Mineral Resources and Ore Reserves, together with the Lower Commercial Skarn (LCS) Mineral Resources and Ore Reserves, form the Underground Skarns Mineral Resources and Ore Reserves.

⁵This production target for 2023 to 2033 is underpinned 25% by Probable Ore Reserves, 9% by Indicated Resources, and 66% by Inferred Resources. Mined copper is reported as total recoverable metal. These estimates of Mineral Resources and Ore Reserves were reported in a release dated 20 June 2023 titled "Rio Tinto Kennecott Mineral Resources and Ore Reserves" (Table 1 Release) which is available on Rio Tinto's website at [resources & reserves \(riotinto.com\)](https://resources&reserves.riotinto.com), and have been prepared by Competent Persons in accordance with the requirements of the JORC code and ASX Listing Rules.

⁶Costs are included in the total H1 2023 exploration and evaluation expense. Excludes amounts capitalised in the period.

Sustainability highlights

We are creating an open and transparent environment which will make positive and lasting change and strengthen our workplace culture for the long term, as we continue to implement the 26 recommendations of the Everyday Respect report. We continue to promote respectful transparency by expanding the adoption of purple banner communications to other parts of the business to highlight disrespectful, discriminatory and hurtful behaviours occurring in our organisation, in the same way we highlight safety concerns. Village councils are being implemented across sites to provide a safe and constructive way for employees and contractors to raise concerns and give feedback. In addition, over 950 people responded to our Pilbara Iron Ore's contractor survey, which was designed to better understand their experiences.

On 3 April, we [published](#) our 2022 Taxes and Royalties Paid Report, detailing \$10.8 billion of global taxes and royalties paid during the year. This compares to \$13.3 billion in 2021, during very strong commodity prices, and is the third-highest annual global taxes and royalties paid by Rio Tinto since it published its first annual Taxes Paid report, for 2010. In the past ten years, Rio Tinto has paid \$74.9 billion in taxes and royalties globally, of which more than 78% was paid in Australia.

On 4 April, we [announced](#) our support for Energy Resources of Australia Ltd's (ERA) plans for an Interim Entitlement Offer (IEO), which sought to raise up to A\$369 million to address funding requirements for the Ranger Rehabilitation Project in Australia's Northern Territory to the end of the second quarter of 2024. Rio Tinto, which owns 86.3% of ERA's shares, subscribed for its full entitlements under the terms of the IEO, at a cost of A\$319 million. Rio Tinto notes that ERA has, in the IEO offer material, recognised the Mirarr People's opposition to further uranium mining on their land. This was a relevant factor in Rio Tinto's recent decision to no longer report the Jabiluka deposit as a Mineral Resource.

On 2 May, together with BHP, we [invited](#) expressions of interest from technology providers, equipment manufacturers, reagent suppliers, startups and research groups across the globe with innovative ideas and technologies to help improve tailings dewatering and management performance. Together we aim to jointly identify a portfolio of tailings management partners with whom they can work to accelerate the development of technologies that could increase water recovery and reduce potential safety risks and environmental footprints associated with tailings storage facilities.

In May, we published our [2022 Statement on Modern Slavery](#) - our seventh statement against UK modern slavery reporting legislation, and our third under Australian legislation. We know that we face a risk of involvement in modern slavery through our value chain, including through our suppliers. And although we are not aware of any recorded modern slavery incidents or complaints in our business during 2022, we are committed to looking for ways to improve.

Communities & Social Performance (CSP)

On 2 June, we [announced](#) plans to invest \$395 million in a seawater desalination plant in the Pilbara, Western Australia, to support future water supply for the company's coastal operations and communities in the region. The proposed Dampier Seawater Desalination Plant, which remains subject to Commonwealth and State Government approvals, will be located within Rio Tinto's existing iron ore port operations at Parker Point. It will have an initial nominal capacity of four gigalitres annually with the potential for this to increase to eight gigalitres in the future. The project includes construction of a new supply pipeline to connect to the existing water network. Subject to relevant approvals, construction is expected to commence in 2024 with the facility expected to be operational and producing water in 2026.

On 13 June, we [announced](#) a partnership with Gemco Rail to bring local iron ore rail car manufacturing and bearing maintenance to the Pilbara region in an industry-first. This partnership will enable Gemco Rail to expand its existing operations to establish the first ever rail ore car manufacturing and maintenance facility in the Pilbara, creating new jobs, increasing spend with local and Indigenous businesses and supporting local economic growth. Rio Tinto expects to invest approximately A\$150 million to purchase 100 locally built ore rail cars over six years as well as continued investment in bearing refurbishment over ten years, to support the company's Pilbara operations.

Key highlights from the quarter are outlined above, with further information available on our [website](#).

Climate change, product stewardship and our value chain

In the second quarter we continued to focus on innovative solutions that have the potential to be scalable across Rio Tinto's global value chains.

- On 3 April, Rio Tinto Iron and Titanium (RTIT) [started](#) its BlueSmelting™ demonstration plant at its metallurgical complex in Sorel-Tracy as part of the process to validate the ground-breaking BlueSmelting™ technology, which aims to decarbonise RTIT's Quebec Operations. We achieved a further milestone subsequent to the end of the quarter in July, delivering first production from the demonstration plant. The BlueSmelting™ project involves an ilmenite reduction technology that could generate 95% less greenhouse gas emissions than the current reduction process, enabling the production of titanium dioxide, steel and metal powders with a significantly lower carbon footprint. This innovative technology was developed by scientists at Rio Tinto's Critical Minerals and Technology Centre in Sorel-Tracy.
- On 2 June, our Boron, California operation successfully [completed](#) the full transition of its heavy machinery from fossil diesel to renewable diesel, making it the first open pit mine in the world to achieve this milestone. The change to renewable diesel brings an anticipated CO₂ equivalent reduction of up to 45,000 tonnes per year, comparable to eliminating the annual emissions of approximately 9,600 cars.
- On 12 June, we [signed](#) a Memorandum of Understanding (MoU) with China Baowu, the world's biggest steelmaker, to explore a range of industry-leading new projects in China and Australia to help decarbonise the steel value chain. Under the MoU, China Baowu and Rio Tinto plan to jointly advance specific decarbonisation projects, demonstrating their commitment to play a leading role in the industry's low-carbon transformation. The projects include:
 - Research, build and demonstrate a pilot-scale electric melter at one of Baowu's steel mills in China. This will enable low-carbon steel making utilising Direct Reduced Iron (DRI) that has been produced from low and medium grade ores.
 - Optimise pelletisation technology for Australian ores as a feedstock for low-carbon shaft furnace-based direct reduction.
 - Expand the development of China Baowu's HyCROF technology which can largely mitigate CO₂ emissions from the blast furnace process.
 - Jointly study opportunities for producing low-carbon iron in Western Australia.

Activity across our global decarbonisation portfolio continues to accelerate, however physical delivery of renewables, diesel replacement and process heat abatement has not progressed as fast as we would like. Delays have arisen due to a range of factors including engineering and construction timelines, securing approvals and the need to carefully integrate our ambitions with the needs of our local communities and stakeholder groups. This particularly challenges our near term objective in 2025 where we have limited time to make adjustments to physical projects.

Our markets

Although commodity prices remain at elevated levels, they declined during the second quarter as global demand slowed. China's economic recovery has fallen short of initial market expectations, as the property market downturn continues to weigh on the economy and consumers remain cautious despite monetary policy easing. Manufacturing data in advanced economies showed a further slowdown and recessionary risks remain.

- China's reopening recovery started strongly but slowed in the second quarter. Consumption is still improving, while weakness in the export and property sectors is providing a drag to growth. Factory activity has slowed down, as manufacturing PMI contracted. The Chinese government has stepped up monetary easing measures.
- The US economy is still growing and the labour market remains resilient, but a recession is still likely later this year. Past tightening of monetary policy and tighter lending standards are expected to constrain consumer spending, hiring and business investment. Inflation remains a challenge for the Federal Reserve, given pressure in the services sector.
- The eurozone economy continues to be challenged by weak manufacturing activity and high core inflation, as manufacturing output and new orders fell, while services showed an expansion. Core inflation has been pushed up by services, whilst manufactured goods inflation has tapered down.
- Iron ore prices declined by 12% over the quarter as China's steel demand recovery encountered persistent headwinds, and steel prices and mill profitability remained compressed. As a result, Chinese steel exports trended up sharply towards 100 million tonne annualised, run-rates last observed in 2016. China's seaborne iron ore imports were also supported by the delayed rebound in scrap availability and challenges to domestic iron ore production. Imports over the quarter declined marginally below their 1.25 billion tonne per annum rate in the first quarter, but trended close to record seasonal levels. Seaborne iron ore supply performed strongly over the quarter, with June shipments from Australia and Brazil estimated at or close to all-time highs.
- The LME cash aluminium price declined by 10% over the quarter, with the average price of \$2,258/t 6% lower than the first quarter of 2023. The price has followed industry operating costs lower, with average smelter costs falling 12% quarter on quarter. Smelter restarts are currently under way in Yunnan, adding supply to a tight global market. Inventories in China are at seven-year lows, and China has continued to import primary aluminium in the first half of the year.
- The copper LME price fell 8% over the quarter, while the average price was down 5% quarter on quarter to \$3.84/lb, as negative macroeconomic headlines related to the slowdown in China's recovery and US debt ceiling gridlock dampened sentiment, moving speculative positions to a net short for the first time since August 2022. The US dollar strengthened over the period as inflationary pressures prevailed. Despite these headwinds, prices were supported by increasing operating costs, exchange inventory tightness and market expectations on China's stimulus.
- Lithium carbonate spot prices rebounded during the second quarter, driven by higher electric vehicle (EV) sales growth and restocking activities from end-users. Short-term uncertainty remains as the global economy slows and higher interest rates dampen consumer spending, although the automotive market sentiment improved in China on the back of tax incentives for EV's and a potential end to the aggressive price war between Chinese car manufacturers. Longer term, market fundamentals for lithium remain strong, as EV adoption continues to rise on supportive government policies and supply shortfalls requiring further investment.

Average realised prices achieved for our major commodities

	Units	H1 2023	Q2 2023	Q1 2023	H1 2022	2022
Pilbara iron ore	FOB, \$/wmt	98.6	93.8	103.3	110.9	97.6
Pilbara iron ore	FOB, \$/dmt	107.2	101.9	112.3	120.5	106.1
Aluminium*	Metal \$/t	2,866	2,786	2,954	3,808	3,330
Copper**	US c/lb	396	385	407	447	403
IOC pellets	FOB \$/wmt	154.7	151.2	158.9	199.0	190.3

*LME plus all-in premiums (product and market).

**Average realised price for all units sold. Realised price does not include the impact of the provisional pricing adjustments, which negatively impacted revenues in the first half by \$4 million (first half 2022 negative impact of \$30 million).

Iron Ore

Rio Tinto share of production (Million tonnes)	Q2 2023	vs Q2 2022	vs Q1 2023	H1 2023	vs H1 2022
Pilbara Blend and SP10 Lump ¹	21.0	+9%	+7%	40.7	+12%
Pilbara Blend and SP10 Fines ¹	31.8	+5%	+3%	62.6	+12%
Robe Valley Lump	1.5	+26%	+31%	2.6	+18%
Robe Valley Fines	2.4	+29%	+21%	4.4	+22%
Yandicoogina Fines (HIY)	11.9	-12%	-13%	25.6	-9%
Total Pilbara production	68.6	+4%	+2%	135.8	+8%
Total Pilbara production (100% basis)	81.3	+3%	+2%	160.5	+7%

Rio Tinto share of shipments (Million tonnes)	Q2 2023	vs Q2 2022	vs Q1 2023	H1 2023	vs H1 2022
Pilbara Blend Lump	14.7	+16%	-6%	30.4	+29%
Pilbara Blend Fines	27.5	+9%	-4%	56.0	+20%
Robe Valley Lump	1.2	+19%	+10%	2.2	+34%
Robe Valley Fines	2.5	+8%	+10%	4.8	+18%
Yandicoogina Fines (HIY)	12.6	-12%	-8%	26.2	-9%
SP10 Lump ¹	1.7	-63%	-2%	3.3	-60%
SP10 Fines ¹	6.6	-2%	-3%	13.4	-3%
Total Pilbara shipments ²	66.6	0%	-4%	136.4	+8%
Total Pilbara shipments (100% basis) ²	79.1	-1%	-4%	161.7	+7%
Total Pilbara Shipments (consolidated basis) ^{2, 3}	68.3	0%	-4%	139.8	+8%

¹SP10 includes other lower grade products.

²Shipments includes material shipped from the Pilbara to our portside trading facility in China which may not be sold onwards by the group in the same period.

³While Rio Tinto has a 53% net beneficial interest in Robe River Iron Associates, it recognises 65% of the assets, liabilities, sales revenues and expenses in its accounts (as 30% is held through a 60% owned subsidiary and 35% is held through a 100% owned subsidiary). The consolidated basis sales reported here include Robe River Iron Associates on a 65% basis to enable comparison with revenue reported in the financial statements.

Pilbara operations

We produced 81.3 million tonnes (Rio Tinto share 68.6 million tonnes) in the second quarter, 3% higher than the corresponding period of 2022. The ramp-up of Gudai-Darri continued to plan, with the mine reaching nameplate capacity on a sustained basis during the period. Challenges at the Yandicoogina mine associated with materials handling and plant reliability, highlighted in the first quarter, continued into the period.

Shipments of 79.1 million tonnes (Rio Tinto share 66.6 million tonnes) were 1% lower than the second quarter of 2022, and 4% lower than the prior quarter. This was primarily due to planned major maintenance at the Dampier Port and a train derailment on 17 June. The rail line was reopened on 21 June.

With ongoing operational improvements across the Pilbara system, and uplift from implementation of the Safe Production System, full year shipments are expected to be in the upper half of the original 320 to 335 million tonne range. With higher production anticipated in the second half, SP10 is expected to be a larger proportion of shipments (first half 2023 = 10%¹).

Approximately 10% of sales in the second quarter were priced by reference to the prior quarter's average index lagged by one month. The remainder was sold either on current quarter average, current month average, average of two months, forward month or on the spot market. Approximately 26% of sales in the second quarter were made on a free on board (FOB) basis, with the remainder sold including freight.

Achieved average pricing in the first half of 2023 was \$98.6 per wet metric tonne (\$110.9 in the first half of 2022) on an FOB basis (equivalent to \$107.2 per dry metric tonne, with a 8% moisture assumption). This compares to the average first half price for the monthly average Platts index for 62% iron fines converted to an FOB basis of \$109.8 per dry metric tonne.

China Portside Trading

We continue to see strong demand for Rio Tinto's portside product in China. Our iron ore portside sales in China were 11.9 million tonnes in the first half of 2023 (14.2 million tonnes in the first half of 2022). At 30 June, inventory levels were 5.7 million tonnes, including 2.6 million tonnes of Pilbara product. In the first half of 2023 approximately 90% of our portside sales were either screened or blended in Chinese ports.

¹Based on total Pilbara shipments on a 100% basis.

Aluminium

Rio Tinto share of production ('000 tonnes)	Q2 2023	vs Q2 2022	vs Q1 2023	H1 2023	vs H1 2022
Bauxite	13,492	-5%	+12%	25,581	-8%
Bauxite third party shipments	9,159	-5%	+16%	17,039	-14%
Alumina	1,861	0%	0%	3,720	-1%
Aluminium	814	+11%	+4%	1,598	+9%

Bauxite

Bauxite production of 13.5 million tonnes was 5% lower than the second quarter of 2022 as our Weipa operations were impacted by the higher-than-average first quarter rainfall, which continued to reduce pit access and led to longer haul distances. Production was further affected by equipment downtime at both Weipa and Gove. As a result, our bauxite full year production is expected to be at the lower end of our 54 to 57 million tonne range, as we implement plans to recover lost production at both operations through the remainder of the year.

We shipped 9.2 million tonnes of bauxite to third parties in the second quarter, 5% lower than the same period of 2022.

Alumina

Alumina production of 1.9 million tonnes was in line with the second quarter of 2022 as improved operational stability at our Yarwun and Vaudreuil refineries was offset by unplanned plant downtime at Queensland Alumina Limited (QAL). As a result, our full year alumina production has been reduced to 7.4 to 7.7 million tonnes (previously 7.7 to 8.0 million tonnes), as QAL implements initiatives to improve plant stability and production rates.

As the result of QAL activation of a step-in process following sanction measures by the Australian Government, Rio Tinto has taken on 100% of capacity for as long as the step-in continues. This results in use of Rusal's 20% share of capacity by Rio Tinto under the tolling arrangement with QAL. This additional output is excluded from the production tables in this report as QAL remains 80% owned by Rio Tinto and 20% owned by Rusal.

Aluminium

Aluminium production of 0.8 million tonnes was 11% higher than the second quarter of 2022 as we benefited from the continued ramp-up of the Kitimat smelter. Recovery at the Boyne and Kitimat smelters is progressing to plan with full ramp-up expected to be completed later in the year. All our other smelters continued to demonstrate stable performance during the quarter.

Average realised aluminium prices including premiums for value-added products (VAP) decreased 25% to \$2,866 per tonne in the first half of 2023 (first half 2022: \$3,808 per tonne). The LME price decreased by 24% to \$2,329 per tonne (first half 2022: \$3,082 per tonne), whilst the mid-west premium duty paid declined 27% to \$583 per tonne in the first half of 2023 (first half 2022: \$801 per tonne), which is 56% of our total volumes (58% in the first half of 2022). Our VAP sales decreased to 47% of primary metal sold in the first half of 2023 (first half 2022: 52%). Product premiums for VAP sales decreased, averaging \$377 per tonne of VAP sold (first half 2022: \$422 per tonne).

Copper

Rio Tinto share of production ('000 tonnes)	Q2 2023	vs Q2 2022	vs Q1 2023	H1 2023	vs H1 2022
Mined copper					
Kennecott	24.8	-27%	-18%	55.1	-32%
Escondida	77.4	-6%	+7%	149.7	-1%
Oyu Tolgoi (66% basis) ¹	28.3	+176%	+1%	56.4	+176%
Total mined copper production	130.5	+3%	0%	261.2	+4%
Total mined copper production (consolidated basis ²)	145.0	-1%	0%	290.2	-1%
Refined copper					
Kennecott	14.4	-56%	-67%	58.1	-20%
Escondida	21.7	+30%	+43%	37.0	+19%

¹Oyu Tolgoi production for 2022 reported on a 33.52% equity share basis. Following the acquisition of Turquoise Hill Resources Ltd on 16 December 2022, Oyu Tolgoi production for 2023 reported on a 66% equity share basis.

²Includes Oyu Tolgoi on a 100% consolidated basis, Kennecott and Escondida on an equity share basis.

Kennecott

Mined copper production was 27% lower than the second quarter of 2022 as the concentrator continued to recover from the failure of a conveyor in March 2023. Mitigating activities have progressed in line with recovery plans, with the conveyor now performing at rates to enable the concentrator to return to full capacity in the third quarter of 2023. The majority of the winter snowpack melted during the quarter, with the successful implementation of a range of measures to manage the associated geotechnical risk resulting in minimal impact to operations.

Refined copper production was 56% lower than the second quarter of 2022 as we commenced the largest rebuild of the smelter and refinery in Kennecott's history in May 2023. The ~\$300 million rebuild has incorporated approximately 300 engineering and maintenance projects and we are on track to complete the full scope of work. While inspecting the integrity of the flash converting furnace, we identified additional work necessitating a full rebuild, rather than the planned partial rebuild. The full rebuild is expected to further improve asset stability and process safety management, however as a result the consolidated scope of work is now expected to be completed in September 2023 (previously August 2023).

As a consequence of this extension, our refined copper production guidance has been reduced to 160 to 190 thousand tonnes (previously 180 to 210 thousand tonnes) and our copper C1 unit cost guidance has been increased to 180 to 200 US cents/lb (from 160 to 180 US cents/lb).

Escondida

Mined copper production was 6% lower than the second quarter of 2022 due to 10% lower concentrator throughput rates following unplanned maintenance, and lower crusher and conveyor availability. In addition, there was also a 16% decrease in copper recoverable from ore stacked for leaching due to lower grades and volume of stacked material.

Refined production increased by 30% compared to the second quarter of 2022 due to improved ore qualities in the oxide leach and better sulphide leach performance on the run of mine pad.

On 17 May 2023, the Chamber of Deputies of Chile approved a new mining royalty which will impact Escondida through a 1% ad-valorem component and an increased operating margin component, all limited by a maximum overall tax rate of 46.5%. The new mining royalty will be effective as of 1 January 2024.

Oyu Tolgoi

Mined copper production on a 100% basis increased 40% from the second quarter of 2022 as the ramp-up in underground production continued to plan, delivering higher average copper head grades (0.52% vs. 0.40%). During the quarter we delivered 0.9 million tonnes of ore milled from the underground mine at an average copper head grade of 1.56%, and 8.8 million tonnes from the open pit with an average grade of 0.41%.

Following our acquisition of Turquoise Hill Resources Ltd on 16 December 2022, our equity share of production increased from 33.52% to 66%, effective in reporting from 1 January 2023. We continue to fully consolidate Oyu Tolgoi in our financials.

During the quarter we signed an extension with the Inner Mongolian Power Company, securing our power supply for the operation until 2030.

Nuton™

Nuton™, our proprietary copper heap leaching technology, made further progress during the quarter, with associated results reported by Arizona Sonoran Copper Company on [5 June](#), McEwen Mining Inc. on [20 June](#) and Regulus Resources Inc. on [6 July](#).

Minerals

Rio Tinto share of production (million tonnes)	Q2 2023	vs Q2 2022	vs Q1 2023	H1 2023	vs H1 2022
Iron ore pellets and concentrate					
IOC	2.1	-21%	-18%	4.6	-8%

Rio Tinto share of production ('000 tonnes)	Q2 2023	vs Q2 2022	vs Q1 2023	H1 2023	vs H1 2022
Minerals					
Borates - B ₂ O ₃ content	133	-3%	+8%	257	-1%
Titanium dioxide slag	303	+4%	+6%	589	+4%

Rio Tinto share of production ('000 carats)	Q2 2023	vs Q2 2022	vs Q1 2023	H1 2023	vs H1 2022
Diavik	970	-16%	+2%	1,924	-10%

Iron Ore Company of Canada (IOC)

Iron ore production was 21% lower than the second quarter of 2022, as we lost ~3.5 weeks of production in June, primarily due to wildfires in Northern Quebec, together with a slightly extended shutdown. Operations have resumed, however our full year production guidance has been reduced to 10.0 to 11.0 million tonnes (previously 10.5 to 11.5 million tonnes), and remains subject to further disruption from fire conditions.

Shipments were 1% higher than the second quarter of 2022, as we drew down inventory. Although logistics have resumed following the wildfires, loading restrictions at the rail and port remain a risk as we repair areas of the rail line damaged by fire.

Borates

Borates production in the second quarter was 3% lower than the corresponding period of 2022 due to the deferral of a bulk vessel to the next quarter. We continued to see an easing of supply chain constraints at the Port of Los Angeles in the period.

Iron and Titanium

Titanium dioxide slag production was 4% higher than the second quarter of 2022, due to improved operational performance at our smelters. Notwithstanding, our RTIT Quebec Operations experienced two incidents in separate furnaces in June and July which we are currently investigating. Given these investigations and weaker market conditions, our full year production is expected to be at the lower end of our 1.1 to 1.4 million tonne range.

Diamonds

At Diavik, our share of carats was 16% lower than the second quarter of 2022 due to the completion of an underground pipe and area of the open pit during the period.

Exploration and evaluation

Pre-tax and pre-divestment expenditure on exploration and evaluation charged to the profit and loss account in the first half of 2023 was \$710 million, compared with \$367 million in the first half of 2022. Approximately 45% of this expenditure was incurred for Simandou, 18% by central exploration, 17% by Minerals, 15% by Copper and 4% by Iron Ore. The increase in expenditure reflects the continued ramp-up of early works at Simandou (included on a 100% basis¹) and Argentina.

Our annual budget for central greenfield exploration remains around \$250 million, mainly focused on copper, with a growing battery minerals programme.

Exploration highlights

Rio Tinto has a strong portfolio of projects with activity in 18 countries across eight commodities in early exploration and studies stages. The bulk of the exploration expenditure in the second quarter focused on copper in Australia, Colombia, Chile, Zambia, Peru, the US and Kazakhstan, and diamonds in Angola. Rio Tinto recently partnered in two lithium exploration projects in Quebec and greenfield lithium exploration continues in Canada, Australia, US and Africa. Exploration for nickel is ongoing in Canada, Finland, Brazil and Peru. Mine-lease exploration continued at Rio Tinto managed businesses including Bingham Canyon in the US, Pilbara Iron Ore in Australia and Diavik in Canada.

A summary of activity for the quarter is as follows:

Commodities	Studies Stage	Advanced projects	Greenfield/ Brownfield programmes
Bauxite			Melville Island, Australia Cape York, Australia
	Rincon Lithium, Argentina Lithium borates: Jadar, Serbia Nickel: Tamarack, US (3rd party operated)		Nickel Greenfield: Australia, Brazil, Canada, Finland, Peru Lithium Greenfield: Australia, Brazil, Canada, Chile, China, Finland, US Lithium borates Brownfield: US
Battery Materials			Copper Greenfield: Angola, Australia, Brazil, Canada, Chile, China, Colombia, Finland, Kazakhstan, Namibia, Laos, Peru, Papua New Guinea, Serbia, US, Zambia Copper Brownfield: US
	Copper/molybdenum: Resolution, US Copper/Gold: Winu, Australia	Copper: La Granja, Peru Pribrezhnyi, Kazakhstan Calibre-Magnum, Australia	
Copper			
Diamonds	Falcon, Canada ²		Diamonds Greenfield: Angola Diamonds Brownfield: Diavik
Iron Ore	Pilbara, Australia Simandou, Guinea	Pilbara, Australia	Greenfield and Brownfield: Pilbara, Australia
	Potash: KL262 ³ , Canada Heavy mineral sands: Mutamba, Mozambique		Potash Greenfield: Canada Heavy mineral sands Greenfield: Australia, South Africa
Minerals			

¹Costs relating to 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%).

²The Falcon Project in Saskatchewan, Canada, is currently in care and maintenance whilst Rio Tinto considers alternative commercial options, including potential exit.

³Limited activity during the quarter.

Forward-looking statement

This announcement 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 announcement, 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 and any statements related to the ongoing impact of the COVID-19 pandemic), are forward-looking statements. The words "intend", "aim", "project", "anticipate", "estimate", "plan", "believes", "expects", "may", "would", "should", "could", "will", "target", "set to", "seek", "risk" 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 are levels of actual production during any period, levels of demand and market prices, the ability to produce and transport products profitably, the impact of foreign currency exchange rates on market prices and operating costs, operational problems, political uncertainty and economic conditions in relevant areas of the world, the actions of competitors, activities by governmental authorities such as changes in taxation or regulation, the risks and uncertainties associated with the ongoing impacts of COVID-19 or other pandemic and such other risk factors 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. The above list is not exhaustive. Forward-looking statements should, therefore, be construed in light of such risk factors and undue reliance should not be placed on forward-looking statements, particularly in light of the current economic climate and the significant volatility, uncertainty and disruption caused by the outbreak of COVID-19. These forward-looking statements speak only as of the date of this announcement. 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 announcement 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 Steve Allen, Rio Tinto's Group Company Secretary.

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

Rio Tinto production summary

Rio Tinto share of production

		Quarter			Half Year		% change		
		2022 Q2	2023 Q1	2023 Q2	2022 H1	2023 H1	Q2 23 vs Q2 22	Q2 23 vs Q1 23	H1 2023 vs H1 2022
Principal commodities									
Alumina	('000 t)	1,864	1,860	1,861	3,765	3,720	0%	0%	-1%
Aluminium	('000 t)	731	785	814	1,467	1,598	+11%	+4%	+9%
Bauxite	('000 t)	14,131	12,089	13,492	27,757	25,581	-5%	+12%	-8%
Borates	('000 t)	137	124	133	260	257	-3%	+8%	-1%
Copper - mined	('000 t)	126.4	130.7	130.5	251.9	261.2	+3%	0%	+4%
Copper - refined	('000 t)	49.4	58.9	36.2	104.1	95.1	-27%	-39%	-9%
Diamonds	('000 cts)	1,149	954	970	2,140	1,924	-16%	+2%	-10%
Iron Ore	('000 t)	68,640	69,784	70,632	131,105	140,416	+3%	+1%	+7%
Titanium dioxide slag	('000 t)	293	285	303	566	589	+4%	+6%	+4%
Other Metals & Minerals									
Gold - mined	('000 oz)	52.5	64.4	61.4	121.0	125.7	+17%	-5%	+4%
Gold - refined	('000 oz)	20.9	22.0	19.2	53.1	41.2	-8%	-13%	-22%
Molybdenum	('000 t)	0.4	0.1	0.3	1.5	0.4	-25%	+144%	-70%
Salt	('000 t)	1,030	1,450	1,652	2,625	3,101	+60%	+14%	+18%
Silver - mined	('000 oz)	846	935	775	1,858	1,710	-8%	-17%	-8%
Silver - refined	('000 oz)	290	432	329	867	761	+13%	-24%	-12%

Throughout this report, figures in italics indicate adjustments made since the figure was previously quoted on the equivalent page or reported for the first time. Production figures are sometimes more precise than the rounded numbers shown, hence small differences may result between the total of the quarter figures and the year to date figures.

Rio Tinto share of production

	Rio Tinto interest	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	H1 2022	H1 2023
ALUMINA								
Production ('000 tonnes)								
Jonquière (Vaudreuil)	100 %	325	336	368	371	346	659	717
Jonquière (Vaudreuil) specialty Alumina plant	100 %	30	30	29	25	27	55	51
Queensland Alumina	80 %	697	662	678	632	677	1,401	1,309
São Luis (Alumar)	10 %	91	95	97	94	66	185	159
Yarwun	100 %	721	715	769	739	745	1,465	1,483
Rio Tinto total alumina production		1,864	1,838	1,941	1,860	1,861	3,765	3,720
ALUMINIUM								
Production ('000 tonnes)								
Australia - Bell Bay	100 %	44	46	48	45	46	91	92
Australia - Boyne Island	59 %	61	65	68	70	73	134	143
Australia - Tomago	52 %	75	76	76	75	75	150	150
Canada - six wholly owned	100 %	323	341	360	367	389	641	756
Canada - Alouette (Sept-Îles)	40 %	63	64	63	62	63	124	126
Canada - Bécancour	25 %	29	29	29	29	29	57	58
Iceland - ISAL (Reykjavik)	100 %	50	51	52	51	52	100	103
New Zealand - Tiwai Point	79 %	66	67	68	66	66	132	132
Oman - Sohar	20 %	20	20	20	20	20	39	39
Rio Tinto total aluminium production		731	759	783	785	814	1,467	1,598
BAUXITE								
Production ('000 tonnes) (a)								
Gove	100 %	2,637	2,905	2,874	2,579	2,739	5,731	5,317
Porto Trombetas	12 %	308	393	391	275	327	548	601
Sangaredi	(b)	1,946	1,953	1,588	1,744	1,614	3,710	3,358
Weipa	100 %	9,240	8,429	8,328	7,492	8,813	17,768	16,304
Rio Tinto total bauxite production		14,131	13,680	13,181	12,089	13,492	27,757	25,581

(a) Mine production figures for metals refer to the total quantity of metal produced in concentrates, leach liquor or doré bullion irrespective of whether these products are then refined onsite, except for the data for bauxite and iron ore which represent production of marketable quantities of ore plus concentrates and pellets.

(b) Rio Tinto has a 22.95% shareholding in the Sangaredi mine but benefits from 45.0% of production.

Rio Tinto share of production

	Rio Tinto interest	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	H1 2022	H1 2023
BORATES								
Production ('000 tonnes B₂O₃ content)								
Rio Tinto Borates - borates	100 %	137	130	141	124	133	260	257
COPPER								
Mine production ('000 tonnes) (a)								
Bingham Canyon	100 %	33.9	50.7	47.5	30.3	24.8	81.0	55.1
Escondida	30 %	82.3	75.1	73.0	72.3	77.4	150.5	149.7
Oyu Tolgoi (b)	66 %	10.2	12.2	10.8	28.1	28.3	20.4	56.4
Rio Tinto total mine production		126.4	138.0	131.3	130.7	130.5	251.9	261.2
Rio Tinto total mine production - consolidated basis		146.7	162.1	152.8	145.2	145.0	292.3	290.2
Refined production ('000 tonnes)								
Escondida	30 %	16.7	14.9	14.9	15.2	21.7	31.1	37.0
Kennecott (c)	100 %	32.7	39.2	36.1	43.6	14.4	72.9	58.1
Rio Tinto total refined production		49.4	54.1	51.0	58.9	36.2	104.1	95.1

(a) Mine production figures for metals refer to the total quantity of metal produced in concentrates, leach liquor or doré bullion irrespective of whether these products are then refined onsite, except for the data for bauxite and iron ore which represent production of marketable quantities of ore plus concentrates and pellets.

(b) On 16 December 2022, Rio Tinto completed the acquisition of 100% of Turquoise Hill Resources Ltd, increasing our ownership in Oyu Tolgoi from 33.52% to 66%. From 1 January 2023, our share of production has been updated to reflect this change.

(c) We continue to process third party concentrate to optimise smelter utilisation. There was no cathode produced from purchased concentrate in 2023 year-to-date. Purchased and tolled copper concentrates are excluded from reported production figures and production guidance. Sales of cathodes produced from purchased concentrate are included in reported revenues.

DIAMONDS

Production ('000 carats)

Diavik	100 %	1,149	1,192	1,319	954	970	2,140	1,924
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GOLD

Mine production ('000 ounces) (a)

Bingham Canyon	100 %	22.8	32.5	29.7	20.6	18.7	60.6	39.3
Escondida	30 %	13.7	11.5	14.5	14.7	16.1	24.6	30.7
Oyu Tolgoi (b)	66 %	16.0	14.3	11.5	29.1	26.6	35.8	55.7
Rio Tinto total mine production		52.5	58.2	55.7	64.4	61.4	121.0	125.7

Refined production ('000 ounces)

Kennecott	100 %	20.9	30.5	30.3	22.0	19.2	53.1	41.2
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(a) Mine production figures for metals refer to the total quantity of metal produced in concentrates, leach liquor or doré bullion irrespective of whether these products are then refined onsite, except for the data for bauxite and iron ore which represent production of marketable quantities of ore plus concentrates and pellets.

(b) On 16 December 2022, Rio Tinto completed the acquisition of 100% of Turquoise Hill Resources Ltd, increasing our ownership in Oyu Tolgoi from 33.52% to 66%. From 1 January 2023, our share of production has been updated to reflect this change.

Rio Tinto share of production

	Rio Tinto interest	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	H1 2022	H1 2023
IRON ORE								
Production ('000 tonnes) (a)								
Hamersley mines	(b)	52,636	56,650	61,339	54,433	55,004	100,315	109,437
Hope Downs	50 %	6,385	6,264	5,945	5,885	5,763	12,215	11,649
Iron Ore Company of Canada	59 %	2,603	2,776	2,530	2,526	2,063	5,007	4,589
Robe River - Pannawonica (Mesas J and A)	53 %	3,054	3,540	4,178	3,123	3,897	5,828	7,020
Robe River - West Angelas	53 %	3,961	4,496	4,424	3,816	3,905	7,740	7,721
Rio Tinto iron ore production ('000 tonnes)		68,640	73,726	78,415	69,784	70,632	131,105	140,416
Breakdown of Production:								
Pilbara Blend and SP10 Lump (c)		19,309	21,317	21,443	19,612	21,042	36,391	40,654
Pilbara Blend and SP10 Fines (c)		30,240	32,592	35,097	30,851	31,750	55,898	62,601
Robe Valley Lump		1,180	1,389	1,645	1,136	1,488	2,230	2,624
Robe Valley Fines		1,874	2,151	2,533	1,987	2,409	3,598	4,395
Yandicoogina Fines (HIY)		13,433	13,501	15,168	13,672	11,880	27,981	25,552
Pilbara iron ore production ('000 tonnes)		66,037	70,951	75,886	67,258	68,569	126,098	135,827
IOC Concentrate		1,282	1,237	1,186	1,241	1,120	2,244	2,361
IOC Pellets		1,321	1,539	1,343	1,285	943	2,763	2,228
IOC iron ore production ('000 tonnes)		2,603	2,776	2,530	2,526	2,063	5,007	4,589
Breakdown of Shipments:								
Pilbara Blend Lump		12,684	15,301	15,089	15,689	14,691	23,493	30,380
Pilbara Blend Fines		25,156	31,597	32,659	28,528	27,474	46,855	56,002
Robe Valley Lump		971	1,281	1,244	1,051	1,152	1,645	2,203
Robe Valley Fines		2,309	2,392	2,896	2,262	2,489	4,040	4,751
Yandicoogina Fines (HIY)		14,201	13,530	14,661	13,689	12,558	28,689	26,247
SP10 Lump (c)		4,456	1,647	2,824	1,686	1,652	8,283	3,338
SP10 Fines (c)		6,775	3,766	5,062	6,832	6,613	13,843	13,446
Pilbara iron ore shipments ('000 tonnes) (d)		66,552	69,515	74,435	69,738	66,629	126,847	136,367
Pilbara iron ore shipments - consolidated basis ('000 tonnes) (d) (f)		68,114	71,379	76,303	71,505	68,322	129,931	139,827
IOC Concentrate		1,083	1,316	1,174	984	1,247	1,683	2,231
IOC Pellets		1,484	1,443	1,036	1,143	1,352	2,896	2,495
IOC Iron ore shipments ('000 tonnes) (d)		2,567	2,759	2,210	2,127	2,599	4,580	4,726
Rio Tinto iron ore shipments ('000 tonnes) (d)		69,119	72,274	76,645	71,864	69,228	131,427	141,093
Rio Tinto iron ore sales ('000 tonnes) (e)		71,263	74,587	75,337	74,273	71,678	137,946	145,951

(a) Mine production figures for metals refer to the total quantity of metal produced in concentrates, leach liquor or doré bullion irrespective of whether these products are then refined onsite, except for the data for bauxite and iron ore which represent production of marketable quantities of ore plus concentrates and pellets.

(b) Includes 100% of production from Paraburdoo, Mt Tom Price, Western Turner Syncline, Marandoo, Yandicoogina, Brockman, Nammuldi, Silvergrass, Channar, Gudai-Darri and the Eastern Range mines. Whilst Rio Tinto owns 54% of the Eastern Range mine, under the terms of the joint venture agreement, Hamersley Iron manages the operation and is obliged to purchase all mine production from the joint venture and therefore all of the production is included in Rio Tinto's share of production.

(c) SP10 includes other lower grade products.

(d) Shipments includes material shipped to our portside trading facility in China which may not be sold onwards in the same period.

(e) Represents the difference between amounts shipped to portside trading and onward sales from portside trading, and third party volumes sold.

(f) While Rio Tinto has a 53% net beneficial interest in Robe River Iron Associates, it recognises 65% of the assets, liabilities, sales revenues and expenses in its accounts (as 30% is held through a 60% owned subsidiary and 35% is held through a 100% owned subsidiary). The consolidated basis sales reported here include Robe River Iron Associates on a 65% basis to enable comparison with revenue reported in the financial statements.

Rio Tinto share of production

	Rio Tinto interest	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	H1 2022	H1 2023
MOLYBDENUM								
Mine production ('000 tonnes) (a)								
Bingham Canyon	100 %	0.4	0.8	1.1	0.1	0.3	1.5	0.4

(a) Mine production figures for metals refer to the total quantity of metal produced in concentrates, leach liquor or doré bullion irrespective of whether these products are then refined onsite, except for the data for bauxite and iron ore which represent production of marketable quantities of ore plus concentrates and pellets.

SALT								
Production ('000 tonnes)								
Dampier Salt	68 %	1,030	1,674	1,458	1,450	1,652	2,625	3,101
SILVER								
Mine production ('000 ounces) (a)								
Bingham Canyon	100 %	385	591	521	356	296	945	652
Escondida	30 %	393	363	453	404	302	774	706
Oyu Tolgoi (b)	66 %	67	86	68	176	177	138	352
Rio Tinto total mine production		846	1,040	1,042	935	775	1,858	1,710
Refined production ('000 ounces)								
Kennecott	100 %	290	571	512	432	329	867	761

(a) Mine production figures for metals refer to the total quantity of metal produced in concentrates, leach liquor or doré bullion irrespective of whether these products are then refined onsite, except for the data for bauxite and iron ore which represent production of marketable quantities of ore plus concentrates and pellets.

(b) On 16 December 2022, Rio Tinto completed the acquisition of 100% of Turquoise Hill Resources Ltd, increasing our ownership in Oyu Tolgoi from 33.52% to 66%. From 1 January 2023, our share of production has been updated to reflect this change.

TITANIUM DIOXIDE SLAG								
Production ('000 tonnes)								
Rio Tinto Iron & Titanium (a)	100 %	293	310	323	285	303	566	589

(a) Quantities comprise 100% of Rio Tinto Fer et Titane and Rio Tinto's 74% interest in Richards Bay Minerals (RBM).

Production figures are sometimes more precise than the rounded numbers shown, hence small differences may result between the total of the quarter figures and the year to date figures.

Rio Tinto percentage interest shown above is at 30 June 2023.

Rio Tinto operational data

	Rio Tinto interest	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	H1 2022	H1 2023
ALUMINA								
Smelter Grade Alumina - Aluminium Group								
Alumina production ('000 tonnes)								
<i>Australia</i>								
Queensland Alumina Refinery - Queensland	80 %	871	827	847	790	846	1,751	1,637
Yarwun refinery - Queensland	100 %	721	715	769	739	745	1,465	1,483
<i>Brazil</i>								
São Luis (Alumar) refinery	10 %	910	946	975	936	657	1,850	1,593
<i>Canada</i>								
Jonquière (Vaudreuil) refinery - Quebec (a)	100 %	325	336	368	371	346	659	717
(a) Jonquière's (Vaudreuil's) production shows smelter grade alumina only and excludes hydrate produced and used for specialty alumina.								
Speciality Alumina - Aluminium Group								
Speciality alumina production ('000 tonnes)								
<i>Canada</i>								
Jonquière (Vaudreuil) plant – Quebec	100 %	30	30	29	25	27	55	51

Rio Tinto percentage interest shown above is at 30 June 2023. The data represents production and sales on a 100% basis unless otherwise stated.

Rio Tinto operational data

	Rio Tinto interest	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	H1 2022	H1 2023
ALUMINIUM								
Primary Aluminium								
Primary aluminium production ('000 tonnes)								
<i>Australia</i>								
Bell Bay smelter - Tasmania	100 %	44	46	48	45	46	91	92
Boyne Island smelter - Queensland	59 %	103	110	114	117	123	226	240
Tomago smelter - New South Wales	52 %	145	148	147	145	146	291	291
<i>Canada</i>								
Alma smelter - Quebec	100 %	121	122	122	120	121	237	241
Alouette (Sept-Îles) smelter - Quebec	40 %	157	159	158	156	159	311	314
Arvida smelter - Quebec	100 %	42	43	44	43	43	84	85
Arvida AP60 smelter - Quebec	100 %	14	15	15	14	14	28	29
Bécancour smelter - Quebec	25 %	117	116	116	115	118	228	232
Grande-Baie smelter - Quebec	100 %	58	59	58	57	57	115	114
Kitimat smelter - British Columbia	100 %	26	38	57	72	92	50	165
Laterrière smelter - Quebec	100 %	63	64	64	61	62	125	123
<i>Iceland</i>								
ISAL (Reykjavik) smelter	100 %	50	51	52	51	52	100	103
<i>New Zealand</i>								
Tiwai Point smelter	79 %	83	85	85	83	83	166	166
<i>Oman</i>								
Sohar smelter	20 %	98	100	100	98	99	195	197

Rio Tinto percentage interest shown above is at 30 June 2023. The data represents production and sales on a 100% basis unless otherwise stated.

Rio Tinto operational data

	Rio Tinto interest	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	H1 2022	H1 2023
BAUXITE								
Bauxite production ('000 tonnes)								
<i>Australia</i>								
Gove mine - Northern Territory	100 %	2,637	2,905	2,874	2,579	2,739	5,731	5,317
Weipa mine - Queensland	100 %	9,240	8,429	8,328	7,492	8,813	17,768	16,304
<i>Brazil</i>								
Porto Trombetas (MRN) mine	12 %	2,569	3,275	3,256	2,288	2,724	4,569	5,012
<i>Guinea</i>								
Sangaredi mine (a)	23 %	4,323	4,339	3,530	3,876	3,586	8,245	7,462

Rio Tinto share of bauxite shipments

Share of total bauxite shipments ('000 tonnes)	14,054	13,294	13,561	12,264	13,603	27,930	25,867
Share of third party bauxite shipments ('000 tonnes)	9,599	9,049	9,233	7,880	9,159	19,734	17,039

(a) Rio Tinto has a 22.95% shareholding in the Sangaredi mine but benefits from 45.0% of production.

	Rio Tinto interest	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	H1 2022	H1 2023
BORATES								
Rio Tinto Borates - borates	100 %							
<i>US</i>								
Borates ('000 tonnes) (a)		137	130	141	124	133	260	257

(a) Production is expressed as B₂O₃ content.

	Rio Tinto interest	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	H1 2022	H1 2023
COPPER & GOLD								
Escondida								
<i>Chile</i>								
Sulphide ore to concentrator ('000 tonnes)		34,318	32,894	33,911	33,309	30,749	64,553	64,058
Average copper grade (%)		0.87	0.83	0.76	0.78	0.93	0.84	0.85
Mill production (metals in concentrates):								
Contained copper ('000 tonnes)		239.5	214.6	212.8	210.0	228.9	430.9	438.9
Contained gold ('000 ounces)		45.8	38.2	48.4	49.0	53.5	82.1	102.5
Contained silver ('000 ounces)		1,311	1,210	1,510	1,346	1,008	2,581	2,353
Recoverable copper in ore stacked for leaching ('000 tonnes) (a)		34.8	35.8	30.4	31.0	29.1	70.7	60.2
Refined production from leach plants:								
Copper cathode production ('000 tonnes)		55.7	49.6	49.7	50.8	72.4	103.8	123.2

(a) The calculation of copper in material mined for leaching is based on ore stacked at the leach pad.

Rio Tinto percentage interest shown above is at 30 June 2023. The data represents production and sales on a 100% basis unless otherwise stated.

Rio Tinto operational data

	Rio Tinto interest	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	H1 2022	H1 2023
COPPER & GOLD (continued)								
Kennecott								
Bingham Canyon mine	100 %							
<i>Utah, US</i>								
Ore treated ('000 tonnes)		6,862	10,125	10,449	7,405	5,339	16,991	12,744
Average ore grade:								
Copper (%)		0.55	0.56	0.52	0.47	0.52	0.53	0.49
Gold (g/t)		0.17	0.16	0.14	0.12	0.16	0.18	0.14
Silver (g/t)		2.39	2.50	2.20	2.16	2.36	2.37	2.24
Molybdenum (%)		0.017	0.021	0.020	0.012	0.018	0.019	0.014
Copper concentrates produced ('000 tonnes)		136	192	184	116	92	312	208
Average concentrate grade (% Cu)		24.9	26.2	25.6	26.1	26.8	26.0	26.4
Production of metals in copper concentrates:								
Copper ('000 tonnes) (a)		33.9	50.7	47.5	30.3	24.8	81.0	55.1
Gold ('000 ounces)		22.8	32.5	29.7	20.6	18.7	60.6	39.3
Silver ('000 ounces)		385	591	521	356	296	945	652
Molybdenum concentrates produced ('000 tonnes):		0.9	1.8	2.0	0.1	0.6	2.9	0.7
Molybdenum in concentrates ('000 tonnes)		0.4	0.8	1.1	0.1	0.3	1.5	0.4
Kennecott smelter & refinery								
	100 %							
Copper concentrates smelted ('000 tonnes)		152	166	194	200	41	365	241
Copper anodes produced ('000 tonnes) (b)		27.9	46.2	24.5	55.1	18.2	73.7	73.3
Production of refined metal:								
Copper ('000 tonnes) (c)		32.7	39.2	36.1	43.6	14.4	72.9	58.1
Gold ('000 ounces) (d)		20.9	30.5	30.3	22.0	19.2	53.1	41.2
Silver ('000 ounces) (d)		290	571	512	432	329	867	761

(a) Includes a small amount of copper in precipitates.

(b) New metal excluding recycled material.

(c) We continue to process third party concentrate to optimise smelter utilisation. There was no cathode produced from purchased concentrate in 2023 year-to-date. Purchased and tolled copper concentrates are excluded from reported production figures and production guidance. Sales of cathodes produced from purchased concentrate are included in reported revenues.

(d) Includes gold and silver in intermediate products.

Rio Tinto percentage interest shown above is at 30 June 2023. The data represents production and sales on a 100% basis unless otherwise stated.

Rio Tinto operational data

	Rio Tinto interest	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	H1 2022	H1 2023
COPPER & GOLD (continued)								
Oyu Tolgoi mine (a)	66 %							
<i>Mongolia</i>								
Ore Treated ('000 tonnes) - Open Pit		9,225	10,141	8,900	9,613	8,809	18,545	18,421
Ore Treated ('000 tonnes) - Underground		460	544	510	675	900	721	1,575
Ore Treated ('000 tonnes) - Total		9,685	10,685	9,411	10,288	9,709	19,266	19,996
Average mill head grades:								
Open Pit								
Copper (%)		0.39	0.40	0.41	0.43	0.41	0.39	0.42
Gold (g/t)		0.26	0.22	0.20	0.21	0.19	0.29	0.20
Silver (g/t)		1.12	1.28	1.14	1.16	1.10	1.19	1.13
Underground								
Copper (%)		0.57	0.82	1.03	1.36	1.56	0.51	1.47
Gold (g/t)		0.24	0.22	0.29	0.35	0.38	0.22	0.36
Silver (g/t)		1.73	2.16	2.54	3.26	3.67	1.48	3.49
Total								
Copper (%)		0.40	0.42	0.45	0.49	0.52	0.40	0.51
Gold (g/t)		0.26	0.22	0.21	0.22	0.21	0.29	0.21
Silver (g/t)		1.15	1.32	1.21	1.30	1.34	1.20	1.32
Copper concentrates produced ('000 tonnes)		146.0	173.6	151.9	201.8	200.3	290.3	402.0
Average concentrate grade (% Cu)		20.9	20.9	21.3	21.1	21.4	21.0	21.2
Production of metals in concentrates:								
Copper in concentrates ('000 tonnes)		30.6	36.3	32.3	42.6	42.8	60.8	85.4
Gold in concentrates ('000 ounces)		47.6	42.7	34.2	44.1	40.3	106.8	84.4
Silver in concentrates ('000 ounces)		201	256	204	266	268	412	534
Sales of metals in concentrates:								
Copper in concentrates ('000 tonnes)		35.3	41.8	25.3	41.4	43.2	65.2	84.6
Gold in concentrates ('000 ounces)		67.9	56.0	26.2	44.0	40.4	125.3	84.4
Silver in concentrates ('000 ounces)		224	282	152	242	257	403	499

(a) On 16 December 2022, Rio Tinto completed the acquisition of 100% of Turquoise Hill Resources Ltd, increasing our ownership in Oyu Tolgoi from 33.52% to 66%. From 1 January 2023, our share of production has been updated to reflect this change.

	Rio Tinto interest	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	H1 2022	H1 2023
DIAMONDS								
Diavik Diamonds	100 %							
<i>Northwest Territories, Canada</i>								
Ore processed ('000 tonnes)		537	590	535	427	446	1,033	873
Diamonds recovered ('000 carats)		1,149	1,192	1,319	954	970	2,140	1,924

Rio Tinto percentage interest shown above is at 30 June 2023. The data represents production and sales on a 100% basis unless otherwise stated.

Rio Tinto operational data

	Rio Tinto interest	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	H1 2022	H1 2023
IRON ORE								
Rio Tinto Iron Ore								
<i>Western Australia</i>								
Pilbara Operations								
Saleable iron ore production ('000 tonnes)								
Hamersley mines	(a)	52,636	56,650	61,339	54,433	55,004	100,315	109,437
Hope Downs	50 %	12,771	12,529	11,891	11,771	11,527	24,431	23,298
Robe River - Pannawonica (Mesas J and A)	53 %	5,762	6,679	7,882	5,892	7,353	10,996	13,244
Robe River - West Angelas	53 %	7,474	8,484	8,347	7,200	7,368	14,604	14,568
Total production ('000 tonnes)		78,643	84,342	89,458	79,296	81,251	150,346	160,547
Breakdown of total production:								
Pilbara Blend and SP10 Lump (b)		23,228	25,452	25,251	23,196	24,910	44,055	48,106
Pilbara Blend and SP10 Fines (b)		36,220	38,709	41,158	36,537	37,108	67,314	73,645
Robe Valley Lump		2,226	2,621	3,103	2,143	2,808	4,208	4,952
Robe Valley Fines		3,536	4,058	4,779	3,748	4,544	6,788	8,293
Yandicoogina Fines (HIY)		13,433	13,501	15,168	13,672	11,880	27,981	25,552
Breakdown of total shipments:								
Pilbara Blend Lump		16,043	18,860	18,153	18,733	17,757	29,669	36,489
Pilbara Blend Fines		32,243	38,186	38,835	35,349	33,668	60,158	69,018
Robe Valley Lump		1,832	2,417	2,348	1,983	2,173	3,105	4,156
Robe Valley Fines		4,357	4,514	5,464	4,268	4,696	7,623	8,964
Yandicoogina Fines (HIY)		14,201	13,530	14,661	13,689	12,558	28,689	26,247
SP10 Lump (b)		4,456	1,647	2,824	1,686	1,652	8,283	3,338
SP10 Fines (b)		6,775	3,766	5,062	6,832	6,613	13,843	13,446
Total shipments ('000 tonnes) (c)		79,907	82,920	87,347	82,540	79,118	151,369	161,658
	Rio Tinto interest	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	H1 2022	H1 2023
Iron Ore Company of Canada								
	59 %							
<i>Newfoundland & Labrador and Quebec in Canada</i>								
Saleable iron ore production:								
Concentrates ('000 tonnes)		2,183	2,106	2,020	2,113	1,908	3,821	4,021
Pellets ('000 tonnes)		2,250	2,621	2,288	2,189	1,605	4,706	3,794
IOC Total production ('000 tonnes)		4,433	4,727	4,308	4,302	3,513	8,527	7,816
Shipments:								
Concentrates ('000 tonnes)		1,845	2,241	1,999	1,676	2,124	2,867	3,800
Pellets ('000 tonnes)		2,527	2,457	1,764	1,947	2,302	4,932	4,248
IOC Total Shipments ('000 tonnes) (c)		4,372	4,699	3,763	3,622	4,426	7,799	8,048
Global Iron Ore Totals								
Iron Ore Production ('000 tonnes)		83,076	89,069	93,766	83,599	84,764	158,873	168,363
Iron Ore Shipments ('000 tonnes)		84,279	87,619	91,110	86,162	83,543	159,168	169,706
Iron Ore Sales ('000 tonnes) (d)		86,108	89,689	89,650	88,490	85,601	165,302	174,091

(a) Includes 100% of production from Paraburdoo, Mt Tom Price, Western Turner Syncline, Marandoo, Yandicoogina, Brockman, Nammuldi, Silvergrass, Channar, Gudai-Darri and the Eastern Range mines. Whilst Rio Tinto owns 54% of the Eastern Range mine, under the terms of the joint venture agreement, Hamersley Iron manages the operation and is obliged to purchase all mine production from the joint venture and therefore all of the production is included in Rio Tinto's share of production.

(b) SP10 includes other lower grade products.

(c) Shipments includes material shipped to our portside trading facility in China which may not be sold onwards in the same period.

(d) Include Pilbara and IOC sales adjusted for portside trading movements and third party volumes sold.

Rio Tinto percentage interest shown above is at 30 June 2023. The data represents production and sales on a 100% basis unless otherwise stated.

Rio Tinto operational data

	Rio Tinto interest	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	H1 2022	H1 2023
SALT								
Dampier Salt	68 %							
<i>Western Australia</i>								
Salt production ('000 tonnes)		1,507	2,449	2,133	2,121	2,416	3,840	4,537
TITANIUM DIOXIDE SLAG								
Rio Tinto Iron & Titanium	100 %							
<i>Canada and South Africa</i>								
(Rio Tinto share) (a)								
Titanium dioxide slag ('000 tonnes)		293	310	323	285	303	566	589

(a) Quantities comprise 100% of Rio Tinto Fer et Titane and Rio Tinto's 74% interest in Richards Bay Minerals' production. Ilmenite mined in Madagascar is being processed in Canada.

Rio Tinto percentage interest shown above is at 30 June 2023. The data represents production and sales on a 100% basis unless otherwise stated.