Rio Tinto

Climate change report
## Contents

<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td><strong>Introduction</strong></td>
</tr>
<tr>
<td></td>
<td>About Rio Tinto</td>
</tr>
<tr>
<td>04</td>
<td>About this report</td>
</tr>
<tr>
<td>05</td>
<td><strong>Our position</strong></td>
</tr>
<tr>
<td></td>
<td>The challenge of climate change</td>
</tr>
<tr>
<td>07</td>
<td>Our climate change position</td>
</tr>
<tr>
<td>09</td>
<td><strong>Our portfolio</strong></td>
</tr>
<tr>
<td></td>
<td>Our assets</td>
</tr>
<tr>
<td>10</td>
<td>Our customers</td>
</tr>
<tr>
<td>11</td>
<td>Our products</td>
</tr>
<tr>
<td>14</td>
<td>Our emissions</td>
</tr>
<tr>
<td>15</td>
<td>Our efficiency targets</td>
</tr>
<tr>
<td>16</td>
<td>Our energy use</td>
</tr>
<tr>
<td>17</td>
<td>Improving haul truck efficiency</td>
</tr>
<tr>
<td></td>
<td>Canada energy award</td>
</tr>
<tr>
<td>18</td>
<td>Shipping with less fuel</td>
</tr>
<tr>
<td>19</td>
<td><strong>Our people</strong></td>
</tr>
<tr>
<td></td>
<td>Governance</td>
</tr>
<tr>
<td>20</td>
<td>Stakeholder engagement</td>
</tr>
<tr>
<td></td>
<td>Great Barrier Reef science partnership</td>
</tr>
<tr>
<td>21</td>
<td>Advocacy</td>
</tr>
<tr>
<td></td>
<td>Industry associations</td>
</tr>
<tr>
<td>22</td>
<td>Industry association positions</td>
</tr>
<tr>
<td>23</td>
<td><strong>Building resilience</strong></td>
</tr>
<tr>
<td></td>
<td>Price on carbon</td>
</tr>
<tr>
<td>24</td>
<td>Climate change scenarios</td>
</tr>
<tr>
<td>25</td>
<td>Low-carbon R&amp;D and investment strategies</td>
</tr>
<tr>
<td></td>
<td>Higher production, lower carbon</td>
</tr>
<tr>
<td>26</td>
<td>Pioneering new energy applications</td>
</tr>
<tr>
<td>27</td>
<td>Adaptation</td>
</tr>
<tr>
<td></td>
<td>Modelling Utah snow melt</td>
</tr>
<tr>
<td>28</td>
<td><strong>Our performance</strong></td>
</tr>
<tr>
<td></td>
<td>Our emissions performance</td>
</tr>
<tr>
<td>29</td>
<td>Our energy use</td>
</tr>
</tbody>
</table>

Cover image: Chute-du-Diable dam, Jonquière, Quebec. Part of the 4,000MW of hydroelectricity Rio Tinto owns in Canada.
About Rio Tinto

At Rio Tinto, as pioneers in mining and metals, we produce materials essential to human progress.

We have been in business for more than 140 years and remain focused on the long term. Our strategy plays to our strengths: world-class assets, talented employees, a strong balance sheet and operating excellence.

Our approach is underpinned by our values of safety, teamwork, respect, integrity and excellence. Combined with the strength provided by our people and our assets, our values help form the foundations of our long-term success. Our world-class assets are run by a 51,000-strong workforce in around 35 countries.

We find, mine, process and market mineral resources, producing a diverse suite of minerals and metals that enable the world to grow and develop.

These products give us exposure to markets around the world, and across the economic development spectrum, from basic infrastructure needs through to industrial and consumer-led demand.

Cautionary statement about forward-looking statements

This document contains certain forward-looking statements, including statements relating to the operations and business of the Rio Tinto Group. These statements are forward-looking statements within the meaning of Section 27A of the US Securities Act of 1933, and Section 21E of the US Securities Exchange Act of 1934. 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. Examples of forward-looking statements in this report include those regarding demand for commodities, plans and objectives of the Group, potential future opportunities for the Group and projections for reduced energy use in certain activities of the Group. Forward-looking statements involve known and unknown risks, uncertainties, assumptions and other factors set forth in this document that are beyond the Group's control. In light of these risks, uncertainties and assumptions, actual results could be materially different from projected future results expressed or implied by these forward-looking statements which speak only as to the date of this report. Except as required by applicable regulations or by law, the Group does not undertake any obligation to publicly update or revise any forward-looking statements.
About this report

This Climate change report has been published alongside our Sustainable development report and provides detailed information about our climate change risks and what we are doing to prepare our business for a low-carbon future.

This first report starts to address the resolution passed by our shareholders at our 2016 annual general meetings, which requires greater disclosure about our climate change approach. It builds on information we provide in our Annual report and Sustainable development report, and our response to CDP, formerly the Carbon Disclosure Project. However we recognise that there is still more that needs to be done, and in future reports we will include additional information about our resilience to a 2°C climate change scenario.

Our response to the five key areas in the shareholder resolution on climate change

<table>
<thead>
<tr>
<th>Resolution area</th>
<th>Where reported by Rio Tinto</th>
</tr>
</thead>
</table>
| 1. Ongoing operational emissions management | Annual report sustainable development section  
Climate change report – Our portfolio  
2016 CDP report on cdp.net |
| 2. Asset portfolio resilience to post-2035 scenarios | Climate change report – Our products and Building resilience |
| 3. Low-carbon energy research and development and investment strategies | Climate change report – Building resilience |
| 4. Strategic key performance indicators and executive incentives | Climate change report – Our partnerships |
| 5. Public policy activities | Climate change report – Our position and Our partnerships  
Rio Tinto Climate change position statement on riotinto.com |

All figures, unless otherwise indicated, are given on a managed share basis.
A glossary of terms is included as part of our Sustainable development report, and covers terms used in this report.
Our position

The challenge of climate change

Today’s challenge is to deliver and meet the growing global demand for the metals and minerals we produce while addressing climate change and environmental issues.

By 2050, almost ten billion people will require food, shelter and energy. The demand for the essential metals and minerals we provide will continue to be immense. Against this backdrop, Rio Tinto has long recognised the significance of climate change. A key role for society - and Rio Tinto - is to find ways to emit much less carbon dioxide and reduce our environmental impact.

This report outlines how we aim to address this challenge by sharing our climate change commitments, our performance and approach.

Our aim is to be part of the solution which we believe can only be delivered through the collective efforts of business, governments and consumers. Governments must lead by providing clear, consistent and effective climate policy frameworks. Level playing fields are essential for businesses to play their part.

At Rio Tinto we support a market-based price on carbon. We believe this is the best way of achieving emissions reductions at least cost.

We have used carbon prices in decision-making since 1998 and use an established process to develop and update our carbon price projections informed by:

• existing short-term market data;
• other price forecasts and scenarios; and
• input from technical experts within and outside the business.

Our approach is always to look to the long term and we use scenarios in a range of internal processes, including the potential impacts of carbon regulation and carbon pricing on business value.
For example, scenarios are directly factored into capital investment decisions and are central to our internal processes for assessing future demand and pricing. The transition to a low-carbon future is expected to affect the future price of energy. So the impact of carbon pricing is also integrated into our internal view of energy prices over the medium to long term. In future reports, we will include more about our use of scenarios and the resilience of our business to a 2°C climate change scenario.

We continue to play our part from a performance perspective, with many of our products used to create environmentally friendly solutions.

Over the past nine years we have reduced our GHG intensity by 26 per cent and cut our absolute emissions by 35 per cent.

Last year we pledged our support for the Paris climate change agreement which establishes global consensus on the need to respond to climate change, and a framework with the objective to limit global average temperature to less than 2°C above pre-industrial levels.

As significant as the agreement is, initial contributions from governments, in the form of their Nationally Determined Contributions, fall short of the aspirational goal and an increased ambition will be required from governments over time.

In turn, each government will look to its own economy, business sector and society to deliver these contributions.

The impacts of climate change, and the need for greater action to decarbonise our activities, will create risks and opportunities across our value chain, including:

- the supply of essential raw materials and energy to our operations;
- the operation of our mines, refineries and smelters;
- the transportation of our products; and
- the use of our products by our consumers.

At Rio Tinto our energy and electricity come from a spectrum of sources. We use oil for ships and locomotives and carbon anodes to turn alumina into aluminium.

Some 68 per cent of the electricity we use is sourced from hydro, solar or wind, while the uranium we export around the world supports many nuclear power stations.

Our products such as copper have a vital role to play in energy transmission and storage, our borates in agriculture, and our iron ore and aluminium in urbanisation and transportation.

We recognise shareholders and stakeholders are seeking more transparency.

This report is a response, to build a better understanding of our position, our portfolio and the purpose behind our products.

Rio Tinto has pioneered many important social and public transparency endeavours, from indigenous agreements to our economic and tax contribution reporting.

We hope this report and publications such as our Sustainable development report will add more insights into our business and our role.

68% of the electricity we use is sourced from hydro, solar or wind

Isle-Maligne power plant, Quebec, Canada.
Our climate change position

Rio Tinto has had a published position on climate change since 2005. Our statement recognises the science of climate change, supports the goal to limit global temperature rise below 2°C, and outlines the role of our company and our products in responding to that goal. You can read our full climate change position statement below.

The science of climate change and the need for action

Rio Tinto recognises that climate change is occurring and is largely caused by human activities. It poses significant risks for, and in many cases is already affecting, a broad range of human and natural systems and we will need to adapt to its effects. There is a need for large reductions in global greenhouse gas emissions to reduce the extent of future climate change and avoid the most severe impacts. This, coupled with the world’s increasing requirements for secure, affordable energy, create significant challenges which are best met by companies, governments and society working together.

We support the outcomes of the Paris Agreement and the long-term goal to limit global average temperature rise to well below 2°C. We recognise that achieving this goal will require individual jurisdictions to take actions in line with their Nationally Determined Contributions, and raise ambition over time. Such actions should contribute to efficient and equitable emissions reductions across jurisdictions and sectors, minimising distortions to international economic activity.

Our role

Climate change will create risks and uncertainties for businesses and society. However, it also presents opportunities. Rio Tinto is taking action to appropriately manage risks and capture opportunities, consistent with our objectives of delivering superior performance and creating long-term shareholder value.

Rio Tinto’s operations are energy intensive and we are taking action to improve productivity and reduce emissions. We have a robust understanding of energy use, low-emissions technology opportunities, and the capacity to innovate.

The metals and minerals we produce have an essential role to play in the transition to, and development of, a low-carbon economy. Our low-emissions aluminium helps reduce our customers’ emissions footprints. Copper, borates, lithium and iron ore contribute to the electrification of transportation, smart technologies, improving energy efficiency and the construction of the renewable energy sector. Uranium is used in low-emissions power generation. And, as a coal producer, Rio Tinto recognises the importance of developing low-emission technologies for fossil fuel use.

Our actions to address climate change

Rio Tinto has set a quantified greenhouse gas emissions intensity reduction target and we publicly report on performance against the target annually. We are reducing our greenhouse gas emissions intensity by minimising where practicable:

• the energy intensity of our operations and emissions intensity of our energy use;

• the intensity of greenhouse gas emissions arising from the chemical processes used at our operations; and

• greenhouse gas emissions from other sources.

We are seeking a substantial decarbonisation of the business by 2050. Research, development and deployment of new technologies and better practices will be crucial to achieve this, although we recognise that constraints imposed by process chemistry and technology costs may remain.

We are adapting to climate change by making our businesses and new projects resilient to a changing climate.
We recognise the need to integrate climate change into our strategic approach. We include carbon prices in our investment decision-making. We factor in the costs and associated risks of emissions and business disruption, and the opportunities created for our business, by the move to a low-carbon economy. We consider a range of carbon scenarios when assessing the long-term future of our business.

We work with others, engaging with:

- our customers and suppliers to reduce value chain emissions, and make best use of our products to build a low-carbon economy;
- our host communities by listening to and working with them on energy, emissions and climate change issues that are important to them;
- governments and other stakeholders to advocate constructively for policies that are environmentally effective, economically efficient and equitable; and
- investors and the broader community, reporting publicly on the issues that are important to them and integrating our climate-related activities into our broader sustainable development programme.

We engage in policy debates, seeking policies that provide a level playing field across the jurisdictions in which we operate and sell our products and that:

- provide the stable regulatory framework necessary for businesses to plan their investments efficiently;
- minimise competitive distortion within and across jurisdictions, with appropriate transitional assistance necessary for emissions-intensive, trade-exposed industries to avoid damage to international competitiveness and carbon leakage;
- provide transparent and predictable carbon prices to provide clear and economically efficient signals for emissions reduction;
- use revenue raised from any carbon pricing to facilitate the transition to a low-carbon economy, including through the development of new technology;
- are broadly based, covering a wide range of sectors and emitting activities; and
- establish fit-for-purpose reporting obligations to minimise administrative burden.

We continue to support market mechanisms as the best way of achieving emissions reductions at least cost, and support a market-based price on carbon.
Our portfolio

Our assets

Since its formation more than 140 years ago, Rio Tinto has been an international company. Today we operate in around 35 countries.

Our asset base reflects an enduring and proven strategy to invest in and operate long-life, low-cost, expandable operations in the most attractive industry sectors. Through acquisitions and divestments we continually shape our portfolio. As at 31 December 2016, more than 85 per cent of our assets were based in the Organisation for Economic Co-operation and Development (OECD).

Our assets by regional location are shown below. For a detailed portfolio list see our Annual report.

1Other Asia mainly relates to assets in Singapore and Oman. Total assets as at 31 December 2016 adjusted for non-controlling interests, cash, current and deferred tax receivables and derivatives. Excludes assets held for sale, cash, bank balances, current and deferred tax receivables, and derivative assets.
Our customers

Our product and customer mix provide exposure to markets around the world, and across the economic development spectrum, from basic infrastructure needs through to industrial and consumer-led demand.

In the space of 25 years, China’s share of demand for copper, aluminium, titanium dioxide, and traded iron ore has increased significantly. China’s share of traded iron ore has grown from 4 per cent in 1990 to 70 per cent in 2015. Similarly, its share of primary aluminium demand has grown from 5 per cent to 50 per cent. And with much of that primary aluminium demand being met from production inside China there is significant demand for bauxite and alumina.

>43%

China’s share of our US$35.3 billion in sales

In 2016 our Group sales revenue was US$35.3 billion with more than 43 per cent of sales to China, 26 per cent to Japan and other Asian countries, 17 per cent to North America, and 8 per cent to Europe.

Read more – Rio Tinto chartbook

Beijing, China home to 22 million people.
Our products

We produce a diverse suite of minerals and metals that enable the world to develop and grow. These products provide exposure to markets around the world and across the economic development spectrum. From iron ore used in steel for industry and infrastructure, to light-weight aluminium in transport. From coal and uranium to power societies, copper to electrify communities, titanium for medical devices, and borates for insulation and agriculture.

Aluminium is light, strong, flexible, corrosion resistant and infinitely recyclable. Four tonnes of bauxite are required to produce two tonnes of alumina (aluminium oxide), which when smelted produces one tonne of aluminium metal. Since 1880, of the almost one billion tonnes of aluminium produced, three-quarters is still in productive use. Around 35 per cent is found in buildings, 30 per cent in electrical cables and machines, and 30 per cent in transport.

Read more – World Aluminium

Copper is the primary conductor in the world’s electrical infrastructure and its communication nodes, carrying voices and data. It is a key component of green technologies from wind energy to solar collection. It is a critical component in electric cars. While a conventional car contains 8kg-33kg of copper, a fully electric vehicle contains 94kg.

Read more – Copper Alliance

Rio Tinto holds interests in leading bauxite deposits in Australia, Brazil and Guinea, and alumina refineries in Australia, Brazil, and in Canada. We have a world-leading position in hydro-electrically powered aluminium smelters. Our advanced AP Technology™ for aluminium smelting, and our largely carbon-free energy profile afforded by our hydropower portfolio lie at the heart of RenewAI™ which has a carbon dioxide footprint three times lower than the industry average.

Read more – RenewAI™

Rio Tinto has interests in copper mines in the US, Mongolia, Chile and Indonesia. In the US, the Kennecott copper operation provides about 15 per cent of US production and 30 per cent of the country’s smelting and refining capacity.
Our products

**Energy** is essential to our societies. Uranium is one of the most powerful natural energy sources, and is used in the production of clean, stable, base-load electricity. Thermal coal is a cost-effective and abundant energy source and currently accounts for almost 40 per cent of global electricity generation. Coking coal is mixed in furnaces with iron ore to produce steel.

Read more – [World Coal Association](#)

**Iron ore** used in steel is the fundamental building block of industry and infrastructure. To produce one tonne of pig iron requires 1.5 tonnes of iron ore and about 450 kilograms of coking coal. Global annual production of crude steel exceeds 1.6 billion tonnes with the majority used for buildings and infrastructure, mechanical equipment, and transport.

Read more – [World Steel Association](#)

In 2016 our share of uranium oxide production was 6.3 million pounds accounting for approximately 10 per cent of the world’s uranium production. The world consumes in excess of 6 billion tonnes of coal per annum. In 2016 our share of thermal and coking coal production was 21.4 Mt and 8.1 Mt respectively.

We operate a world-class iron ore portfolio, with operations in the Pilbara region of Western Australia and the Iron Ore Company of Canada. In the Pilbara, we operate the world’s largest integrated system of iron ore assets, comprising 15 mines, four independent port terminals, and over 1,700km of the largest privately owned heavy freight railway in Australia.
Our products

**Borates** are a vital ingredient of many building materials and are essential micro-nutrients for crops. They are commonly used in glass and ceramic applications, including fibre glass, television screens, floor to wall tiles, and heat-resistant glass. Our Rio Tinto Borates business in California’s Mojave desert provides 30 per cent of the world’s supply, serving more than 1,000 customers in 100 countries.

**Diamonds** are an important component in both affordable and higher-end jewellery. We are able to service all established and emerging markets as we produce the full range of diamonds in terms of size, quality and colour distribution.

**Salt** is a basic raw material for the chemicals industry and is indispensable to a wide array of automotive, construction and electronic products, as well as for water treatment, food and healthcare. In 2016 our share of Dampier Salt production was 5.2 Mt. Around 99 per cent of the energy Dampier Salt uses in the growing and processing of salt comes from the sun and wind.

**Titanium dioxide** is used in paints, plastics, paper, inks, textiles, food, sunscreen and cosmetics. Titanium metal is lightweight, chemically inert and strong, making it ideal for use in medical applications and in the aerospace industry. Rio Tinto Iron & Titanium is an industry leader in high-grade titanium dioxide feedstocks, with operations in Canada, Madagascar and South Africa.
Our emissions

Our greenhouse gas emissions (GHG) result from the energy and chemical processes used in our activities. In addition, GHG emissions occur when our customers use our products.

To manage our emissions and energy use, we start by measuring and reporting our GHG and energy performance each year. We report at a consolidated, Group level using the GHG Protocol developed by World Resources Institute (WRI) and World Business Council on Sustainable Development (WBCSD), the Global Reporting Initiative (GRI) G4 Sustainability Reporting Guidelines and the International Council on Mining & Metals (ICMM) Sustainable Development Framework.

In 2016, our total GHG emissions were 32 million tonnes of carbon dioxide equivalent (CO$_2$-e). The use of energy accounted for over 90 per cent of this, with the balance generated through other chemical processes and land management activities.

32 Mt CO$_2$-e
Greenhouse emissions by source

- Anodes and reductants: 22%
- Diesel and fuel oil: 19%
- Natural gas: 12%
- Process emissions: 7%
- Coal: 5%
- Net land management: 1%

34% Electricity and steam
Our reported total GHG emissions include Scope 1 and Scope 2 emissions. They do not include the transportation and use of our products (Scope 3), which also contribute to GHG emissions.

In 2016, the three most significant sources of Scope 3 emissions were:

- 102 million tonnes of CO$_2$-e associated with customers using our coal in electricity generation and steel production, a 10 per cent decrease from 2015.
- 524 million tonnes of CO$_2$-e associated with customers using our iron ore to produce steel. These emissions are not all in addition to the coal-use emissions above, as some customers use both our iron ore and our coal to produce steel. This was a three per cent increase from 2015.

Our reported total GHG emissions include Scope 1 and Scope 2 emissions. They do not include the transportation and use of our products (Scope 3), which also contribute to GHG emissions.

In 2016, the three most significant sources of Scope 3 emissions were:

- 6 million tonnes of CO$_2$-e associated with third-party transport of our products and raw materials, a 10 per cent increase from 2015.

**Scope 1**

21.1 Mt CO$_2$-e

**Scope 2**

11.3 Mt CO$_2$-e

**Scope 3**

+600 Mt CO$_2$-e

**Scope 1** are those emissions from our managed operations, including mines, processing and power facilities.

**Scope 2** emissions are from third party facilities that supply electricity and/or steam to our managed operations.

**Scope 3** includes emissions from third party transport of our products and use of our products by customers.

Our efficiency targets

Rio Tinto set its first public GHG target in 1998. Our current target began in 2008 when we set a target for the GHG emissions intensity of our operations based on a measurement of emissions per tonne of production against a 2008 baseline.

We targeted a six per cent reduction by 2013, and a further four per cent reduction by 2015. We exceeded this target, reducing our GHG emissions intensity by 20.3 per cent by the end of 2015.

This was achieved through greater efficiencies within the businesses and by divesting or closing emissions-intensive assets.

In 2015, we extended our GHG emissions intensity target period to 2020, aiming for a 24 per cent reduction from the 2008 baseline. In 2016 we achieved a 5.6 unit reduction in GHG intensity compared with 2015.

You can find more data about our emissions in the Our performance section of this report.
Our energy use

We use large amounts of energy to mine, refine and transport our products. In 2016, our total energy consumption was 454 petajoules.

The majority of our energy used is in the form of electricity (222 petajoules) and diesel (70 petajoules). But we also use energy in our chemical processes, for example gas to generate steam, our use of fuel oil for explosives, and carbon anodes used in our smelting processes for aluminium and pig iron.

Rio Tinto owns significant renewable electricity generation. Most of this is in Canada, where we own and operate over 4,000 megawatts of hydroelectric generation. We continue to seek opportunities to expand our use of renewables where this is commercially viable. For example, our Diavik diamond mine in northern Canada uses a wind-diesel hybrid system that offsets approximately 4.5 million litres of diesel each year. Diavik was recognised for innovative use of wind power at the Toronto 2016 Energy and Mine Renewables in Mining Awards.

We also own coal, gas and diesel generation that provides some of our operations with low-cost, secure base-load electricity. In 2016, Rio Tinto Kennecott announced it was closing its three oldest coal units after establishing a new multi-year electricity supply arrangement with Rocky Mountain Power. With a lower emissions intensity than the existing coal fired units at Kennecott, this arrangement will save 90,000 tonnes of carbon dioxide each year.

In mining we are constantly challenged to mine ore at greater depths, move more waste rock and transport materials over greater distances. Without a continuing focus on energy efficiency, this would mean more energy is needed to supply our products. Energy is a significant cost for our business and we continually look for ways to use it more efficiently.

You can find more data about our energy use in the Our performance section of this report.

222 PJ
Sources of electricity used

67% Hydro

17% Coal

8% Gas

5% Nuclear

3% Other
Case studies

Improving haul truck efficiency

As part of the Rio Tinto Coal Australia (RTCA) Dhanna Yurubaya* project, simple software changes to haul trucks were developed in partnership with equipment manufacturer Komatsu, delivering fuel efficiency savings of approximately five per cent.

These changes have been rolled out across RTCA’s fleet of electric drive trucks, and the initiative is now being replicated at our iron ore operations in Western Australia.

An engine replacement programme is also improving fuel efficiency over time. Haul truck engines have a finite life and when an old unit is replaced with a new powerplant, efficiencies of five to seven per cent can be expected, reducing fuel consumption and GHG emissions.

Read more – Collaboration driving efficiency

Canada energy award

Our aluminium smelters are significant consumers of electricity. Even though much of it comes from our own low-emission hydropower, we work hard to use this electricity as efficiently as possible.

Business planning at our aluminium facilities includes reviewing energy use and looking for ways to improve energy efficiency. For example, as most of the electricity is consumed in the aluminium reduction lines, we put a lot of focus on minimising electrical losses. We also look to reduce wastage in our auxiliary power requirements, for example reducing our compressed air usage.

In March 2016, Rio Tinto’s aluminium operations in Canada achieved “Distinction” status in Hydro Quebec’s Energy Savers’ Circle, a programme that recognises the energy-saving achievements of large power customers. And in July 2016, Rio Tinto’s smelter in Dunkerque, France obtained the internationally recognised ISO 50001 energy management certification.

Read more – Energy Savers’ Circle

*Dhanna Yurubaya means “Stand Strong” in the language of the Wiri people the Traditional Owners from the area of our Hail Creek operation.
Shipping with less fuel

Operating one of the largest shipping fleets in the world, Rio Tinto Marine is a critical supply chain partner to our mining businesses. In 2016, our shipping fleet travelled over 1.1 million nautical miles transporting our product to customers.

We actively seek to improve the energy efficiency of our ships, using a range of techniques that help reduce fuel costs and emissions.

Propeller boss cap fins break up the vortex behind a ship’s propeller, reducing fuel consumption by around two per cent. These devices are currently fitted to 40 per cent of our owned vessels and we continue to fit them to the remainder of our fleet.

Improved anti-fouling systems can save a further two per cent in fuel use by reducing the drag caused by the organisms that accumulate on ships’ hulls.

Our maintenance programmes include regular reviews and treatment of hull fouling, and scheduled dry-docking to refurbish anti-fouling systems.

Our Voyage Monitoring Tool, introduced in 2016, is now implemented across our own fleet and much of our charter fleet. By capturing data, such as position and fuel consumption, it enables us to analyse the root cause of differences in performance between ships and take corrective action. We expect the Voyage Monitoring Tool to deliver a further one per cent saving in fuel consumption from 2017.

Read more – Rio Tinto Marine

In 2016 Rio Tinto Marine shipped 281 Mt of dry bulk cargo
Governance

Climate change is discussed at the most senior levels of management and by the board. The board Sustainability Committee, chaired by Megan Clark AC, includes climate change as one of its areas of focus. The committee was an important internal stakeholder in the development of this report, and they reviewed and approved the extension of our GHG intensity target in 2015.

That target is one of the seven external key performance indicators for Rio Tinto. Each month we report against it to the Sustainability Committee and senior management, and it features each year in our Annual report. The Executive Committee approves our climate change position statement.

In 2016, the board of Rio Tinto supported a shareholder resolution for greater disclosure of our resilience to climate change that was presented to our annual general meetings by a group of investors. We are committed to continued transparency on the reporting of relevant data and the management of risks and opportunities relating to climate change. We will be evolving our disclosure to include progress on our actions and resilience to climate change.

To read more about our performance indicators read our Annual report.
Stakeholder engagement

Rio Tinto engages with a broad range of stakeholders on climate change challenges and opportunities. We work with suppliers to prepare product specific life cycle assessments of our products, which evaluate GHG emissions through the product value chain.

We are partnering to understand the impacts of climate change. We work with researchers to understand how ocean acidification is affecting Australia’s Great Barrier Reef. We engage with our host communities by listening to, and working with them, on climate change issues that are important to them. This has the potential to help communities respond to climate change. It also increases our understanding of local experiences and priorities relating to climate risk and building resilience.

External expectations around climate change continue to evolve. Investors are increasingly interested in the disclosure of climate change risks and resilience. Rio Tinto has a long history of engaging constructively on these issues. We actively engage with investors, investor groups and NGOs, to understand how disclosure requirements are evolving and what we need to do to better inform our stakeholders about climate risk and management actions.

Government policies on energy and climate change are important and sensitive political issues. The intent shown by governments adopting the Paris Agreement indicates a trajectory of increasing ambition over time towards dealing with the challenges of climate change. As countries work to deliver their national commitments and participate in the process of reviewing and increasing commitments, we expect policy to change. This could have an impact on our costs and competitiveness, particularly for activities that are trade exposed and emissions intensive.

However, policy can also stimulate the use of our products by influencing consumption patterns. If it increases the cost of carbon-intensive materials and hydrocarbon-based energy, this is likely to create opportunities for other lower-carbon materials and energy sources. For example, aluminium created from hydroelectric energy could be a beneficiary.

Case study

Great Barrier Reef science partnership

In 2016, Rio Tinto extended for a further three years a research partnership with Australia’s premier science research body, the CSIRO, and the Great Barrier Reef Foundation to monitor ocean chemistry and acidification along the length of the Great Barrier Reef Marine Park.

Future Reef 2.0 is the only research project monitoring ocean chemistry along the 2,300km marine park, allowing scientists to run an advanced sensor system on an existing Rio Tinto vessel that travels between our Weipa and Gladstone operations.

Ocean acidification occurs when increased carbon dioxide is absorbed by the ocean. This could have a significant impact on the health of the Reef by reducing coral growth and weakening ecosystems. With this data, researchers — over an extended period of time — will be able to build a unique model of the Reef’s health.
Advocacy

To assess how carbon policy and regulation will affect us in the future, we monitor climate and energy policy developments closely. We use our knowledge of climate policy and regulation to advocate constructively for policies that are environmentally effective, economically efficient and equitable.

Our climate change advocacy positions are guided by principles outlined in our climate change position statement. This ensures they are in line with Rio Tinto’s overall climate change strategy and consistent across the jurisdictions in which we operate.

Much of our advocacy is through direct submissions to governments. We also work with like-minded organisations and industry groups to help secure economically and environmentally sound climate policy that safeguards the economic competitiveness of our businesses. For trade-exposed industries to compete effectively in a global, low-carbon marketplace, it is important to create and sustain a level playing field for carbon costs.

We seek policies that:

• provide a stable regulatory framework so that businesses can plan their investments efficiently;
• minimise competitive distortion within and across jurisdictions; and
• feature sound transitional assistance that helps emissions-intensive, trade-exposed industries to avoid carbon leakage and remain competitive.

Rio Tinto continues to support market mechanisms as the best way of achieving emissions reductions at least cost. We support a market-based price on carbon.

Industry associations

Membership of industry associations helps us to better understand the implications of climate change issues and policy proposals, and contribute our own perspectives and experiences in support of good policy outcomes.

We belong to industry associations in Europe, Australia, Canada, South Africa and the US. Each represents a different mix of companies and organisations, and often covers multiple issues, not solely climate change. Sometimes, an association’s view is not exactly the same as ours. That is why we have our own publicly available position on climate change and make our own written submissions on policy proposals where appropriate.

As part of our annual CDP submission, we provide a list of climate change-related associations of which we are a member and update it each year (see cdp.net).

The table on the following page highlights the main organisations we support, and participate in, to actively engage on climate change issues. In all cases, our position on climate change is materially consistent with that of the association.
## Industry association positions

<table>
<thead>
<tr>
<th>Industry association</th>
<th>Association’s view</th>
<th>Rio Tinto’s involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>International Emissions Trading Association (IETA)</strong> promotes the use of carbon markets and aims to establish a functional international emissions trading regime.</td>
<td>Emissions trading is one of the principal policy instruments available to manage industrial greenhouse gas emissions by encouraging operational excellence and the deployment of new and existing technologies. A central objective of climate change policy should be the efficient direction of capital within the market towards low and zero carbon emission investment. Read more – IETA</td>
<td>Rio Tinto is a member of the board and participates in a number of IETA working groups, in part by providing insights into experiences associated with the development and implementation of emissions trading schemes globally. We are a founding member and funder of the Business Partnerships for Market Readiness initiative run by IETA with the World Bank.</td>
</tr>
<tr>
<td><strong>Center for Climate and Energy Solutions (C2ES)</strong> is an independent, non-partisan, non-profit organisation working to forge practical solutions to climate change. Its mission is to advance strong policy and action to reduce greenhouse gas emissions, promote clean energy, and strengthen resilience to climate impacts.</td>
<td>At C2ES, we believe that ensuring safe, reliable, affordable energy, while protecting the global climate, is a paramount challenge of the 21st century. Read more – C2ES</td>
<td>Rio Tinto participates in C2ES meetings and workshops as part of its Business Environmental Leadership Council. Rio Tinto signed C2ES’s statement in support of the Paris Agreement.</td>
</tr>
<tr>
<td><strong>International Council on Mining &amp; Metals (ICMM)</strong> has an established set of principles on climate change and continues to expand understanding within the industry and further develop its approach.</td>
<td>Climate change is an undeniable and critical global challenge, and its causes must be addressed by all parts of society. ICMM member companies are committed to being part of the solution. We support an effective binding global agreement on climate change. We support a price on carbon, and other market mechanisms that drive reduction of greenhouse gas emissions and incentivise innovation. Read more – ICMM</td>
<td>Rio Tinto’s chief executive is a member of the ICMM Council and has worked closely to support the development of ICMM’s climate change position. We are an active participant in the climate change and energy working groups.</td>
</tr>
<tr>
<td><strong>Minerals Council of Australia (MCA)</strong> represents Australia’s exploration, mining and minerals processing industry, nationally and internationally, in its contribution to sustainable development and society.</td>
<td>The minerals sector welcomes the Paris Agreement as an important step forward in securing a durable and sustainable path to progressively lower global greenhouse gas emissions. Read more – MCA</td>
<td>Rio Tinto is on the board and actively participates in the MCA’s energy and climate change committee and contributes to MCA policy development activities.</td>
</tr>
</tbody>
</table>
Price on carbon

Rio Tinto has used an internal price on carbon to test investment decisions since 1998. We have developed separate price assumptions for the regions and main markets in which we operate and sell our products, and modelled how these might change over time.

We use an established process to develop and update the carbon price projections informed by:

- existing short-term market data;
- other price forecasts and scenarios; and
- input from technical experts within and outside the business.

The scenarios we use consider both the potential for an explicit price on carbon, and the potential cost impacts from government actions that impose an implicit carbon price (such as policy tools like a renewable energy target).

We monitor a range of important issues that have the potential to trigger an update to our internal carbon prices.

These include:

- progress of international agreements, to inform our view of the trajectory of global commitments to reduce emissions;
- economic growth and the implications for future emission projections;
- low-emission technology costs and deployment rates, and implications for the overall cost of abatement;
- climate and energy policies, including non-market-based policies such as renewable subsidies, and the impact on industry costs and competitiveness; and
- willingness of major economies to address competitiveness issues for key industries.

As with many internal assumptions, Rio Tinto does not publicly disclose the internal carbon prices used as we consider these to be commercially sensitive information.
Climate change scenarios

Rio Tinto takes a long-term approach to strategy development and takes into account a range of external variables that cannot always be directly influenced or controlled. Some of these are highly uncertain but have the potential to significantly impact business outcomes.

By using scenarios, we can explore these uncertainties and better understand their implications for our organisation.

Rio Tinto uses scenarios in a range of internal processes which focus on the long-term future of our business. We look at the potential impacts of carbon regulation and carbon pricing on business value. For example, scenarios are directly factored into the economics of capital investment decisions and are central to our internal processes for assessing future product demand and pricing. The transition to a low-carbon future is expected to affect the future price of energy. So the impact of carbon pricing is also integrated into our internal view of energy prices over the medium to longer term.

In future reports, we will include more about our use of scenarios and the resilience of our business in a 2°C climate change scenario.

Rio Tinto’s climate change scenarios

| Limited action | Global concern focuses on economic growth and stability. Limited action to address climate change challenges beyond current commitments. Coordination of action between jurisdictions is slow to evolve. Fossil fuels continue to be the global primary energy source, with lower levels of renewables growth. |
| Regional differences | Nations focus on domestic concerns but with regional co-operation developing over time. Some tension between countries driven by differences in speed of policy adoption. Actions over time by the US and China are influential in global policy development. Multiple policy levers in play, including regulations to improve energy efficiency and increase renewable energy growth. Response to adaptation is reactive and localised. |
| Co-operative outcomes | Aligned with an IEA 2°C outcome. National policies implemented faster than current ambition, with progressive convergence of approaches leading over time to global policy coverage. Mitigation enabled in part due to speed of low-emissions technology development and deployment with subsequent reduction in emissions from fossil fuels. High level of renewables growth across all regions. Proactive adaptation responses. |
Low-carbon R&D and investment strategies

To contribute to the goal of limiting temperature increases, we must find ways to decarbonise our business over the long term.

The use of new technology will be a key enabler for this. Technology has a role right across the Rio Tinto value chain, from reducing the energy and carbon intensity of our operations, to reducing GHG emissions from the use of our products.

To understand where technology might best be applied, we need to know where our current and future GHG emissions are likely to come from. For our own GHG emissions, this includes analysing and updating our longer-term carbon trajectory and understanding what technologies could reduce energy demand and carbon intensity at our operations. Technologies like our proprietary AP™ Technology, used in our Kitimat aluminium smelter, have significant energy efficiency benefits over older technologies.

We are looking at how technologies can reduce GHG emissions from the use of our products, and how our products can be used in ways that reduce GHG emissions compared with existing applications. For example, we have partnerships looking at how greenhouse gas emissions in the steelmaking industry can be decreased, and exploring applications for borates in energy.

We also support research into carbon capture and storage and low-emissions technologies for coal, by supporting the work of the Cooperative Research Centre for GHG Technology and the Australian COAL21 Fund. The COAL21 Fund has a focus on research, development and demonstration (RD&D) of low-emissions technologies and is currently funding a number of projects in relation to carbon capture and storage. We also contribute to funding the activities of the black coal industry’s RD&D programme, ACARP, which carries out research into a number of areas relating to the production and use of black coal, including low-emissions coal use.

Kitimat uses our proprietary AP™ Technology, which reduced its energy usage by 33 per cent per tonne of aluminium produced, and the smelter’s upgrade has also reduced GHG emissions and intensity by around 50 per cent. At the same time, Kitimat’s production capacity has been increased by 48 per cent. Together with the fact that its power comes from our own hydroelectric power station, this helps it operate with a carbon footprint of 2.1 tonnes of CO₂-e per tonne of aluminium produced, more than five times lower than the industry average.

AP™ Technology reduced Kitimat’s energy usage by 33% per tonne
ISEM researcher Dr Zhenguo Huang has been working with Rio Tinto's Denver-based Research and Innovation team to investigate new borate technologies that have potential applications in batteries and hydrogen storage systems. Borates show promise to enhance the performance and safety of lithium-ion batteries when added to the graphite anode. Boron is a key element in some commercial electrolytes for lithium-ion batteries. Dr Huang recently developed a boron compound that outperforms current commercial compounds as an electrolyte for emerging sodium-ion batteries, which hold great potential for grid-scale energy storage.

Under a ten-year intellectual property licence agreement, Boron Molecular, a specialist chemical manufacturer, is now commercialising this compound, together with another for hydrogen storage and chemical synthesis.

Energy is a strategic area for borates, as boron is used in applications that conserve energy, such as insulation materials, and applications that generate it, such as oil and gas production, and solar and wind power. The minerals' role in next-generation energy applications offers further growth potential for this part of Rio Tinto's business.

Read more – [Boron Molecular](#)
Adaptation

Climate change is expected to lead to a change in the intensity and frequency of extreme weather events, as well as changes in temperature and rainfall trends over the longer term.

Events such as tropical cyclones have the potential to damage infrastructure and disrupt operations and the delivery of our products to market. Mining and mineral processing relies heavily on climate-sensitive inputs such as energy, water, land and people, and climate change can affect the availability and cost of these inputs. Impacts may also be felt across our global supply chains.

The climate risk profile for our business is also changing. There is no one-size-fits-all solution to the challenges we face, as these will be different depending on the region in which we operate, and on the characteristics of our assets. Rio Tinto has a robust company-wide standard for risk analysis and management, and we use it to identify and assess climate-related risk, and determine appropriate risk management actions.

We consider climate risk over the life of the operations (including closure and post closure), and we use both “top-down” and “bottom-up” approaches, with work at Group level complementing the many activities happening at our sites.

We recognise that the actions we take to manage risk in the short-term will also affect our medium- to longer-term risks. So we focus on identifying opportunities to be more flexible to future change, and we avoid measures that are likely to constrain future adaptation options. For example, we use short-term weather forecasts and seasonal outlooks to better understand the potential impacts of storm activity and flooding. Experience has shown that information like this must be readily accessible, relevant to the business and produced in a timeframe that aligns with planning processes. This information can also be used in our discussions with regulators, to link the regulatory requirement for water management with expected seasonal conditions. Business resilience and recovery plans help us prepare for and recover from the impacts of extreme events. We use the lessons learned to update and improve our procedures.

Climate change risks are also taken into account in the way we design and develop new projects. This is important, because the project stage offers opportunities to improve long-term climate resilience that are either impracticable or too expensive to retrofit once an asset is operational.

Case study

Modelling Utah snow melt

Rio Tinto's Kennecott copper operation in Salt Lake City, Utah, produces about 15 per cent of US copper supply. To understand how climate change will affect the mine, Kennecott sponsored impact studies and modelling exercises at the University of Utah.

The results pointed to future changes in the timing and volume of water run-off, with less precipitation likely to fall as snow and more as rainfall, and more frequent high-intensity storms. Kennecott is using this work to inform the way it uses water. Improvements to water planning, monitoring and infrastructure are under way, and Kennecott is also looking to reduce the use of high-quality water, substituting with lower-quality sources where possible. The operation works closely with regional and local planners and stakeholders, building strong relationships and sharing its expertise in water planning and conservation.
This year we are reporting our 2016 GHG emissions, and restating our 2015 GHG emissions, using the updated global warming potentials for non-CO\textsubscript{2} gases from the IPCC’s fourth assessment report.

### Our emissions performance

**Total greenhouse gas emissions**

In 2016, our total GHG emissions were 32 million tonnes of carbon dioxide equivalent (CO\textsubscript{2}-e), an increase of 0.3 million tonnes from 2015. This increase was a result of increased emissions at the Kitimat smelter following its return to full operation after completion of its modernisation and an increase in iron ore production in the Pilbara.

![Graph showing total greenhouse gas emissions from 2007 to 2016](image)

**Greenhouse gas emissions intensity**

Indexed relative to 2008

There was a 5.6 unit reduction in GHG intensity in 2016 compared with 2015. We are on track to meet our target of a 24 per cent reduction in GHG emissions intensity between 2008 and 2020. This year’s result was largely a result of attaining full operations at the Kitimat smelter after it was modernised and operational efficiency gains at Kennecott Utah Copper and Oyu Tolgoi copper-gold mine.

![Graph showing greenhouse gas emissions intensity from 2008 to 2016](image)
Our energy use

In 2016, our total energy use was 454 petajoules, a five per cent increase over the previous year, due in part to the ramp-up of the Kitimat aluminium modernisation project and higher production in the Pilbara.

Forty nine per cent (222 petajoules) of the energy we used was electricity. Of that, 116 petajoules were purchased from commercial networks and 106 petajoules were generated at our hydroelectric, natural gas, coal, diesel and fuel oil power stations.

Seventy four per cent (163 petajoules) of our total electricity use were sourced from hydro, nuclear and renewable power sources.

We exported 15 petajoules of the electricity we generated to remote communities near our operations, or to commercial networks where our generation exceeded our needs.

Primary energy is a term used to describe energy before it has undergone a conversion or transformation process. The electricity and steam that we identify in our total energy figures has been created as a result of some other energy source being converted (ie the gravitational energy in stored water behind a dam is converted to electrical energy) or transformed (ie gas being combusted to heat water into steam) into electricity or steam.

In 2016 our sources of primary energy were: coal (32 per cent), hydroelectricity (27 per cent), gas (18 per cent), diesel and fuel oil (15 per cent), nuclear (7 per cent) and other sources (1 per cent).
Energy use, greenhouse gas emissions performance data

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy use (petajoules)</td>
<td>454</td>
<td>433</td>
<td>450</td>
<td>484</td>
<td>502</td>
</tr>
<tr>
<td>GHG intensity (indexed relative to 2008)</td>
<td>74.1</td>
<td>79.7**</td>
<td>81.7*</td>
<td>83.2</td>
<td>94.1</td>
</tr>
<tr>
<td>GHG Scope 1 (Mt CO₂-e)</td>
<td>21.1</td>
<td>20.2</td>
<td>21.9</td>
<td>23.6</td>
<td>26.5</td>
</tr>
<tr>
<td>GHG Scope 2 (Mt CO₂-e)</td>
<td>11.3</td>
<td>11.9</td>
<td>12.4</td>
<td>14.4</td>
<td>16.4</td>
</tr>
<tr>
<td>Total GHG emissions (Mt CO₂-e)</td>
<td>32.0</td>
<td>31.7</td>
<td>33.8</td>
<td>37.4</td>
<td>40.7</td>
</tr>
</tbody>
</table>

* Numbers restated from those originally published to ensure comparability over time.
# Number restated from 76.9 following the application from 1 January 2015 of updated global warming potentials from the IPCC's fourth assessment report.

2016 greenhouse gas emissions by location (million tonnes CO₂ equivalent)

<table>
<thead>
<tr>
<th>Location</th>
<th>Scope 1 GHG emissions</th>
<th>Total GHG emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>10.3</td>
<td>17.5</td>
</tr>
<tr>
<td>Canada</td>
<td>6.3</td>
<td>6.4</td>
</tr>
<tr>
<td>France</td>
<td>0.6</td>
<td>0.9</td>
</tr>
<tr>
<td>South Africa</td>
<td>0.4</td>
<td>2.0</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>United States</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Other: Rest of Africa</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>Other: Rest of Europe</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Other: Asia, New Zealand, Central America, South America</td>
<td>1.3</td>
<td>2.5</td>
</tr>
<tr>
<td>Total Rio Tinto</td>
<td>21.1</td>
<td>32.0</td>
</tr>
</tbody>
</table>

Note: Due to rounding, sum may not equal the total shown.

2016 greenhouse gas emissions by product group (million tonnes CO₂ equivalent)

<table>
<thead>
<tr>
<th>Product group</th>
<th>Scope 1 GHG emissions</th>
<th>Total GHG emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminium</td>
<td>10.3</td>
<td>17.5</td>
</tr>
<tr>
<td>Copper &amp; Diamonds</td>
<td>1.6</td>
<td>3.3</td>
</tr>
<tr>
<td>Energy &amp; Minerals</td>
<td>5.3</td>
<td>7.5</td>
</tr>
<tr>
<td>Iron Ore</td>
<td>3.8</td>
<td>3.7</td>
</tr>
<tr>
<td>Total Rio Tinto</td>
<td>21.1</td>
<td>32.0</td>
</tr>
</tbody>
</table>