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# GLENCORE



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CLIMATE CHANGE CONSIDERATIONS  
FOR OUR BUSINESS 2017



# Who we are

In 2016, Glencore published its first carbon publication *Climate change considerations for our business 2016*. Climate change is a material issue that will impact our business and create both challenges and opportunities. In response, we have initiated a process to examine the different aspects of climate change and consider how we can best position the company going forward.

This report is intended to communicate our progress in integrating climate change issues into our business and to provide stakeholders with further detail on our ongoing work programme.

Glencore is an integrated marketer and producer of a range of commodities. We supply, trade and transport products in a global marketplace, from areas of surplus to consumers in the places where they are most needed. In doing so, we create value in the geographies where we operate, for our customers and for our shareholders.

With a global marketing network and portfolio of industrial assets, our views on commodity trade flows, global supply and demand fundamentals are based on decades of successful experience. The scale and diversity of our business across commodities and geographies is a key strength which enhances our investment optionality.

We believe that Glencore is well positioned with the right commodity mix to meet the changing needs of key maturing economies: leading, low-cost supply positions in mid- and late-cycle commodities and significant operational leverage to improving fundamentals in key commodities, as well as substantial volumes of low-cost latent capacity.

In 2016, Glencore delivered a strong financial performance with strong free cash flow underpinned by outstanding cost performance in our key commodities and continued resilience of our marketing business.

Our company's main strategic objective is to sustainably grow total shareholder returns while maintaining a strong investment grade rating and acting as a responsible operator.

To achieve this ambition, we are focusing on three strategic imperatives: to maintain a robust and flexible balance sheet, to focus on cost controls and operational efficiencies and to fully integrate sustainability throughout our business.

# Contents

|  |          |                                      |
|--|----------|--------------------------------------|
| Introduction                               | 02       | Chairman's introduction              |
|  | 03       | Our approach to climate change       |
| Policy developments                        | 04       | Paris Agreement                      |
|  | 06       | International Energy Agency (IEA)    |
|  | 07       | Carbon regulation                    |
| Integrating climate change within Glencore | 08       | Towards delivering 'Aiming for A'    |
|  | 14       | Risk management                      |
|  | 15       | Transition to low carbon economy     |
|  | 17       | Business opportunities               |
|  | 18       | Analysis of our portfolio resilience |
|  | 22       | Case studies                         |
|  | 24       | Next steps                           |
| 24   | Contacts |                                      |

# 1. Chairman statement



Responding to climate change is a strategic focus for our company. As a major producer and consumer of fossil fuels, we recognise our responsibility to understand and manage our greenhouse gas emissions, and support the global transition to a low carbon economy.

In May 2016, we published our *Climate Change Considerations for Our Business 2016 report*, which described our position on climate change and the approach we are taking to identify and manage the opportunities and challenges associated with climate change across our business, focusing particularly on our coal business.

During the past year, we have engaged extensively with our stakeholders on the topics covered by the report, including investors, governments, non-government organisations (NGOs) and the media. Areas of particular interest raised during these conversations include an analysis of our portfolio against the various policy scenarios developed by the International Energy Agency (IEA), as well as an assessment of the risks and opportunities presented by climate change across our product and operational portfolio.

Last year saw a number of important geopolitical and international climate policy developments which are likely to influence the pathway forward and the prospects for achieving global climate change goals. This includes the entry into force of the Paris Agreement on climate change on 4 November 2016, the release of recommendations of the Taskforce on Climate Related Financial Disclosures, the UK Brexit decision and likely changes to US energy and carbon policy following the election of Donald Trump as President of the United States.

While the global geopolitical landscape remains somewhat uncertain, Glencore has continued its efforts to address climate change as a material issue for our business.

This new report, *Climate Change Considerations for Our Business 2017*, provides our stakeholders with an update on what we have achieved. Our work is ongoing, but over the past year we have made positive progress.

At the 2016 Glencore Annual General Meeting, shareholders supported a special resolution to participate in the 'Aiming for A' investor coalition initiative. 'Aiming for A' is primarily focussed on an assessment of "strategic resilience for 2035 and beyond" using the Carbon Disclosure Project (CDP) performance bands and sector analysis as an initial benchmark.

As part of our commitment to the 'Aiming for A' initiative we have undertaken a range of activities across our business:

- Formation of an internal cross functional and cross commodity working group, led by our Chairman with Board oversight to consider and examine climate change issues
- Further integration of carbon emissions and energy as part of our annual business planning process including mapping our forward projected energy and carbon footprint out to 2020
- Detailed review of our carbon emissions and energy profile including an assessment of potential mitigation and abatement projects which will form the basis of an internal Marginal Abatement Cost Curve (MACC) across the business and introduction of a carbon target for our business
- Further consideration of how we can support greater R&D and investment into low emission technologies
- Developing a more detailed risk management framework for identifying, assessing and managing material climate change risks
- Examining the potential implications for our asset portfolio from policy developments and market movements linked to climate change issues

Our company continues to play an informed and constructive role in the public policy development process on climate change across our different commodity businesses and in multiple jurisdictions. We work with policy makers directly and through trade associations, on issues related to clean energy, carbon reporting and carbon pricing. We look forward to ongoing dialogue with our investors and other stakeholders on this important issue.

Tony Hayward  
Chairman

# 2. Our approach to climate change

We recognise the science of global climate change set out by the Intergovernmental Panel on Climate Change (IPCC) and acknowledge the global climate change goals outlined in the United Nations Convention on Climate Change (UNFCCC) Paris Agreement.

We believe these measures and public sentiment will continue to drive public policy developments and programmes to restrict global greenhouse gas emissions. This will impact our business and represents both challenges and opportunities that our company needs to manage.

At present we group our response to climate change issues under four broad areas;

- Assessment of risk and materiality
- Management of our energy and carbon emissions footprint
- Engagement with our stakeholders
- Support for low emission technologies

As a global patchwork of energy and climate change regulation evolves, Glencore will continue to monitor international and national developments and play a constructive role in the advancement of climate change policy across our global business group.

We strongly believe that global climate change goals will only be met in an economically stable and secure world where people are able to pursue a better quality of life.

Governments and industry must work together to establish policy frameworks that deliver the optimal balance of social, environmental and economic considerations appropriate for individual nations; this may include pricing carbon as part of a balanced transition to a low carbon economy.

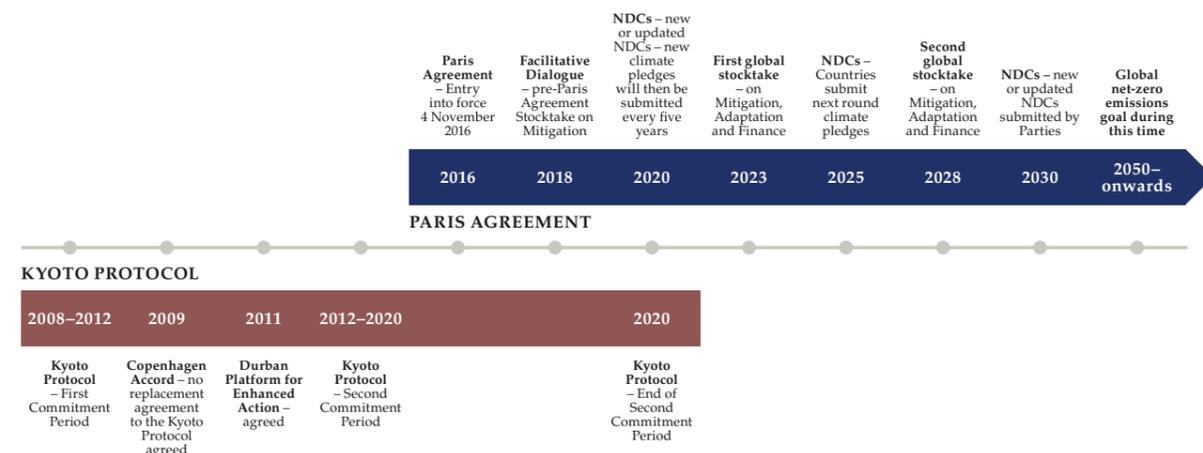
We support a least-cost pathway to achieving climate change goals that considers the cost and consequences of all available policy options and does not hinder socio-economic development.

# 3. Climate change policy developments

## 3.1 Paris Agreement

The historic global climate change “Paris Agreement” entered into force on 4 November 2016 after at least 55 Parties to the United Nations Convention on Climate Change (UNFCCC), accounting in total for at least an estimated 55% of the total global greenhouse gas emissions, submitted their instruments for ratifying the agreement. This agreement was adopted by 195 countries at the UNFCCC 21st Conference of the Parties (COP21) meeting in Paris on 12 December 2015.

Timeline: Kyoto Protocol and Paris Agreement



The Paris Agreement represents a commitment to achieve a number of global climate change goals, including:

- A global goal to hold average temperature increase to well below 2°C and pursue efforts to keep warming below 1.5°C above pre-industrial levels. To achieve this goal, countries are to have net zero emissions as soon as possible after 2050 by achieving a balance between anthropogenic emissions by sources and emissions absorption or removals by sinks.
- Review of implementation and progressive global stock takes on the progress towards delivering outcomes well below 2°C goal every 5 years from 2020. In 2025, all countries shall submit and communicate revised nationally determined contributions (NDC’s) and mitigation targets.
- Support the efforts of developing countries to build clean, climate-resilient futures including provision of resources to achieve a balance between adaptation and mitigation. This includes financial, technological and industrial support to help developing countries implement the Agreement. Countries shall work to define a clear roadmap on ratcheting up climate finance to US\$100 billion per year by 2020.
- Promote actions that enhance adaptation and build resilience to the impacts of climate change.

Below is a summary of NDC’s from key countries whose energy and emissions policies have significant influence on the global emissions trajectory and which impact Glencore’s business.

### Paris Agreement – Nationally Determined Contributions (NDCs)

| Country              | Mitigation Target and implementation   |
|----------------------|--|
| <i>Australia</i>     | Economy-wide target of reducing emissions by 26-28% below 2005 levels by 2030. The 28 per cent target will be implemented should circumstances allow, taking into account opportunities to reduce emissions and factors such as the costs of technology.   |
| <i>China</i>         | Achieve peak CO <sub>2</sub> emissions around 2030 and make best efforts to peak earlier; lower CO <sub>2</sub> emissions per unit of GDP by 60-65% from the 2005 levels and increase the share of non-fossil fuels in primary energy consumption to around 20% by 2030.   |
| <i>Europe</i>        | A minimum 40% domestic reduction in total greenhouse gas (GHG) emissions by 2030 compared with 1990 levels.  |
| <i>India</i>         | Reduce emissions intensity of GDP by 33-35% below 2005 levels by 2030; achieve about 40% cumulative electric power installed capacity from non-fossil sources by 2030 with the help of technology transfer and low cost international finance. In order to secure reliable, adequate and affordable supply of electricity, coal will continue to dominate power generation in future.<br><br>A detailed and full-scale assessment of international climate finance needs will be finalised at a later stage and would depend on the gap between actual cost of implementation of India’s plans, and what can be made available from domestic sources.<br><br>While this would evolve over time, a preliminary estimate suggests that at least US\$2.5 trillion (at 2014-2015 prices) will be required to meet India’s climate change actions between now and 2030. |
| <i>Japan</i>         | Economy-wide target of reducing GHG emissions by 26% below fiscal year 2013 levels by fiscal year 2030.  |
| <i>United States</i> | Economy-wide target of reducing net GHG emissions by 26-28% below 2005 levels in 2025 including land use, land use change and forestry (LULUCF) and to make best efforts to reduce emissions by 28%.   |
| <i>South Africa</i>  | Reducing GHG emissions to between 398 and 614 MtCO <sub>2</sub> e (incl. LULUCF – land use, land use change and forestry), over the period 2025–2030 (equivalent to 20-82% above 1990 levels by 2030). In the short-term (up to 2025), South Africa faces significant rigidity in its economy and any policy-driven transition to a low carbon and climate resilient society must take into account and emphasise its overriding priority to address poverty and inequality.   |

Source: UNFCCC NDC submissions

### 3.2 International Energy Agency (IEA) – World Energy Outlook 2016

Following the announcement of the Paris Agreement, the IEA has incorporated the stated NDCs of countries into their policy scenarios as part the World Energy Outlook 2016.

Under the IEA's central scenario (New Policy Scenario), which incorporates the NDC's, it is clear that there is a significant gap between reconciling the global energy reality to forecasts based on ambitious policy statements, where actioning energy or emission reduction policies is consistently delayed, subject to short term geopolitical influences or economic constraints.

According to analysis from the IEA, UNFCCC and many others, the pledges made under the Paris Agreement fall significantly short of achieving the global goal of holding average temperature increase to well below 2°C.

Under the IEA's central scenario, the New Policies Scenario, the IEA depicts a world in which;

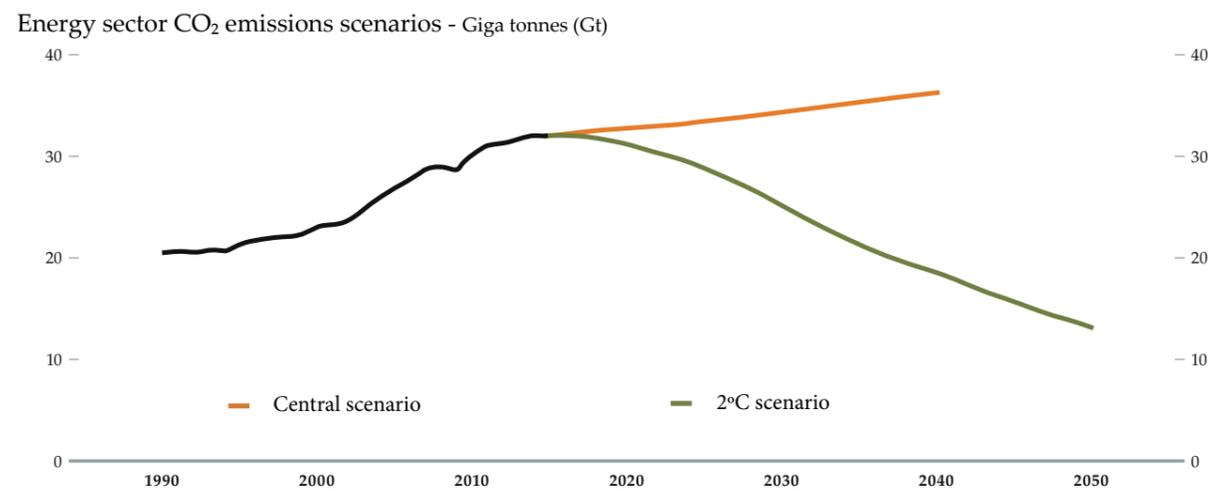
- Global population increases from 7.3 to 8.3 billion by 2030
- The global economy grows at ~3.6%pa to 2030 but is dominated by Asia at 5.8%pa
- Global energy demand grows 19% by 2030

Full implementation of NDC pledges will require investment of US\$13.5 trillion. Fossil fuels will continue to account for ~76% of the global energy mix compared to renewables which will account for only 4% by 2030.

The IEA estimates the incremental cost of achieving the 450 scenario, compared to the New Policies Scenario, is US\$8 trillion to 2040.

In view of this, particularly the continuing role fossil fuels will play in the global energy mix, Glencore supports a pragmatic policy (including fiscal policy) approach that provides strong backing for high-efficiency, low-emission technology for power plants and carbon capture and storage as a vital part of a portfolio of measures to achieve stated climate change goals.

|  |  |
|--|--|
| <b>The New Policies Scenario (NPS)</b>     | The IEA's central scenario which includes policies and measures adopted as of mid-2016 and also takes into account measures that have been announced but are yet to be enshrined in legislation or the means for their implementation are still taking shape. These include the IEA's considered view of the implementation of the Nationally Determined Contributions (NDCs) pledged under the Paris Agreement. |
| <b>The Current Policies Scenario (CPS)</b> | Takes into consideration only those policies for which implementing measures had been formally adopted as of mid-2016. In this sense it represents a default setting for the global energy system with little or no change to settled, established positions.  |
| <b>The 450 Scenario (450S)</b>             | The primary decarbonisation scenario which assumes implementation of policies consistent with providing a 50% chance of limiting the average global temperature increase in 2100 to 2 degrees Celsius (2°C) above pre-industrial levels.   |

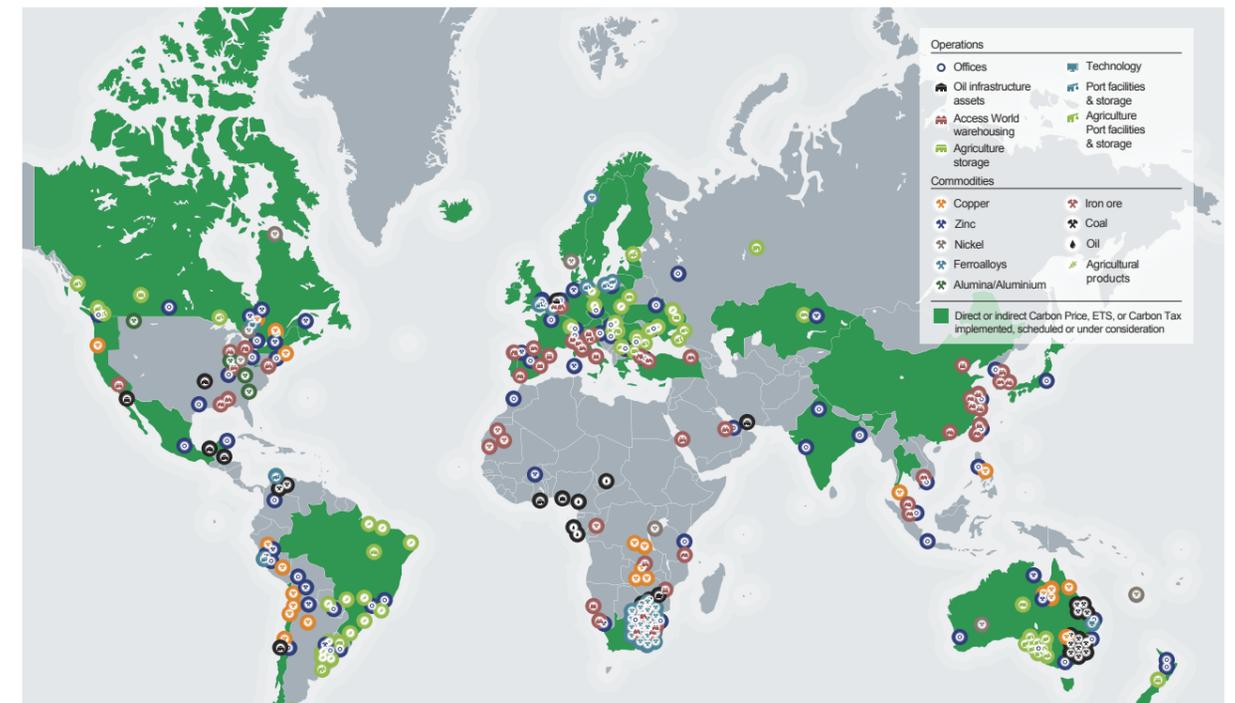


Source: Adapted from IEA WEO 2016

### 3.3 Global patchwork of carbon regulation

According to the World Bank, in 2016, about 40 jurisdictions and over 20 cities, states and regions were putting a price on carbon. Together, these jurisdictions are responsible for almost 25% of global emissions, but on average, carbon pricing initiatives only cover about half of the emissions in these jurisdictions, translating to around 7Gt CO<sub>2</sub>e, or only 13% of global emissions<sup>1</sup>.

#### Carbon pricing initiatives and Glencore assets



Source: Adapted from "Carbon Pricing Watch 2016" World Bank Group & Ecofys

Our business continues to operate successfully in multiple jurisdictions that have direct and indirect carbon pricing or regulation.

We consider carbon price sensitivities as part of our ongoing business planning for existing industrial assets, new investments and as part of our marketing activities.

We play a constructive role and proactively engage with policy makers throughout the public policy development process from initial design through to implementation and compliance. Pricing carbon should be part of an informed and considered process which is structured to provide market signals to drive the behaviours and incentivise investments which deliver the least cost pathway to emissions reductions.

We have broad-ranging expertise on most aspects of climate change and energy policy across our business; making us well-placed to constructively participate in the development and implementation of climate regulation.

<sup>1</sup> "Carbon Pricing Watch 2016" World Bank Group & Ecofys

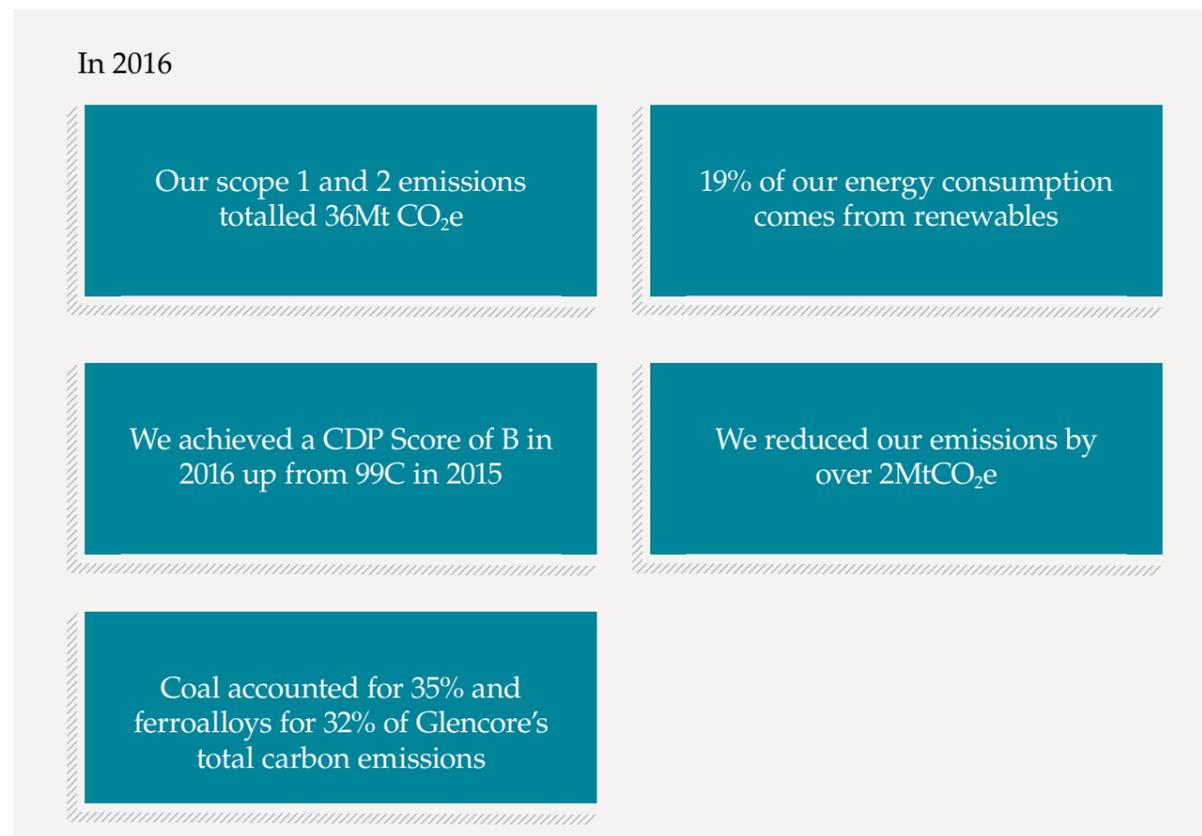
## 4. Ongoing integration of climate change issues across our business

### 4.1 Towards delivering 'Aiming for A'

Following the adoption of a special resolution by the Aiming for A shareholder coalition at our 2016 AGM, we established a working group to deliver our climate change commitments. The group is led by our Chairman and includes department heads and senior representatives of key functions. It makes regular reports on its progress to the Board HSEC Committee. To date, we have taken the following steps to comply with the provisions of the resolution:

#### a) Ongoing operational emissions management

Glencore continues to openly and transparently disclose its energy and carbon emissions footprint.



Energy remains a key input and cost to our business and is a material source of carbon emissions.

We have incorporated energy and carbon into our annual planning process. Commodity departments provide energy and GHG emissions forecasts for each asset over the forward budget period and provide details of any mitigation projects which may reduce emissions, as well as any anticipated changes in climate change regulation.

Linked to this, we have mapped our global opportunities pipeline to reduce GHG emissions across our portfolio.

These projects will inform the development of a Glencore group marginal abatement cost curve (MACC).

It is important to note that parts of our business have already invested considerable amounts of capital and effort into reducing their energy use and/or carbon emissions, often as this delivers an operational benefit or cost saving. As a result, there are both economic and operational limits on the options available to realise further material emission reductions in some operations.

The majority of our Scope 1 emissions include fugitive emissions from the production of coal and consumption of fuel and reductants. Scope 2 emissions are principally related to purchased electricity for our operations, in particular our metals processing assets, which require secure and reliable energy 24 hours a day, 365 days a year.

We have also considered our approach to carbon targets. Reflecting the product and production process diversity of the Glencore group, it is likely that we will adopt a combination of both emission intensity targets and absolute emission reduction targets across our business. This will continue to be a focus of ongoing work for each commodity department. Based on the work completed to date, we believe an initial group wide emission intensity reduction target of at least 5% on 2016 levels by 2020 is appropriate for our business, to drive additional emission reduction efforts.

#### b) Asset portfolio resilience to the IEA scenarios

In our 2016 report, we presented three scenarios we consider to be plausible views of the future, with regard to the world's climate change responses. We have reviewed these scenarios following the Paris Agreement and ratification of NDC's and remain of the view that our scenarios continue to represent plausible views of the future with regard to the world's climate change responses.

The Glencore carbon scenarios take into account energy market projections by leading organisations such as the IEA and World Energy Council (WEC), leading climate science projections from the IPCC, and our analyses of likely shifts in policy and other conditions corresponding to scientific technology and economic changes.

The NDC pledges, made as part of the Paris Agreement, fall materially short of what is required to put the world on a pathway towards achieving the IEA 450 scenario. Glencore believes that the current global carbon emissions trajectory, which also considers NDC pledges, is more consistent with our Delayed Action scenario.

Glencore will continue to monitor policy developments and review our scenarios on an annual basis, taking into account any material changes to actual or proposed policies.

During 2016, we have evaluated each of our commodity departments against the scenarios to determine their resilience and assess consequences for the portfolio of commodities we market.

Glencore climate scenarios

| Glencore scenario   | Alignment with IEA scenario  | Description   |
|---|--|---|
| <b>Delayed Action</b><br><i>(Glencore Central Scenario)</i> | New Policies Scenario but with implementation being uncoordinated and haphazard in nature with outcomes reflective of 5-10 year delays to full and timely implementation | Domestic efforts to reduce emissions (including NDC implementation) are variable, with many countries not meeting their stated targets or objectives. Inconsistent implementation of carbon pricing across mainly developed economies.<br><br>Fossil fuels continue to be the primary base for electricity generation, especially in Asia with slower introduction of low-carbon technologies and delayed retirement of old plants. Stronger global emphasis on efficiency but slow and poor delivery of climate finance.<br><br>Carbon prices range from US\$5 to US\$25 per tonne CO <sub>2</sub> e by 2030, rising to a range of US\$10 to US\$40 by 2040 per tonne CO <sub>2</sub> e.                 |
| <b>Committed Action</b>                                     | New Policy Scenario, including timely and full implementation of Nationally Determined Contributions (NDCs)  | Domestic efforts to reduce emissions with focussed NDC implementation achieved by key countries. Carbon pricing implementation led by developed economies in a coordinated and structured manner.<br><br>Moderate growth of nuclear, renewables and increasing use of high-efficiency, low emission (HELE) technologies for use in fossil fuel-based electricity generation. Enhanced energy efficiency and consumption improvements in developed and developing countries supported by climate finance.<br><br>Carbon prices implemented per the IEA NPS and range from US\$10 to US\$40 per tonne CO <sub>2</sub> e by 2030, rising to a range of US\$20 to US\$50 by 2040 per tonne CO <sub>2</sub> e. |
| <b>Ambitious Action</b>                                     | 450ppm Scenario (consistent with achieving 2°C degree climate change goal)   | Globally coordinated efforts to reduce emissions accelerated beyond the implementation of existing NDCs. Universal adoption of carbon pricing supported by a structured global carbon pricing regime.<br><br>Rapid deployment of break-through technologies and non-subsidised investment in renewable energy, battery storage, energy efficiency and carbon capture and storage (CCS).<br><br>Carbon prices implemented per the IEA 450S and range from US\$75 to US\$100 per tonne CO <sub>2</sub> e by 2030, rising to a range of US\$125 to US\$140 by 2040 per tonne CO <sub>2</sub> e.  |

c) Low carbon energy R&D and investment strategies

Glencore has continued investing in a range of emission reduction projects and initiatives, focusing on both our operations and the use of our products:

- **Mitigation of fugitive emissions from our coal operations:**
  - **Using waste coal mine gas for power:** our Australian coal business captures methane emissions and converts it into electricity that is used on site, with a total installed capacity of 59MW.
  - **Flaring waste coal mine gas:** flares at our coal assets, with the necessary supply and concentration of methane, capture and flare methane gas to burn it off. This reduces the impact of emissions.
- **Wind power in Quebec:** Raglan Mine, our nickel-copper mine in Nunavik, northern Quebec, has constructed a wind turbine and storage facility, the largest in the province. We estimate that the turbine will save more than CAD40 million in fuel costs over its projected 20-year lifetime.
- **Hydropower:** our Kazzinc operation in Kazakhstan which employs more than 26,000 people operates the Bukhtarma hydroelectric plant, which generates around 85% of Kazzinc's electricity requirements. Nearly all of the electricity used by our assets in the DRC and Zambia, which run some of the Group's largest operations, is generated from renewable hydroelectric facilities.

- **Developing energy-efficient technologies:** our proprietary Premus technology developed by our ferroalloys business addresses the challenges of rising energy costs and stricter emissions regulations in South Africa. The technology improves energy efficiency by using a pelletising process, which significantly reduces furnace time and thus electricity consumption.

In addition to our work on our own GHG emission reductions, we actively support low-emission coal technology projects and GHG-related studies to address Scope 3 emissions, including:

- **The Callide Oxyfuel project:** an AUD245 million large-scale demonstration project in Queensland, Australia. This world-first project proved the suitability of oxyfuel technology for capturing CO<sub>2</sub> from new and existing coal-fired power stations.
- **The CTSCo CO<sub>2</sub> storage project:** an upcoming carbon capture and storage project and CO<sub>2</sub> hub in the Surat Basin, Queensland. CTSCo is undertaking a feasibility study that involves a 3D seismic survey, updating of a CO<sub>2</sub> storage plume model and post-combustion capture CO<sub>2</sub> and transport studies in conjunction with a coal-fired power station.

d) KPIs and executive incentives

Following an internal review of existing roles and responsibilities across the business, it was determined that the most logical level within our business to introduce KPIs and / or incentives related to energy and carbon issues is at an asset level.

This is a pragmatic approach because it is at an asset level that most initiatives, programmes or projects to manage energy and emissions are implemented. As we continue to refine our understanding of climate-related challenges and opportunities for our business, this will remain an area of focus.

e) Public policy positions relating to climate change

We continue to participate in a wide range of public policy discussions on carbon and energy issues. These include:

| Organisation   | Summary of view   | Glencore involvement  |
|--|---|---|
| <i>International Council on Mining and Metals (ICMM)</i> | ICMM accepts climate change as an undeniable and critical global challenge, and its causes must be addressed by all parts of society. ICMM member companies commit to being part of the solution.   | Glencore's CEO is a member of the ICMM council. We are an active participant in the climate change working group.   |
| <i>World Coal Association (WCA)</i>                      | WCA recognises international objectives on climate change and believes that effective implementation of the Paris Agreement requires support for low emission coal technologies in order to integrate environmental imperatives with the aims of energy security, economic development and an end to poverty.   | A Glencore representative is currently Chair of the WCA and participates in discussions associated with how the industry needs to respond to climate change and low emission technologies   |
| <i>IEA Coal Industry Advisory Board (CIAB)</i>           | The CIAB provides advice to the IEA on a wide range of issues relating to coal including reducing GHG emissions through advanced coal technologies.   | A Glencore representative is currently Vice Chairman of the CIAB and we actively participate in a number of working groups.   |
| <i>Business Unity South Africa (BUSA)</i>                | BUSA accepts that climate change is a global challenge and that collective international action is required. With a focus on South Africa, it agrees that climate change must be managed through a suite of instruments that do not restrict international competitiveness, while considering all aspects of social economic impacts.<br><br>BUSA does not support the draft South African Carbon Tax bill in its current format. It supports a mechanism in which GHG emission must be reported and propose a carbon budget combined with a cost on carbon for emission exceeding the carbon budget. It also recommends allowing for emissions to be offset and to be tradable.<br><br>BUSA is also actively involved in any consultation processes relating to the drafting of climate change policy and related legislation. | A representative of Glencore's ferroalloys business is currently the chair of the Ferro Alloys Producers Association (FAPA) and represent FAPA at BUSA Environmental Committee, as well as representing Glencore ferroalloys when required. |
| <i>South African Chamber of Mines (CoM)</i>              | The CoM view is in line with that of BUSA. The CoM also participates in the BUSA forum.   | Glencore's ferroalloys and coal businesses are members of the CoM Environmental Policy Committee.   |

| Organisation                                     | Summary of view  | Glencore involvement  |
|--|--|---|
| <i>Ferro Alloys Producers Association (FAPA)</i> | The FAPA view is in line with that of BUSA. The FAPA also participates in the BUSA forum.  | A representative of Glencore's ferroalloys business is currently the chair of the FAPA, which represents the specific sector views at BUSA or directly during any consultation processes. |
| <i>Minerals Council of Australia (MCA)</i>       | The minerals industry acknowledges that sustained global action is required to reduce the scale of human induced climate change.<br><br>A measured transition to a low emissions global economy will require the alignment of three key policy pillars:<br><ul style="list-style-type: none"> <li>• A global agreement for greenhouse gas emissions reduction</li> <li>• Market-based policy measures</li> <li>• Investment in low emissions technologies and adaptation measures</li> </ul>   | Glencore holds MCA's vice chair and chairs its Energy & Climate Change Committee  |
| <i>Mining Association of Canada (MAC)</i>        | MAC has released Principles for Climate Change Policy Design.<br><br>Includes<br><ul style="list-style-type: none"> <li>• Establish a broad-based carbon price</li> <li>• Be revenue neutral</li> <li>• Address competitiveness and carbon leakage concerns</li> <li>• Be predictable, flexible and sensitive to changing economic conditions and geographic circumstances,</li> <li>• Be simple, complementary and effective</li> <li>• Support investments in the development and implementation of technologies that lower emissions</li> <li>• Recognize early action</li> </ul> | Glencore is a member of MAC.  |

## 5. Our business and climate change: Risk management

We recognise that the effective management of carbon risks across all aspects of our business is vital to ensure our growth and to provide greater certainty to all stakeholders. In our first report on climate change we outlined our general approach to risk management, steps we had taken to incorporate climate change, and commitments to take further action to broaden our existing risk management framework to consider the challenges and opportunities from climate-related developments.

To this end, we note the recommendations issued in February 2017 by the Task Force on Climate-related Financial Disclosures for more efficient and effective

climate-related disclosures, and particularly, the framework it offers for understanding and reporting on climate-related challenges and opportunities.

To meet the commitments made in our first report, and to ensure our continued resilience to climate change, we have developed a framework for identifying, understanding and, ultimately, managing climate-related challenges and opportunities facing our portfolio. The framework structure is presented below; we believe it is aligned with the process recommended by the Task Force and we will continue to report on developing it further.

| <i>Climate change risks</i>    | <i>Sample risk identification</i>  | <i>Evaluating business impact</i>  | <i>Identifying potential responses</i>   |
|--------------------------------|--|--|--|
| <i>Government policy</i>       | Potential policy changes both positive and negative.<br>Government energy policies, which directly or indirectly impact on costs.  | Determine materiality for industrial and marketing regions.  | <p>Identify and implement appropriate responses at Group and operational levels.</p> <p>➤ Incorporate into Group risk register and monitor implementation of mitigating actions.</p> |
| <i>Energy costs</i>            | Projected price changes by operating region.<br>Operating cost sensitivity by asset in affected regions.   | Review potential energy cost impact on operating costs.  |  |
| <i>Physical impacts</i>        | Change in rainfall patterns: floods; droughts; and storm frequency<br>Storm surge impact on ports and critical infrastructure<br>Temperature changes: heat stress; permafrost melt; and ice sheets<br>Impacts on local communities | Review existing risk registers; where potential risks are identified but not currently included in risk registers, survey asset for current and projected impacts. |  |
| <i>Stakeholder perceptions</i> | Negative perception resulting in impacts to permit approval, divestiture or cost of finance.<br>Impacts on operating policy environment.   | Determine policy and financial consequences for the business and operations.   |  |
| <i>Market impacts</i>          | Potential impacts on existing commodity markets.<br>New or increased opportunities for our products from emerging technologies and policy changes.   | Determine how significant the potential impacts are (both positive and negative).  |  |



## 6. Transition to low carbon economy

### 6.1 Acknowledging the energy and carbon reality

We believe there is a significant gap between the energy reality and the various carbon policy scenarios which are perceived to be actual forecasts produced by some commentators based on policy statements.

The ability to achieve a climate change goal consistent with limiting average global temperature rise to 2°C degree or better is a political, environmental and economic challenge.

Unless all parties acknowledge the energy reality that fossil fuels will continue to be a part of the global energy mix for decades to come and put greater effort into supporting emission reductions from fossil fuels, the 2°C degree goal will not only be unachievable but it will also be unaffordable.

Our own market intelligence indicates that global energy demand will be driven by developing economies in Asia and will be largely met by fossil fuels to 2030. While it is clear that the relative share of renewable energy will grow, the absolute volume of fossil fuels will also grow due to overall growth of energy demand. Coal remains an important, secure and reliable industrial input that currently accounts for 40% of the world's electricity, 70% of global steel and 90% of global cement.

According to the IEA *Global Energy Demand*, under both their central scenario (New Policy Scenario) and the 450 Scenario, fossil fuels will account for ~70% of energy demand to 2030, even with a US\$40 price on carbon.

Growth of renewable energy clearly needs to be part of the solution but it is still only likely to account for a small share of total global energy mix to 2030, even after countries have maximised what is both technically possible and affordable. The challenges of integrating large-scale renewables into energy markets to ensure ongoing grid stability will increasingly need to be considered.

The gap between the IEA New Policy scenario (including NDCs) and the 450ppm scenario is significant and raises fundamental questions as to the ability to achieve the stated climate change goals in the Paris Agreement.

We urge policy makers to carefully consider and understand the cost and consequences of all available options and how to attain the best emission reduction return on deployment of finite investment capital. To this end, we think it is vital that key societal institutions remain engaged with business and policy makers to avoid negative economic and environmental outcomes.

### 6.2 The least cost pathway to meeting climate change goals

We support climate and energy policy that reduces global emissions in the most cost effective manner, whilst ensuring energy security. We believe a technology-neutral approach is required to achieve this.

Our preference is for policy makers to adopt a pragmatic approach and ensure that any solution recognises the ongoing use of fossil fuels in a low-emission and sustainable manner.

Greater policy parity between renewables and high-efficiency, low-emission (HELE) and carbon capture and storage (CCS) technologies will be required. Deployment of HELE technologies, particularly in developing economies, who will continue to rely on fossil fuels for secure baseload power generation, offer a compelling case for achieving material emission reductions, while still being able to achieve socio-economic development goals.

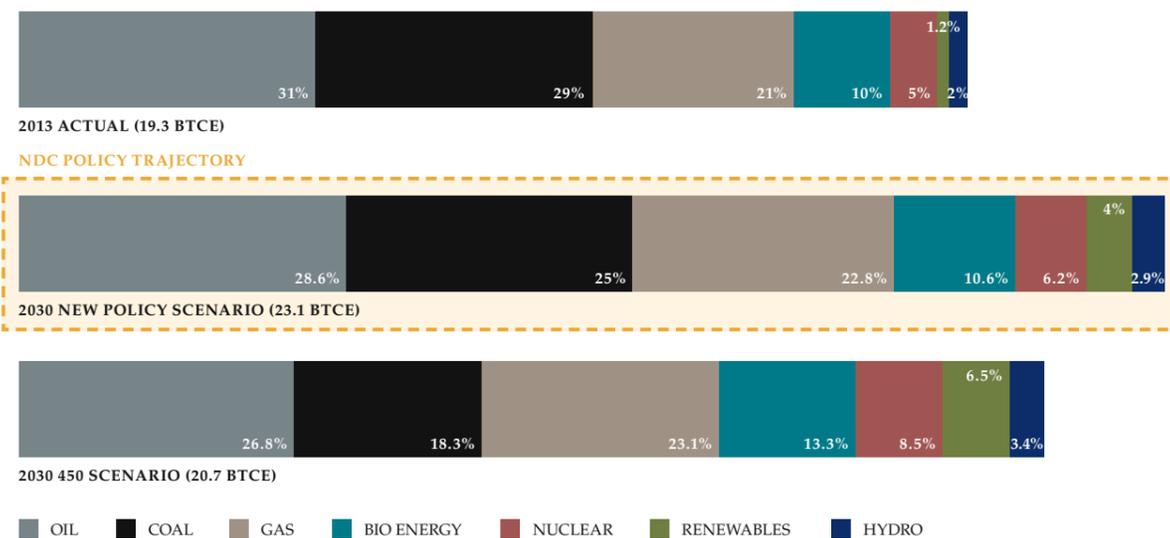
Both HELE and CCS are proven technologies that can deliver material emission reductions from the global energy complex, and in the case of CCS, are also applicable to synthetic fuel production and other industrial processes.

Without CCS, the cost of achieving a 450ppm (~2°C goal) target is estimated to rise to 5% of cumulative global GDP between 2010 and 2100, compared to 2% of GDP if included. We question the global ability to fund the former, while also meeting objectives of improving global living standards and eliminating energy poverty<sup>2</sup>.

Glencore is investing in a number of low carbon energy projects that address direct / indirect emissions from our operations. They include treatment of coal fugitive emissions and ventilation air methane, a large scale solar farm (Concept Stage), which leverages off Australian solar power subsidies, and a large-scale CCS coal energy demonstration project (Feasibility Stage) in Australia.

<sup>2</sup> Source: IEA WEO 2016

#### Global primary energy demand BILLION METRIC TONS COAL EQUIVALENT (BTCE)



Source: Adapted from IEA WEO 2016



# 7. Positioned for business opportunities

The scale and diversity of our business across commodities and geographies is a key strength which enhances our existing and future investment optionality.

We believe that Glencore has the right commodity mix to meet the changing needs of key maturing economies. We have leading low-cost supply positions in mid- and late-cycle commodities and significant operational leverage to improving fundamentals in key commodities.

As economies transition towards a low carbon economy, we consider Glencore well positioned to service growing demand for many of the raw materials that will be required for decades to come.

## 7.1 Nickel / Cobalt / Copper – Batteries and electric vehicles

Glencore continues to foster strategic links and partnerships with a range of technology providers as a means to understand the technology development pathway and the potential impact on global markets from both a risk and opportunity perspective.

The growth of renewable energy in the form of wind and solar is a positive opportunity for our business, given both technologies require significant amounts of copper and aluminum for construction.

Another good opportunity for our business is the electric vehicle (EV) revolution which is driving demand for

mass production of powerful batteries that require raw materials such as nickel and cobalt.

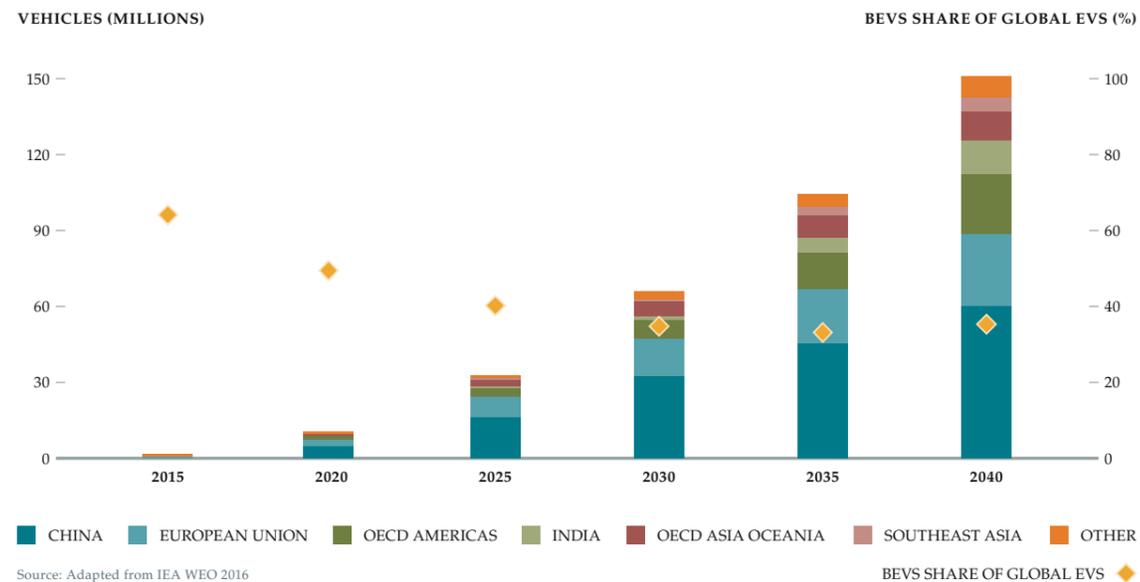
Increased regulation to limit air pollution is driving greater penetration of EVs into the automotive market as car makers move to electrify their car fleets to meet regulatory targets. To date, Tesla has been the early mover however, along with Chinese manufacturers, most major car makers have all announced new EV models.

Government subsidies are helping to make EVs more affordable for the moment, but reliable and secure access to the raw material supply is a key factor for manufacturers, who are also looking to decrease USD/kwh battery costs and ensure competitive supply chain.

Glencore has an opportunity to supply this growing demand given its strong position, particularly with respect to nickel and cobalt for batteries. Separately, increased deployment of EVs will also result in greater demand for secure and reliable baseload electricity and associated infrastructure required to service the EV fleet – this may also benefit our business.

The International Energy Agency recognises that reaching 2020 deployment targets for electric vehicles requires a sizeable growth of the electric car stock globally and meeting the 2030 decarbonisation and sustainability goals across all scenarios requires a major deployment of electric cars in the 2020s.

### Electric vehicles in circulation – New Policies Scenario



## 7.2 Coal

While coal's share of the global energy supply is expected to decline, absolute demand for coal is set to rise in the developing Asia Pacific region, as those economies focus on lowest-cost electricity for their economic growth and urbanisation.

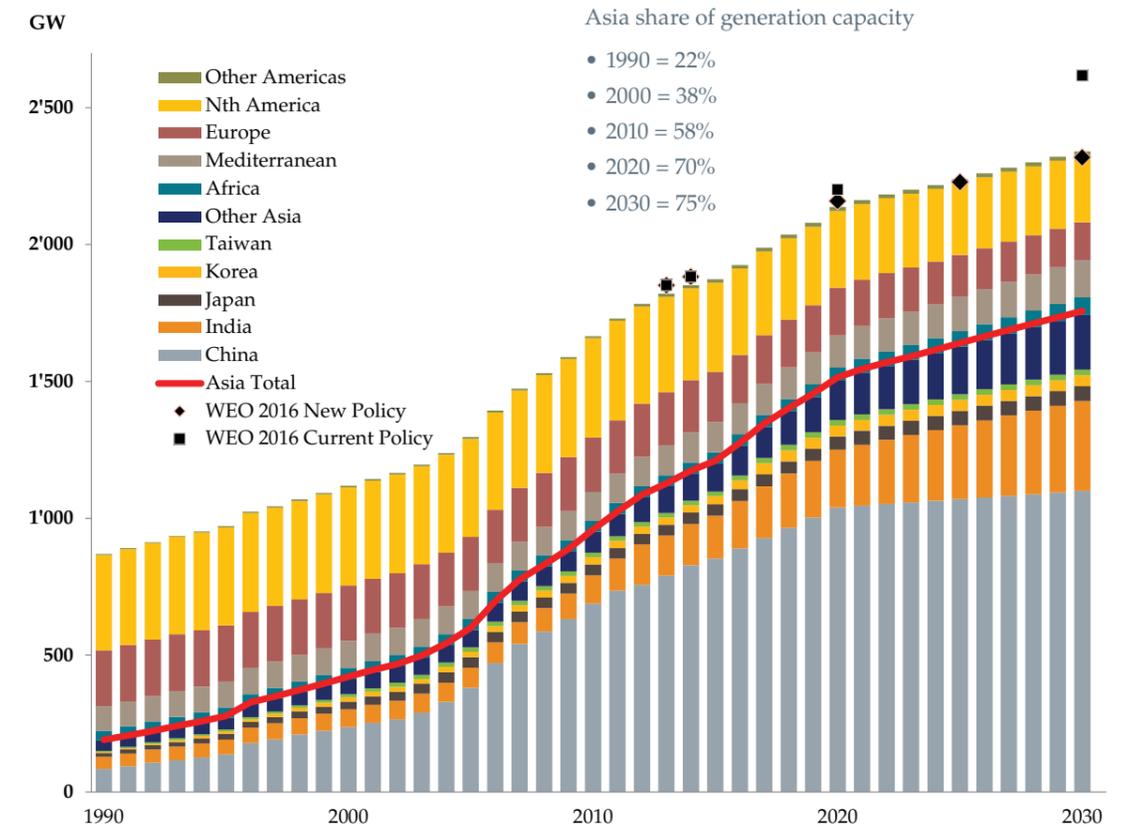
Coal is expected to continue to be the lowest cost fuel source for large-scale baseload power generation. Coal's relative cost advantage is the driver of current and future investment.

Glencore expects investment of over 107GW, or more than 220 new coal-fired units over the next 15 years, in markets dependent on seaborne-traded thermal coal. We expect growth in the net global seaborne coal trade during the period 2015 to 2030 to be 290 million tonnes.

Glencore's coal business continues to occupy a competitive cost position on the global supply cost curve for seaborne-traded coal markets.

We believe that the realities of future global energy demand and supply will continue to support our business, fully utilising coal reserves and supporting future optional investment in resource conversion.

Asia drives coal electricity generation capacity growth to 2030 as fuel of choice to meet industrialisation and urbanisation goals.



## 8. Portfolio resilience analysis under Glencore climate scenarios

Consistent with our obligations under “Aiming for A”, we have evaluated each commodity business to assess its attractiveness and resilience against each climate scenario.

Our evaluation takes into account price, supply, demand and industry structure. Based on this analysis, we remain confident in our business portfolio and have a clear understanding of the impact of progressively higher carbon prices in each scenario.

The analysis below is based on applying our stated carbon scenarios to each industrial operation, excluding JVs, equity interests and any non-operated assets.

Marketing includes total marketing activities across all Glencore commodities.

The evaluation is presented below and illustrates the strength of the portfolio.

Under Glencore’s delayed action (central case) and committed action scenarios, our business units retain a positive investment outlook, with the exception of ferroalloys and oil, which are likely to move towards a neutral investment position, reflecting the relatively high carbon intensity of the business.

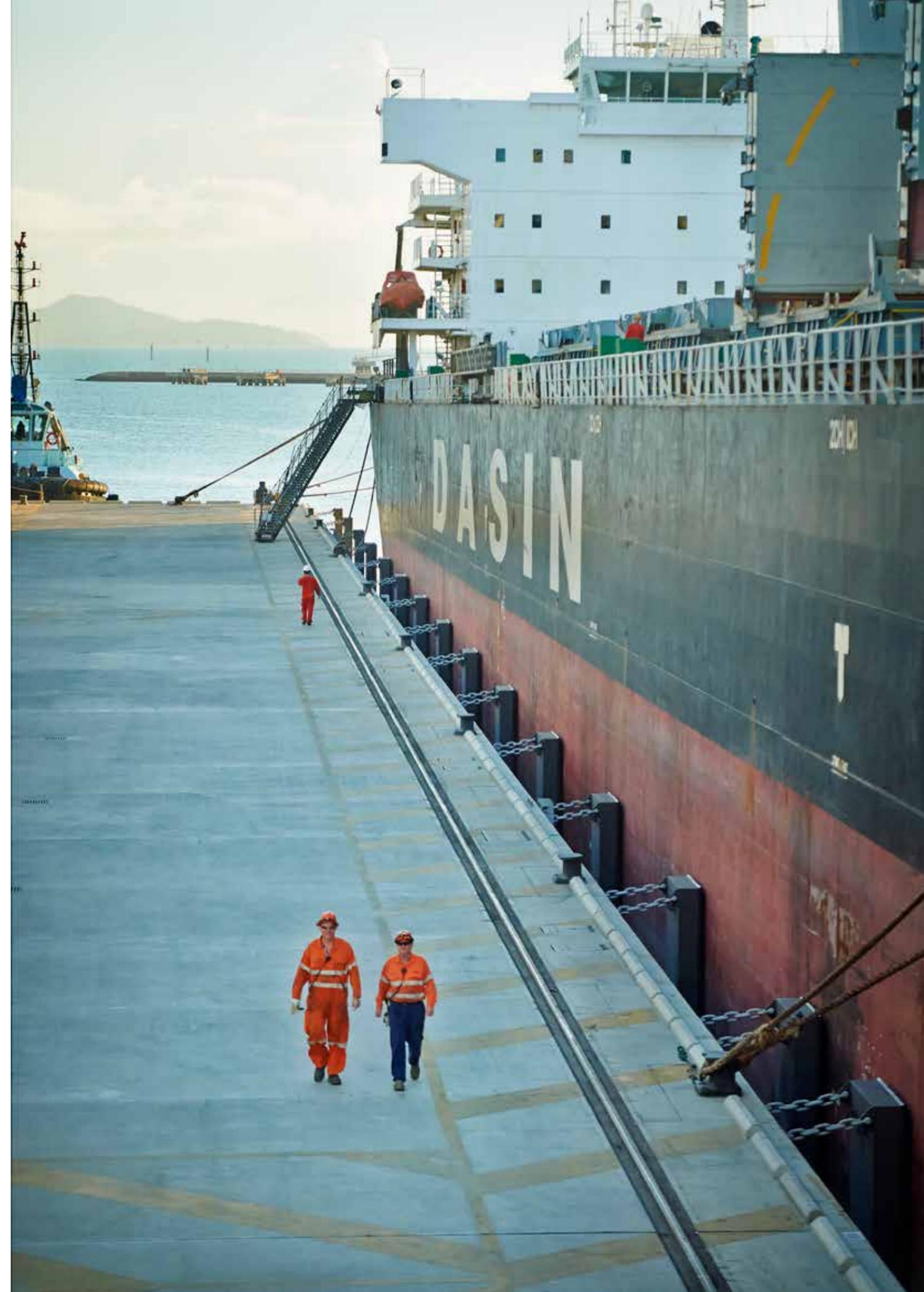
### Portfolio Resilience Analysis

| BUSINESS UNIT<br>(2016 EBITDA<br>CONTRIBUTION) | SCENARIO         | OUTLOOK | IMPACTS UNDER<br>AMBITIOUS ACTION SCENARIO   |
|--|------------------|---------|--|
| Copper<br>31%                                  | Delayed Action   | ⬆️      | Marketing attractiveness is robust and demand growth improves as climate action is globally coordinated driving electrification of energy and transport systems. Increased demand supports low cost incumbents as prices rise to reflect the need for investment in lower yielding ore bodies. |
|  | Committed Action | ⬆️      |  |
|  | Ambitious Action | ⬆️      |  |
| Marketing<br>28%                               | Delayed Action   | ⬆️      | Marketing and trading margins not impacted by climate initiatives. Remains core to Glencore’s business model and differentiates Glencore from its peers.   |
|  | Committed Action | ⬆️      |  |
|  | Ambitious Action | ⬆️      |  |
| Zinc<br>18%                                    | Delayed Action   | ⬆️      | Demand growth for Zinc based on its anti-corrosive properties and use as an alloy to form materials that are used in automobiles, electrical components, and household fixtures will be supported by ongoing electrification, industrialisation and urbanisation.                              |
|  | Committed Action | ⬆️      |  |
|  | Ambitious Action | ⬆️      |  |
| Seabourne Coal<br>13%                          | Delayed Action   | ⬆️      | Seaborne traded coal differentiated from the broader coal market as ongoing investment in low cost coal based power generation across south east Asia supports seaborne demand. Glencore’s competitive portfolio continues to generate acceptable returns.                                     |
|  | Committed Action | ⬆️      |  |
|  | Ambitious Action | ⬆️      |  |
| Nickel<br>4%                                   | Delayed Action   | ⬆️      | Marketing attractiveness is robust and demand growth improves as climate action is globally coordinated driving electrification of energy and transport systems. Increased demand supports low-cost incumbents as prices rise to reflect the need for investment in lower yielding ore bodies. |
|  | Committed Action | ⬆️      |  |
|  | Ambitious Action | ⬆️      |  |
| Ferroalloys<br>4%                              | Delayed Action   | ⬆️      | The high cost of carbon assumed under the Ambitious Action Scenario would potentially lead to the closure of some of South Africa’s marginal ferrochrome producers, resulting in major job losses.   |
|  | Committed Action | ⬆️      |  |
|  | Ambitious Action | ⬆️      |  |
| Agriculture<br>1%                              | Delayed Action   | ⬆️      | Agriculture maintains positive investment attractiveness under each of Glencore’s scenarios.   |
|  | Committed Action | ⬆️      |  |
|  | Ambitious Action | ⬆️      |  |
| Oil<br>1%                                      | Delayed Action   | ⬆️      | Oil has a neutral investment attractiveness under each of Glencore’s scenarios. We will continue to monitor any increase in carbon prices which may provide a driver for investment into emission reduction options to reduce our overall risk to the business.                                |
|  | Committed Action | ⬆️      |  |
|  | Ambitious Action | ⬆️      |  |

⬆️ POSITIVE INVESTMENT OUTLOOK

⬆️ NEUTRAL INVESTMENT OUTLOOK, ONGOING MONITORING

⬆️ NEGATIVE INVESTMENT OUTLOOK



## 9. Case studies

### Coal

#### CTSCo Integrated Surat Basin CCS Project



Over the past eight years, Glencore has participated in a number of low emission technology projects in Australia and overseas. Glencore's Integrated Surat Basin CCS Project is a demonstration project that aims to test the Surat Basin in Queensland for the suitability of deep carbon storage.



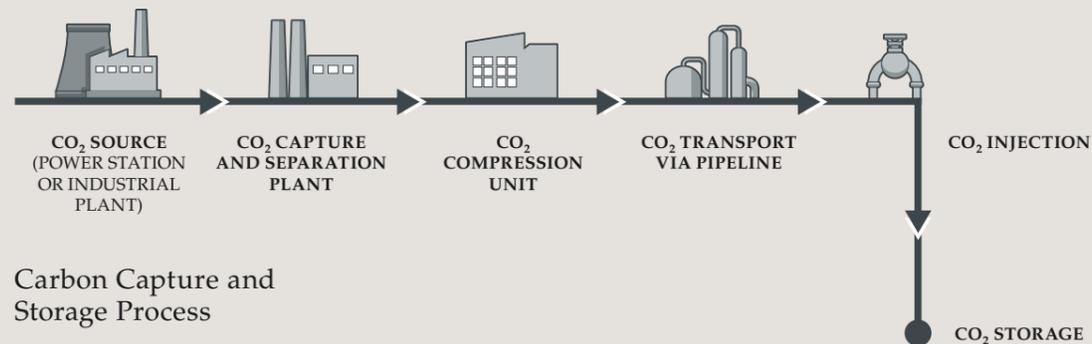
The geology of the Surat Basin has up to 2.9 billion tonnes of CO<sub>2</sub> storage potential and there are a number of coal-fired power stations nearby.

The Integrated Surat Basin CCS Project is located within a single greenhouse gas tenement on Glencore-owned land 15 km from Wandoan, granted by the Queensland Government in 2012. The project is being delivered by the Carbon Transport and Storage Company (CTSCo) – a wholly-owned, subsidiary of Glencore.

The project began in 2009 with a pre-feasibility study that ran to 2012. The project is currently in feasibility stage undertaking geological studies and environmental baseline monitoring with a view of gaining permits to inject CO<sub>2</sub>.

A post-combustion-capture (PCC) plant, attached to a coal power station, is expected to be built by 2021 and CO<sub>2</sub> injection anticipated for 2021 to 2024. It has received strong industry support from the Australian Coal Association Low Emissions Technologies Ltd (ACALET) and also from the Federal and Queensland Governments.

The project uses existing and proven technology, which reduces both risks and costs. It aims to demonstrate that CO<sub>2</sub> can be safely stored in an 'industrially scalable' manner more than 1km underground, at a cost of millions – rather than billions – of dollars. It aims to benefit all emitters of CO<sub>2</sub> – including coal- and gas-fired power stations as well as industrial producers of cement, iron, steel, fertilizers and chemicals.



### Ferroalloys



#### Improving energy efficiency, reducing emissions

The South African government has ratified the COP21 Paris agreement and submitted an NDC, which requires sizeable reductions in its greenhouse gas (GHG) emissions, as well as committing to transition to a green economy. The government is proposing a tax on carbon as one of the instruments in helping South Africa meet its international commitments to reduce GHG emissions.

Our ferroalloys business is mainly located in South Africa, where the cost of its production of ferrochrome is heavily exposed to energy prices and energy security. A carbon tax will further increase the cost of production and potentially lead to the closure of some of South Africa's marginal ferrochrome producers, resulting in major job losses.

There is also high possibility that the South African carbon policy will lead to carbon leakage as ferrochrome production is simply moved offshore.

To address this challenge, we have been improving energy efficiency through a range of initiatives, identifying alternative energy supplies and developing energy-efficient technologies, such as our proprietary Premus technology.

Over a number of years, our ferroalloys business has been planning and implementing new technology to address the challenges of rising energy costs and stricter emissions regulations:

- In 2007, we commissioned the Bokamoso Pelletiser at the Wonderkop smelter at a cost of ZAR800 million, improving the energy efficiency (Scope 2 emissions) of these smelters by 12.6% in 2016 compared to 2006.

- In 2007 Phase 1 and in 2014 Phase 2 were commissioned at Lion smelter, costing a total of ZAR6.6 billion and resulting in Glencore's largest proprietary Premus smelter, with 720,000tpa ferrochrome capacity. Premus is designed to reduce electrical energy consumption by using waste gas and heat. Its improved efficiency delivers substantial financial benefits over existing technologies. Lion's specific energy consumption (Scope 2 emissions) is 28% less than the South African average smelter's energy consumption.

- In 2012, the Tswelopele Pelletiser at the Rustenburg Smelter was completed at a cost of ZAR800 million, to replace the pellets that the smelter received from the Bokamoso facility. The utilisation of pellets improved the energy efficiency (Scope 2 emissions) of these smelters by 10.4% in 2016 compared to 2006.

- During 2017, we will be piloting co-generation technology at our Boshhoek smelter. This technology generates electricity from the carbon monoxide to carbon dioxide combustion heat, which is currently a waste emission. If successful in terms of operational and financial viability, the co-generation technology will initially reduce Boshhoek's Scope 2 emissions by 8%. In addition, the capacity at the Boshhoek smelter could be doubled and the technology could also be considered for the Lion and Lydenburg smelters.

In total, the initiatives implemented by our ferroalloys business have improved energy efficiency and Scope 2 emissions at our smelters by 26% in 2016 compared to 2003.

Going forward, our ferroalloys business' cost of production and greenhouse gas emissions will be highly connected to the energy generation options that are implemented by the South African government's Integrated Resource Plan (IRP) 2010–30. The IRP provides scenarios for forecasting future energy demand and identifies the required increases in national energy generation. The IRP considers the impact on emissions from installing different energy generation options that include, amongst others, fossil fuel, solar, wind and nuclear.

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## 10. Next steps

We recognise that climate change will remain a strategic issue for our company, and will continue to report to our stakeholders on our work in this area. Among the actions we plan to undertake going forward are:

- Continual monitoring of current and emerging policy trends and their impacts on our portfolio.
- Refine our understanding of the challenges and opportunities related to climate change facing our business, and identify mitigating actions. This process will also help us identify appropriate KPIs and performance management incentives and actions for our operations.
- Build the Group marginal abatement cost curve to help us track and implement optimal carbon abatement options.
- Continue to work with Glencore commodity departments on quantifying emission reduction and abatement opportunities across our business.

We look forward to continued dialogue with our stakeholders on this topic.

## Contacts

We welcome feedback on this report or on any other aspect of sustainability at Glencore. You can send general comments to [gcp@glencore.com](mailto:gcp@glencore.com)

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### Forward looking statements

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