ENVIRONMENT 2018

HOW WE WORK

When we started our journey as South32 we knew that if done well and sustainably, developing natural resources can change people's lives for the better.

We are working together to create an inclusive workplace where we hold ourselves and each other to account by living our values of care, trust, togetherness and excellence. Our values govern how we act, work, speak to each other and how we evaluate our behaviour. They guide us and are part of every decision we make.

OUR PURPOSE

Our purpose is to make a difference by developing natural resources, improving people's lives now and for generations to come.

We are trusted by our owners and partners to realise the potential of their resources.

THE VALUES THAT GUIDE US

CARE
We care about people, the communities we're part of and the world we depend on.

TOGETHERNESS
We value difference, listen and share, knowing that together we are better.

TRUST
We deliver on our commitments and rely on each other to do the right thing.

EXCELLENCE
We are courageous and challenge ourselves everyday to be the best in what matters.

THE WAY WE WORK

Together we will create an inclusive workplace where we hold ourselves and each other to account to demonstrate our values.

We ensure all work is well designed and reliably delivers safe outcomes, with a focus on continuously improving and learning.

HOW WE MAKE A DIFFERENCE

- We all guarantee everyone goes home safe and well
- We are meaningfully connected and believe in our purpose
- Our operations run to their full potential and maximise return on investment
- Our functions are lean and enable our operations to deliver their full potential
- Technology and innovation is radically lifting our performance
- We create value through our environmental and social leadership
- We have optimised our portfolio and have multiple growth options with a bias to base metals

OUR BREAKTHROUGHS

This year we have introduced seven breakthroughs, which describe how we make a difference.

Our breakthroughs are our new business strategy, and enable us to focus on what is important, balance our priorities and ensure we are all aligned to deliver on our purpose. Our breakthroughs form the foundation of how we plan our business. While no breakthrough has more importance than another, safety sits at the top of the list of seven as it is at the forefront of everything we do. Our breakthroughs bring us together as one South32 to create long-term value for all.

Breakthrough	Breakthrough
BREAKTHROUGH 1 We all guarantee everyone goes home safe and well	BREAKTHROUGH 5 Technology and innovation is radically shifting our performance
BREAKTHROUGH 2 We are meaningfully connected and believe in our purpose	BREAKTHROUGH 6 We create value through our environmental and social leadership
BREAKTHROUGH 3 Our operations run to their full potential and maximise return on investment	BREAKTHROUGH 7 We have optimised our portfolio and have multiple growth options with a bias to base metals
BREAKTHROUGH 4 Our functions are lean and enable our operations to deliver their full potential	

ENVIRONMENT

We work hard to be responsible stewards of the environment and treat natural resources with care so that they are available for future generations.

Successful environmental management is essential to our business. We have a comprehensive environmental management system, which includes our internal standards and reporting framework, and which is assured through governance processes. In FY18, we revised our environment standards to include additional performance requirements related to water stewardship, land biodiversity and rehabilitation.

We recognise resource companies have an important role to play in supplying the materials needed to create a more prosperous future in a lower carbon economy. We take our commitment to reduce our emissions seriously and are actively planning and implementing energy efficiency and emission reduction projects. Further information on our climate change strategy can be found in our report, Our Approach to Climate Change, which is available at *www.south32.net*.

Our environment-related data and management systems are subject to both internal and external assurance processes. These processes assist us to evaluate the efficacy of our management approach and we use findings to continuously improve. Within South32, responsibility for the environment sits in both functional and operational roles.

Our Sustainability Policy states our commitment to sustainable development and can be found at *www.south32.net*.

South32 supports the United Nations (UN) Sustainable Development Goals (SDGs). The United Nations 2030 Agenda for Sustainable Development defined 17 SDGs in September 2015 that seek to address the world's greatest challenges. The SDGs build on the work undertaken through the Millennium Development Goals but have a greater focus on the involvement of the private sector. South32 plans align with the SDGs. The key to a successful result is working with stakeholders to develop and implement actions that contribute to sustainable development.

WATER

Water is a valuable resource which requires increasingly careful management to ensure its availability and suitability for use by the whole of society. We all share our water resources and we are all responsible for them. We acknowledge the human right to water access and use a catchment-based approach to our water planning which considers all relevant stakeholders.

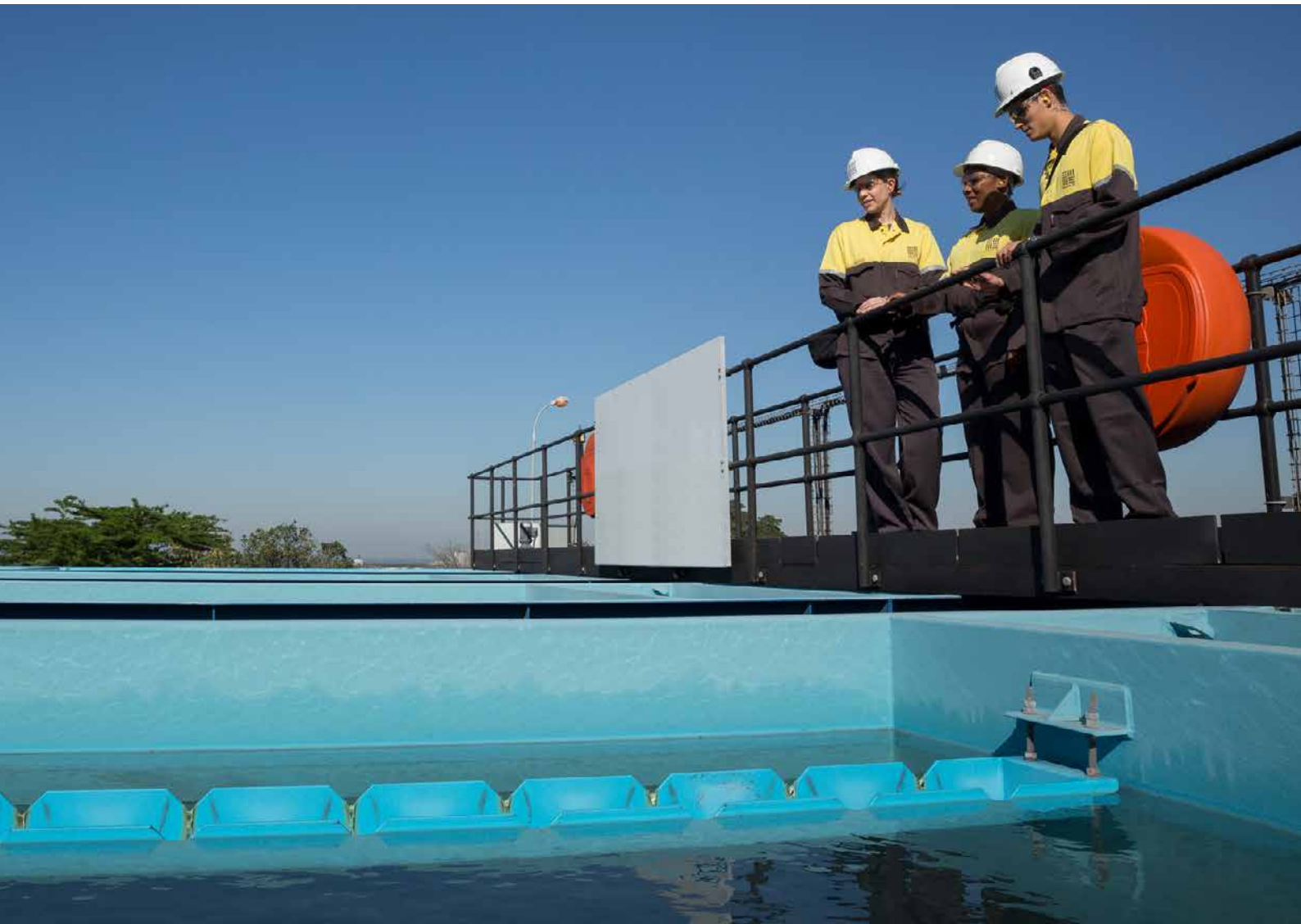
Water availability is being affected by a combination of climate change, population growth, infrastructure planning and land use change. We are working with our communities and other stakeholders to achieve water security for our operations and address water issues within the catchments where we operate.

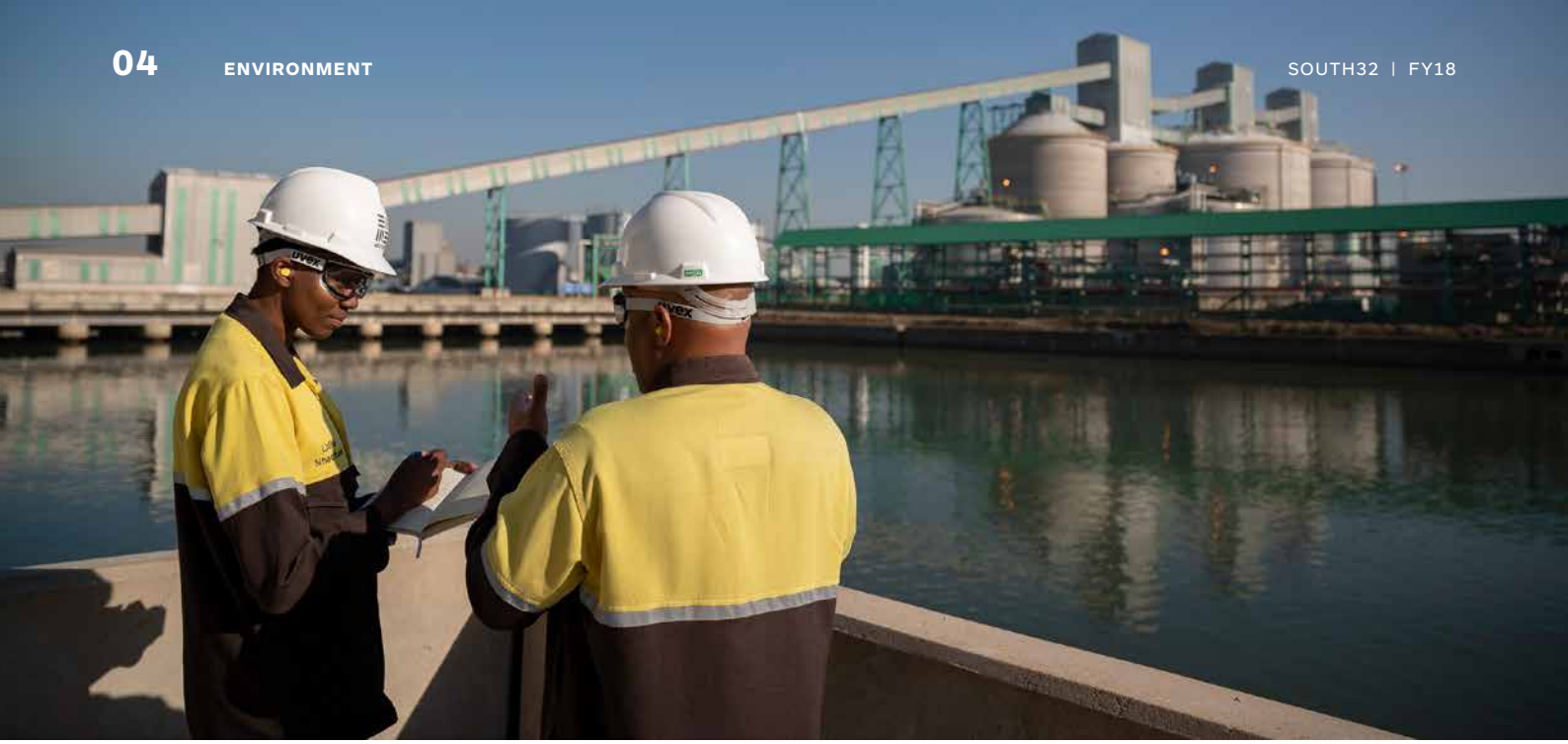
We continue to manage water-related material risk at three of our operations. We constructed a modular desalination plant at Mozal Aluminium and operate a desalination plant at South Africa Aluminium. In FY18, we obtained access to an alternative water source at Worsley Alumina and continued to study water-related efficiency projects.

SOUTH AFRICA ALUMINIUM

Our desalination plant at our Hillside aluminium smelter continues to provide process water to our operation. This means we are accessing less water from the municipal water system, which is also the water source for the community and other stakeholders, whilst being as cost-effective in our water security as possible.

We work closely with the Department of Water and Sanitation (DWS), as well as engage with other users within the Richards Bay Industrial Area. We have also implemented water use efficiency projects including water awareness campaigns for employees and contractors, addressing water leaks as ‘breakdowns’ and reducing our reliance on domestic water.





MOZAL ALUMINIUM

Current climate projections, as well as recent trends in weather patterns, show a declining rainfall trend in the region where our Mozal Aluminium smelter is located, making reliable access to water an emerging risk for our operation. As there is no alternative climate resilient source of water supply, we built a desalination plant to mitigate the risk. This has the added benefit of reducing our need to use municipal water that is required for community use. The desalination plant was commissioned in February 2018 and ongoing work to integrate the alternative water source will continue into FY19. This is the second desalination plant we have built for our African operations since FY16, having established a fully containerised, modular desalination plant for our Hillside aluminium smelter in FY17.

WORSLEY ALUMINA

The south-west region of Australia has experienced decreased levels of rainfall in recent years. We have an onsite freshwater dam that is used to supply potable water for our operation. Water supply from our dam is likely to decrease. As a result, we have been looking at alternative water supply sources for our Worsley Alumina refinery that also minimises our reliance on the communities' potable water supply.

In April 2017, we completed construction of a pipeline from Wellington Dam to our refinery to ensure availability of a reliable supply of water. Wellington Dam was selected as studies showed that the dam's water is not suitable for many uses due to high levels of salinity, and the current industrial allocation is underutilised. The construction of the pipeline means that our reliance on purchasing water from Harris Dam, which also supplies the community, has been significantly reduced. Along with exploring water supply options, we continue to look at ways to use water more efficiently at the refinery.

ICMM POSITION STATEMENT ON WATER STEWARDSHIP

As a member of the International Council on Mining and Metals (ICMM), we were pleased to play a role in the development of the Council's Position Statement on Water Stewardship. We are committed to meeting its goals, including:

- Strong and transparent corporate water governance
- Effective water operations management
- Working with others to achieve responsible and sustainable water use

Member companies have made a commitment to implement the requirements of the Position Statement by November 2018 and, as a result, we have updated our internal standards and processes to strengthen our approach to water stewardship.

One of the key commitments of the Position Statement is to set context-based targets or objectives. We committed to establishing these for our operations with material water-related risks. The term 'context-based' acknowledges that local risks and considerations are specific to each water catchment, as are the timeframes to implement actions. In FY19, we will establish context-based water targets and objectives for our three operations with material water-related risks.

CASE STUDY

PARTNERSHIPS FOR PROGRESS

Several of our South Africa Energy Coal (SAEC) operations are working with partners to manage water risk, including the Mine Water Coordinating Body (MWCB).

The MWCB is a public-private platform that encourages collaboration between the coal mining industry, government and other stakeholders. Its purpose is to identify and implement joint solutions to improve water quality and address mine closure, starting in the Upper Olifants Catchment. While the MWCB is in its infancy, it offers opportunities for mining partners, the public and government to address water management challenges collectively.

The first year of the MWCB has focused on securing the participation and funding of the larger mining organisations. In the coming year, the focus will be on engaging with mid-tier and junior mining organisations to encourage their active participation in developing MWCB projects.

WORKING TOWARDS WATER STEWARDSHIP

We have a holistic approach towards water management centred on promoting better water use, effective catchment management and improved water security, working towards catchment-level water stewardship. This is achieved by:

- Maintaining water balances for all operations
- Maintaining water resource forecasts in our business planning process
- Undertaking water resource risk and opportunity analyses, which considers both operational and broader catchment aspects

OUR SHARED WATER, OUR SHARED FUTURE

We recognise the significance of water-related risks to our business and to the community. Our focus is to shift the way we think about water to a long-term, catchment-wide planning approach with integration across all areas of our business.

To achieve water security for our operations, and address potential water issues within the catchments where we operate, each operation is now required to carry out a water risk and opportunity analysis process every two years. A pre-screening tool captures water-related information for every operation. A multidisciplinary team then analyses the information to identify any water-related risks and potential opportunities that would benefit the operation and the broader catchment area.

MANAGING WATER AT ILLAWARRA METALLURGICAL COAL

At Illawarra Metallurgical Coal in Australia we continue to work with a diverse range of stakeholders to reduce potential impacts from our operations, including potential subsidence impacts to natural and built features.

A key focus is to better understand and manage potential impacts on the local water catchment area from underground mining activities at our Dendrobium mine. We recognise the importance of the catchment area and its role in the region's water supply network. We work closely with government agencies charged with responsibilities in the catchment, including WaterNSW, and continue to undertake comprehensive environmental assessments to support our mine planning. We operate in accordance with regulatory requirements, including WaterNSW approved management plans. In FY18, we engaged with the newly-formed Independent Expert Panel on Mining in Sydney's Drinking Water Catchment, which was established as an advisory body to the NSW Government.

At our Appin mine, we operate a desalination plant. Sourcing water from this plant has reduced our reliance on water from the Sydney Catchment Area. This area is potentially susceptible to water scarcity in the future, making water security a focus for our operation. In FY18, we commenced work to increase the capacity of our desalination plant. This work is scheduled for completion during FY19.

In FY18, our Appin mine continued to work closely with the Environment Protection Authority and established working groups with local government and community stakeholders. Together, we are working to improve the quality of licenced mine discharge waters entering the Georges River.

CASE STUDY

IMPROVING ACCESS TO WATER SUPPLIES

During FY18, our Hillside aluminium smelter, in partnership with the South African Red Cross Society KwaZulu-Natal and the uMhlathuze local municipality, launched a Water Harvesting Project to support the provision of water services alongside water education in uMhlathuze, KwaZulu-Natal. The strategic partnership aims to address the severe drought in KwaZulu-Natal and to educate the local community on water conservation, water treatment and health care.

People in local rural communities have been particularly affected by the drought and have experienced a shortage of suitable drinking water. While the municipality's water tankers have made regular visits to these communities, there was insufficient storage capacity and community members were forced to travel long distances to source water. In response, we funded 1 million South African rand for the provision and installation of 135 water tanks, which will improve water access for local communities in the uMhlathuze area. The funding will also support local community education programs on topics such as water conservation, improving water health and hygiene, and sanitation practices.

WATER PERFORMANCE

We report our water data in accordance with the Minerals Council of Australia's Water Accounting Framework (WAF). The WAF is an accepted industry water accounting standard and aims to improve data integrity and comparability across the sector to ensure the continuous improvement of water reporting. In FY18, we adopted the new ICMM reporting guidelines, integrating them into our reporting methodology.

Under the WAF, water is categorised as Type 1 (close to drinking water standards), Type 2 (suitable for some purposes), and Type 3 (unsuitable for most purposes). In FY18, our Type 1 water input increased by 22 per cent compared with FY17, primarily due to above-average seasonal rainfall at our Worsley Alumina refinery.

No water quality or quantity breaches or fines for water quality or quantity breaches were received for the reporting period.

Water use compliance audits were conducted across our SAEC operations in FY18 by the DWS. Upon receipt of the audit reports by the operations, respective action plans were developed and submitted to DWS for further consideration. No formal feedback has been received from the regulatory authorities.

BIODIVERSITY

We have a fully integrated business planning process designed to protect ecosystems and minimise biodiversity impacts. This includes land management activities such as conservation of high biodiversity value areas, pre-clearance surveys and progressive rehabilitation.

The recent update to our environment standards strengthens the business planning process by including biodiversity risk and opportunity analysis. This is to ensure that biodiversity impacts and opportunities are identified at the project planning phase.

Biodiversity considerations are part of our mine plans and, where possible, we seek to avoid impacts to sensitive features. To manage potential impacts, we collect biodiversity baseline activity and implement controls consistent with the biodiversity mitigation hierarchy (see Diagram 1).

We establish environmental outcome targets for biodiversity, developed on a two-yearly cycle, with the aim of contributing to enduring environmental benefits for important ecosystems.

Our environment standards align with the ICMM principles(1) for sustainable mining and commitments for mining and protected areas, including the commitment to not mine or explore in World Heritage Areas and to respect legally designated protected areas.

Our mitigation hierarchy process, illustrated in Diagram 1, aims to achieve no overall negative impacts on biodiversity. We seek to primarily avoid and minimise potential impacts, then rehabilitate areas no longer required for mining or processing operations. Where there are residual adverse impacts, we offset land to ensure that high value biodiversity land is protected from future disturbance.

Diagram 1 Our mitigation hierarchy process

MANAGING MATERIAL BIODIVERSITY-RELATED RISK

For operations with a biodiversity-related material risk, we undertake a detailed biodiversity assessment that includes the potential of impact from the disturbance footprint, cumulative impact assessment and climate modelling specific to the risk. Controls are developed and implemented that align with regulatory requirements and reduce the biodiversity risk consistent with the mitigation hierarchy (Diagram 1).

REHABILITATION

Through effective rehabilitation programs, we aim to restore similar ecosystem services where we operate, including supporting projects which provide resilience to climate change impacts.

In FY18, we rehabilitated 40 per cent of the land we have previously disturbed. Where possible, to minimise our operational impacts, we perform progressive rehabilitation activities in parallel with our mining activities. We do this by integrating rehabilitation into the mine planning process and ongoing operations.

By including rehabilitation as part of the mine plan we benefit from operating efficiencies, leading to a reduction in costs and improved environmental outcomes. For example, equipment that is not fully utilised for mining can be used to undertake rehabilitation. Progressive rehabilitation ensures a well-planned and tracked process that continually establishes biodiversity values and prevents soil erosion.

We also have extensive programs designed to monitor the performance of our rehabilitation against specific approved performance criteria.

LAND AND REHABILITATION PERFORMANCE

In FY18, we rehabilitated a total of 410 hectares, increasing our total rehabilitated area to 15,554 hectares. This is compared to a disturbed land footprint of 23,292 hectares. We also continue to support conservation, with a total of 2,001 hectares(2) of our land currently set aside for this purpose.

(1) *https://www.south32.net/docs/default-source/sustainability-reporting/fy2017-sustainability-reporting/gri-navigator.pdf?sfvrsn=a0cbe798_4*

(2) The amount of land in conservation decreased compared to FY17's total of 2,107, due to conservation land handed over to the Office of Environment and Heritage (New South Wales).

CASE STUDY

WORKING TOGETHER TO KEEP GROOTE EYLANDT CANE TOAD FREE

We have formed a partnership with the Anindilyakwa Land Council (ALC) and the ALC Land and Sea Rangers of Groote Eylandt to help protect the local environment from biosecurity risks. Groote Eylandt, an island approximately 50 kilometres from the Northern Territory (NT) coastline in Australia, is home to our Groote Eylandt Mining Company (GEMCO). The island has a unique environment and is recognised nationally and internationally for its outstanding ecological and conservation values.

Groote Eylandt is free from many of the threatening species found on the NT mainland, including cane toads, which have caused widespread ecological devastation on mainland Australia. Cane toad incursion and establishment on Groote Eylandt is considered a significant threat to the environment. We continue to improve existing risk management processes to mitigate the risk of cane toad presence on Groote Eylandt from both a business and community perspective.

In partnership with the ALC, we have funded a Quarantine and Biosecurity Officer who manages a professionally trained sniffer dog, Edna. Edna inspects high-risk freight, vehicles and materials entering Groote Eylandt for both GEMCO operations and community freight delivery and sea transport services. GEMCO is committed to assisting in the management of biosecurity and quarantine on Groote Eylandt and undertakes a work program which includes manual load inspection, barrier controls and education and awareness campaigns.

CASE STUDY

SUSTAINABLE FUTURE PLANNING

In Colombia, our Cerro Matoso operation is in its second year of a pilot Intelligent Land Management project. The project involves 40 families in a community-led farming initiative, taking progressively greater levels of responsibility for their business.

An assessment of non-operational land assets around the operation found that the land formerly leased for grazing could be used to benefit the community. Following extensive community consultation, Cerro Matoso and a community-formed company reached an agreement regarding use of the land. Cerro Matoso provided the initial technical and financial support and commissioned market research to support product selection and business capacity building. Over 40 families now farm melons on the land, with both community and Cerro Matoso invested in the business and sharing responsibility for its successes and failures (e.g. crop failures, market fluctuations).

Incorporating the effects of projected climate change on product selection and yield is currently being considered, along with the long-term production potential of long-cycle products, such as cocoa and timber, and short-cycle products, like melons. Product diversification is recognised as important for business resilience.

The project aims to foster a spirit of entrepreneurship, build business capacity and deliver demonstrable economic benefit into the community. The project has also highlighted the need to understand and adjust to the rhythm and pace of local community life and to recognise that change processes take time. Early, long-term planning for a sustainable economic future allows time to explore options and opportunities, to trial approaches, to fail, learn and move forward, and to co-develop desired projects with local stakeholders and authorities.

INTELLIGENT LAND MANAGEMENT: OUR INDUSTRY LEADING SUSTAINABILITY FRAMEWORK FOR LAND MANAGEMENT

Intelligent Land Management (ILM) is a sustainability framework for land management designed to transform land holdings which are currently unused or subject to rehabilitation into areas that increase climate resilience and generate shared financial, social and environmental value. ILM projects are based on delivering long-term benefit for our host communities, biodiversity values and our operations.

Our ILM framework (Diagram 2) represents a considerable maturity in the way we perceive and generate value for our stakeholders and is an acknowledgment of our industry's accountability for socio-environmental stewardship and landscape level planning for the life of an operation and beyond.

Project selection for ILM initiatives is comprehensive and requires a broad outlook of both internal and external operating environments as well as considerable stakeholder engagement.

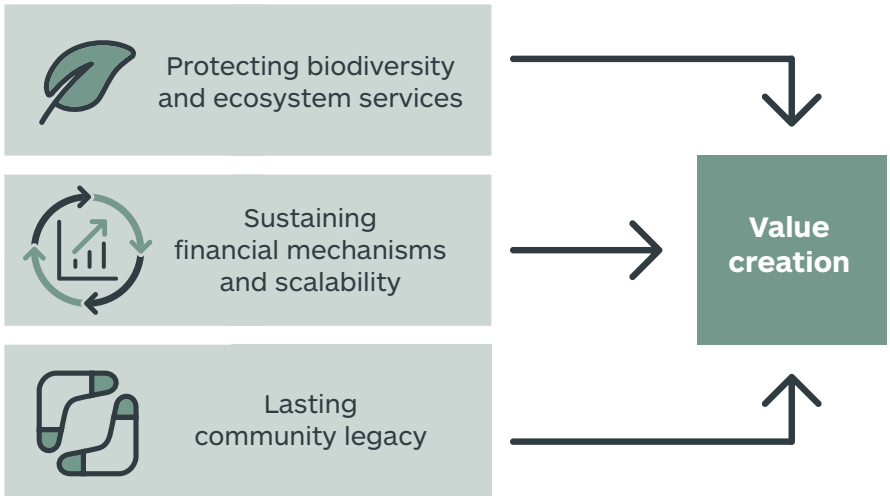
Our Strategic Land Assessments (SLAs) form the backbone of project development and include:

- Analysis on land availability and compatibility
- Opportunity mapping to support the business, the environment and society
- Internal and external context analysis

SLAs will roll out across all of our operations over time. During FY18, an SLA was completed for Worsley Alumina to identify projects which could deliver outcomes aligned with ILM objectives. Identified projects will undergo further analysis prior to selection and execution throughout FY19. In FY18, we were invited to present our ILM initiative to the ICMM Land Stewardship Working Group as an example of using non-operational landholdings to achieve sustainability objectives.

ILM follows the guiding principles as set out in Diagram 2.

Diagram 2 Our sustainability framework for land management



CASE STUDY

ILM IN ACTION

Historically, value from mining has been generated by extracting mineral and energy resources from the land. As a result, mining companies can have considerable landholdings, many of which are unused for mining activities. For example, unused land which acts as a buffer between mining activities and/or infrastructure.

In the Illawarra region of New South Wales, Australia, endangered ecological communities exist in buffer areas adjacent to our Appin mine. Our ILM framework has identified these areas as high conservation value land which is critical to the ecological communities that inhabit it. In FY17, we contributed 84 hectares to conservation. In FY18, via the New South Wales Government BioBanking scheme, a further 67 hectares were contributed for conservation in perpetuity, ensuring the land will remain undisturbed for future generations. This ILM project follows the guiding principles set out in our ILM framework.

CASE STUDY

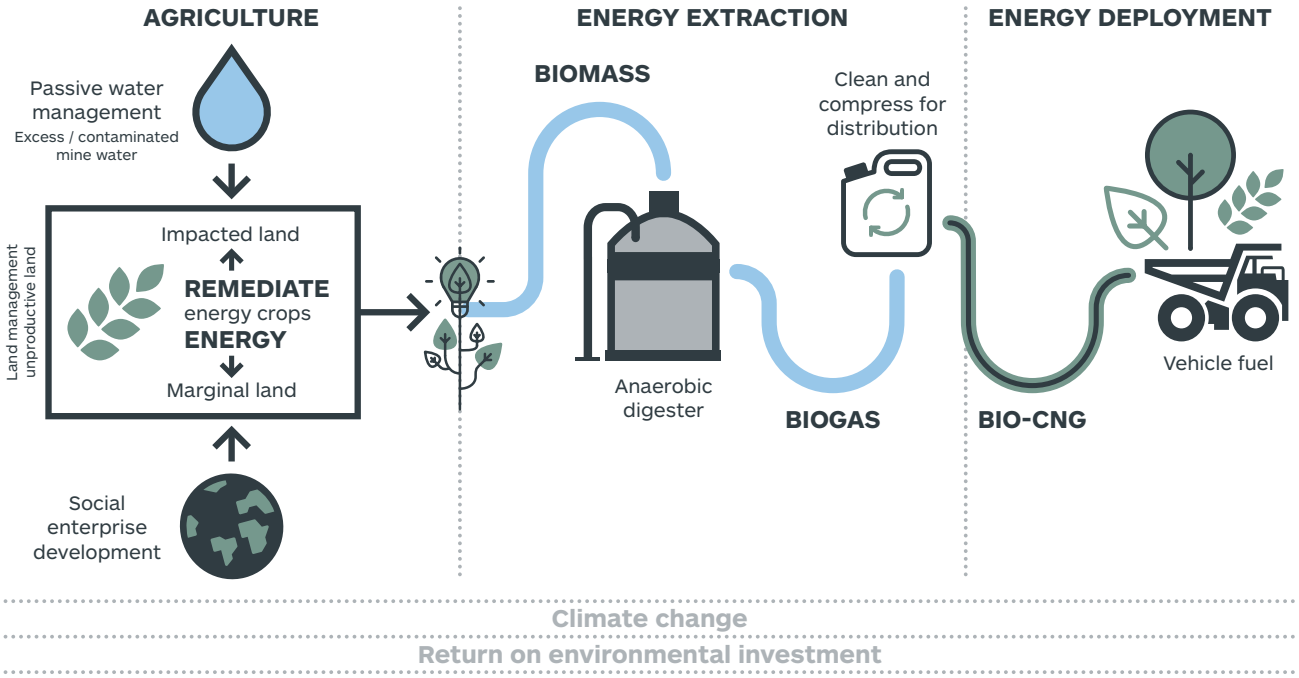
BIOFUELS TRIAL

At our SAEC operations, we have large fleets of trucks which use diesel fuel. As part of our efforts to reduce our carbon footprint, we have initiated an ILM concept study to reduce our dependency on diesel. We are investigating the potential to partially power our fleet with biogas, BioCNG, generated by crops grown on rehabilitated land, as shown in Diagram 3.

A 10 hectare crop trial tested four distinct species planted on both dry and irrigated rehabilitated land. The water used for irrigation is mine recycled water. Seedbed preparation, planting and irrigation installation was completed in January 2018 with annual crops harvested in June 2018 and perennial crops to be harvested in 2019.

If successful, this project will result in a carbon emission reduction of approximately 30 kilotonnes (kt) per year. Through unlocking the potential of our rehabilitated land and utilising mine recycled water, the project also has the potential to reduce our overall rehabilitation provision and water liability, as water is remediated through this process. Through the growing of crops, the project also represents an opportunity for social enterprise development.

Diagram 3 Biofuel generation process



EMISSIONS

Our commitment to our Climate Change Strategy and focus on emission reduction continued in FY18. We are progressing towards meeting our short-term emission reduction target, to stay below our FY15 Scope 1 emission baseline in FY21. We are committed to reviewing and ratcheting our carbon emissions reduction approach every five years from FY21 towards net zero carbon emissions by 2050. Any remaining (residual) emissions will form the basis of our carbon offset planning to reach the net zero goal by 2050.

To further our ambition, we are developing decarbonisation plans in FY19 to support our goal of net zero operational emissions by 2050. We are primarily focusing on our long-life, emissions intensive operations at Worsley Alumina and Illawarra Metallurgical Coal (representing around 60 per cent of our current Scope 1 emissions).

Our minimum performance requirements for management of our emissions are detailed in our environment standards. These requirements include:

- Monitoring of all emission sources in accordance with applicable regulations or standards
- Incorporating emission reduction initiatives into our business planning process
- Maintaining 'life of operation' emission forecasts that are inclusive of Scope 1 and Scope 2

Relevant activities and outcomes in FY18 at our operations include:

- An increased focus on gas drainage efficiency at Illawarra Metallurgical Coal
- Accreditation of the Worsley Alumina refinery Multi Fuel Co-generation (MFC) facility under the Renewable Energy Target scheme, allowing credits to be generated from combustion of biomass
- A successful pilot trial of biomass at Worsley Alumina in one of the MFC facility boilers, resulting in abatement of approximately 5.75kt of carbon dioxide equivalent (CO_2 -e)
- Commencement of a 3 megawatt (MW) solar array project at our Cannington operation which, once finalised, will generate 6,500MW of electricity per annum and abate approximately 3kt of CO_2 -e per year
- Abatement of approximately 125kt of CO_2 -e at our Hillside aluminium smelter through projects which include perfluorocarbons emission reduction and various compressed air improvements

Emission reduction targets are included in our Business Scorecard. Performance against these targets is directly linked to all employee remuneration, including the Lead Team.

Decarbonisation plans detail the steps involved in reducing carbon emissions at operations and will assist us in reaching the 2050 carbon neutrality goal.

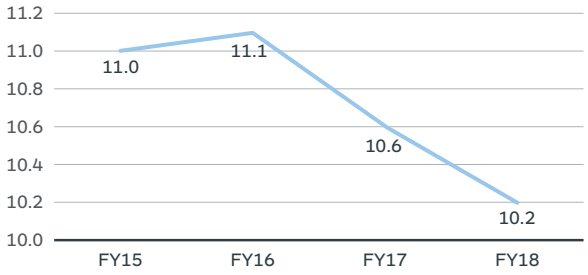
GREENHOUSE GAS (GHG) PERFORMANCE

Our emissions are from within our boundaries (Scope 1), indirectly from energy purchased (Scope 2) and indirectly from our value chain (Scope 3). We monitor and report on our Scope 1 and 2 emissions as per our reporting standards and operation specific atmospheric emissions licences, as well as country-specific regulatory requirements, for example the National Atmospheric Emissions Inventory System (NAEIS) in South Africa and the National Greenhouse and Energy Reporting Act 2007 (NGER) in Australia.

In FY18, our Scope 1 and Scope 2 emissions totalled 22.9 million tonnes (Mt) of CO_2 -e. This is an increase in emissions of one per cent compared to FY17. This increase was influenced by higher Scope 2 emissions at our Mozal Aluminium smelter, due to a shortfall in delivery of third-party contracted hydropower, which resulted in greater consumption of coal powered electricity. This impact was largely mitigated by reduced emissions at our Illawarra Metallurgical Coal and South Africa Aluminium operations.

Our Scope 1 GHG emissions decreased by four per cent to 10.2Mt of CO_2 -e in FY18 compared to FY17. We therefore continue to progress towards our target of staying below our FY15 Scope 1 emissions baseline in FY21, with current forecasts suggesting our emissions will be approximately three per cent lower than our target in FY21. This performance rates as meeting target within our FY18 Business Scorecard.

Diagram 4 Scope 1 GHG emissions (Mt of CO_2 -e)



At Illawarra Metallurgical Coal, flaring activities at our Appin mine between June 2016 and November 2017 generated 238,638 Australian Carbon Credit Units which were issued by the Clean Energy Regulator. The credits were awarded due to converting methane to carbon dioxide, in the absence of the gas being able to be used for electricity generation. Carbon dioxide has significantly less global warming potential than methane.

We have calculated the indirect emissions from certain sources in our value chain (Scope 3) for FY18, which equates to 117Mt of CO_2 -e. This represents a six per cent decrease from FY17. Approximately 60 per cent of our Scope 3 emissions come from the downstream use of our energy coal. A detailed breakdown of our emissions performance, including the Scope 3 calculation methodology, is published at *www.south32.net*.

CASE STUDY

WORSLEY ALUMINA BIOMASS TRIAL

We are committed to reducing our carbon footprint, and our Climate Change Strategy has the goal of net zero emissions by 2050.

Researching alternative fuel sources is one way we can reduce our emissions and during FY18 we completed a biomass trial at our Worsley Alumina refinery in Australia. The pre-feasibility trial tested the use of waste from pine logging, referred to as biomass, as a renewable energy fuel in our MFC facility. The trial was to test our ability to use 30 per cent biomass fuel load in the MFC. During the trial, the suitability of the current infrastructure, storage locations, material movement and handling, and boiler feed systems were analysed to understand whether biomass can become part of the long-term energy mix for Worsley Alumina. The trial was successful, resulting in an abatement of approximately 5.75kt of CO_2 -e.

Accreditation under the Renewable Energy Target Scheme of the MFC facility was obtained in November 2017 which will allow Worsley Alumina to create and sell Large-scale Generation Certificates.

AIR QUALITY

We continue to monitor and implement controls to minimise the potential impacts of dust, gaseous emissions and noise across our operations to remain within regulatory limits and address community concerns. We frequently conduct internal audits, verifications and assessments against our internal standards and legislation, and address potential non-compliances through action plans. We regularly review our approach to air emissions to ensure we continue to mitigate potential impacts and manage our performance.

In FY18, our Metalloys manganese smelter in South Africa received an administrative fine under South African environmental legislation, for US$100,240, which will be paid in tranches by FY20. The fine is in relation to the operation of new technology used in the agglomeration (smelting related) process, which was utilised under the existing Atmospheric Emissions Licence (AEL) but, according to the regulator required rectification for unauthorised commencement of a new activity, and should only have been utilised following receipt of a new or renewed AEL. The regulator required Metalloys to pay the first administrative tranche of the fine prior to processing an application to renew the existing AEL. The AEL was renewed upon receipt of the first tranche of the fine.

In FY18, our Cerro Matoso operation was fined US$398,474 by the Regional Environmental Authority (CVS) for alleged air pollution and related health impacts which occurred in August 2013. While Cerro Matoso is required to pay the fine to the CVS, we will be seeking to apply to the Courts to have the fine annulled. Cerro Matoso operates in accordance with legislated air emissions requirements and our air quality monitoring systems are subject to periodic reviews to ensure that they remain fit for purpose and effective.

We continue to support and actively engage in local airshed (air catchment area) forums and studies near our operations to help reduce the potential impact on our local communities and improve ambient air quality. Examples of our involvement include the Collie Airshed Study in the south-west of Australia, which is within the airshed of our Worsley Alumina operation.

In FY18 we emitted 35.8kt of oxides of sulphur, a 9 per cent decrease compared to FY17, and 10.9kt of oxides of nitrogen, a four per cent increase compared to FY17.

ENERGY

We regularly review our energy supply options to identify sustainable supplies and reduce our GHG emissions wherever possible. Energy costs represent a significant component of operational expenditures and a disruption in energy supply could have a direct impact on our production. Consistent with the requirements of our environment standards, our business planning process considers energy use and identifies energy efficiency initiatives.

We have invested in energy efficiency initiatives and continue to support viable renewable energy schemes. We purchase hydro-generated electricity for TEMCO in Australia, Cerro Matoso in Colombia and Mozal Aluminium in Mozambique.

At our Metalloys manganese smelter in South Africa we have a co-generation plant that sources its primary energy from furnace off-gas, which is both cost-efficient and reduces our demand from the national grid. At TEMCO, we operate an energy recovery unit which creates efficiency by sourcing energy from furnace off-gas.

Eskom is the state-owned power provider in South Africa supplying electricity to all of our Southern African operations (via Motraco for Mozal Aluminium). The FY18 power supply has been stable, with minimal load-shedding events and no voluntary reductions in power usage, despite lower availability of hydropower in Mozambique.

ENERGY PERFORMANCE

In FY18, our total energy use was 174 petajoules, of which 19 per cent was renewable energy. Our total renewable energy use decreased in FY18, compared to FY17. This was primarily due to greater consumption of coal powered electricity at our Mozal Aluminium smelter, because of a shortfall in the third-party hydropower supply delivery.

CASE STUDY

CANNINGTON SOLAR PHOTOVOLTAIC FARM

In May 2018, we commenced construction of an off-grid renewable energy project to offset gas consumption with solar at our Cannington operation's power station. The six hectare farm is a solar/gas hybrid power supply and represents our first solar installation.

This will supply clean and reliable renewable energy while preventing between 4,000 and 6,000 tonnes of GHG emissions per year, which contributes to the objectives of our Climate Change Strategy.

The three megawatts of electricity generated will supply the mine's accommodation village and airport, with the surplus electricity supporting the mining and processing operations at Cannington.

The cost to install and operate the solar farm will be offset by lower fuel costs, which makes it an economically viable solution for the operation. Electricity supply from the solar farm is expected to commence in FY19.

ENVIRONMENTAL COMPLAINTS AND GRIEVANCES

To address individual concerns, we have a complaints and grievances procedure at every operation, which includes environmental complaints such as those associated with dust and noise. This allows community members and other interested stakeholders to raise issues directly with our operations. We respond to all complaints and grievances through our local Community teams and aim to resolve any issue as soon as possible. We report our recorded complaints and grievances.

COMPLAINTS IN FY18

We received 115 complaints in FY18, a two per cent reduction on the previous year. In FY17, most community complaints received across our operations were related to noise, and in FY18 this remained the same. We did, however, experience a 44 per cent decrease in the total number of noise related complaints we received. Worsley Alumina had a 54 per cent decrease in noise-related complaints from 39 to 18, largely due to activity from our operations moving to more sparsely populated areas. Complaints are investigated and closed out as per our process. We continue to engage with our communities on the issues they have raised.

CLOSURE

All of our operations have Closure Plans, integrating the ICMM closure toolkit. We regularly review all potential closure risks to retain value for future generations. The guiding principles that support our closure planning are fit for purpose, consistent with regulatory requirements and fully integrated into our business planning cycle.

All Closure Plans include closure criteria and land use options, as well as current and future shared economic, environmental and social value. This includes requirements for rehabilitation of disturbed areas, decommissioning infrastructure, remediation of contaminated sites, disposal of waste and monitoring of effectiveness. Consideration is also given to economic transitions and sustainable communities, especially where we have a significant presence in the region. One hundred per cent of our operations have Closure Plans.

Our Closure Plans provide the basis for closure cost estimates and associated financial provisions. Further information on our closure provisions can be found in note 15 on page 123-125 of the financial statements in the 2018 Annual Report which is on our *website*.

CASE STUDY

GLASSHOUSE TRIALS USING TAILINGS SHOW PROMISE AT GEMCO

In partnership with researchers from the CSIRO, GEMCO has commenced investigations to determine whether plants can grow in various waste material substrates from the Groote Eylandt mine.

The Closure Plan for GEMCO requires rehabilitation of mining areas and Tailings Storage Facilities (TSFs). In a post-mining landscape, differences in soil properties and hydrology are often found and it is unknown how well native vegetation will establish and grow in the modified landscapes.

In FY18, glasshouse trials were conducted to compare the growth of trees, grasses and sedges in a range of alternatives to soil, including clay tailings and various mixes of clay tailings with sand tailings, overburden and/or topsoil. Physical and chemical analysis of the different substrates were analysed, revealing that the overburden and tailings materials are mildly acidic and extremely low in organic matter and nitrogen. However, all substrates were shown to be able to support plant growth, which is a positive result.

The next phase of study will be to investigate the use of different fertiliser treatments to enhance the establishment of woody vegetation without encouraging weed growth and potentially commence field trials.

The results from this study will contribute to topsoil seedbank and management techniques of TSF slopes to capture water, nutrients and seed. This assists in the creation of fertile patches of ground useful for reducing further erosion and enhancing successful rehabilitation using what has been considered waste material.

WASTE

We manage various waste streams from our operations including waste rock, waste water and tailings. Waste materials can contain potentially hazardous chemical or physical properties. We manage and report our performance on waste in accordance with company standards and applicable legislation.

We are exploring ways to generate value from materials previously classified as waste, while also mitigating potential environmental and financial legacy impacts. We have commenced research to identify the best remediation and rehabilitation strategies at some of our operations. The outcome of this research will be integrated into our operations' planning processes and will inform our Closure Plans.

TAILINGS

We recognise the potential risks posed to communities, our workforce, the environment and shareholders from tailings and water retaining dams and remain committed to safe and responsible dam management. In FY18, we released new dam management standards that defines the minimum requirements in support of responsible dam management and conformance to industry level practices.

Our internal standards are consistent with our commitments to the ICMM Position Statement on Preventing Catastrophic Failure of Tailings Storage Facilities. The foundation of ICMM's Position Statement is a Tailings Governance Framework which enhances the focus on six key elements of management and governance necessary to prevent catastrophic failure of tailings storage facilities.

These include:

- Accountability, responsibility and competency
- Planning and resourcing
- Risk management
- Change management
- Emergency preparedness and response
- Review and assurance

We construct, operate and decommission all of our dam facilities in a safe and compliant manner consistent with regulatory requirements, applicable guidelines, our internal standards and obligations to stakeholders. This is applicable to all phases of each dam's life cycle including planning and site location, design and construction, operation and preventative maintenance, decommissioning, closure and rehabilitation and post-closure monitoring and maintenance.

All our dams are carefully managed and monitored. Our large tailings dams are all located in Australia:

- Worsley Alumina
- GEMCO
- Cannington

These three operations have numerous tailings dams that are hydraulically filled, some with clay liners and some with synthetic liners. Our Australian dams are designed and built to the standards required by the various States and Territories and to Australian National Committee on Large Dams (ANCOLD) standards. They are designed by expert tailings consultants and the facilities audited annually.

To ensure effective implementation and governance of our new standards, this year, we have employed a Technical Governance (Tailings) Specialist.

PRODUCT STEWARDSHIP

We are committed to implementing the ICMM Sustainable Development Framework, which encourages responsible design, use, reuse, recycling and disposal of our products along the supply chain.

As our main activities are resource extraction and primary processing, our involvement is at the beginning of the product life cycle. Through our management systems and internal audit processes, we assess, prevent or mitigate potential environmental, health and safety risks to our people and communities. This ensures that the resources we produce are properly managed when in our control and we work with other stakeholders in the supply chain to promote responsible use of our products after they have left our control.

Safety Data Sheets (SDSs) and labels are used to communicate current, complete and accurate information to all stakeholders in our supply chain. The SDSs outline the products' health, safety and environmental aspects to allow their safe and responsible use. For products where chemical safety assessments are required by law, we also supply exposure scenario information to our customers, which covers risk management measures for the identified uses of our products.

We are engaged across commodity associations relevant to the products we produce.

In FY18, we contributed to the collection of life cycle data as part of the Nickel Institute's life cycle management program. This data comprises all process inputs and outputs required to assess the environmental performance of our nickel production plants and products. The lifecycle data will measure the improvements made in energy efficiency, reduction of greenhouse gases and emission reduction into both air and water. The data will be shared with our customers who, in turn, can incorporate into their own life cycle assessments to help calculate the environmental performance of their nickel-containing products.

Through our membership of the International Aluminium Institute, we aim to promote the use of aluminium in sustainable applications. Additionally, we are a member of the Manganese International Institute.

For products we sell into the European Union under the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) regulation, we conduct annual REACH regulation training and compliance reviews. The main findings of the FY18 review were to ensure that all REACH communication is stored centrally and that updated SDSs are provided to customers.

CASE STUDY

IMPROVING COMMODITY SHIPPING

Failure to comply with the International Maritime Solid Bulk Cargoes (IMSBC) code for the safe transportation of solid bulk cargoes which have a potential to liquefy, poses a material risk as the impact could be a loss of cargo, vessel and ultimately, seafarer lives. To mitigate this risk, we conduct an annual assessment of our moisture management procedures and we implement the necessary controls to ensure that our products will not liquefy when on board a vessel.

Our Marketing team regularly participate in the International Maritime Organisation sub-committee meetings on carriage of cargoes and containers. Extensive test work conducted on the silicomanganese we produce has revealed that the product is not classified as a dangerous good in accordance with the International Maritime Dangerous Goods code, nor as a material hazardous only in bulk in accordance with the IMSBC code. As such, we have taken the industry lead and worked closely with the Australian Maritime Safety Authority and amended the IMSBC code to include a new individual schedule for the shipping of a non-hazardous silicomanganese product.

We also took part in a global industry initiative that developed a new transportable moisture limit (TML) test method for bauxite. This new TML test method will be included in the next version of the IMSBC code to be published in 2019.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