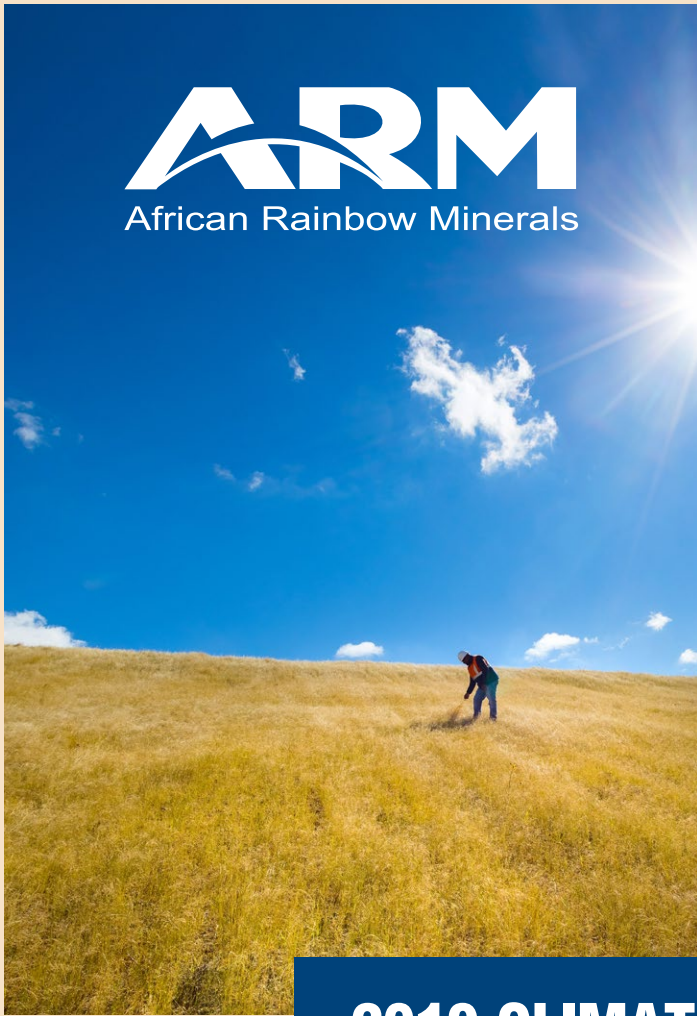
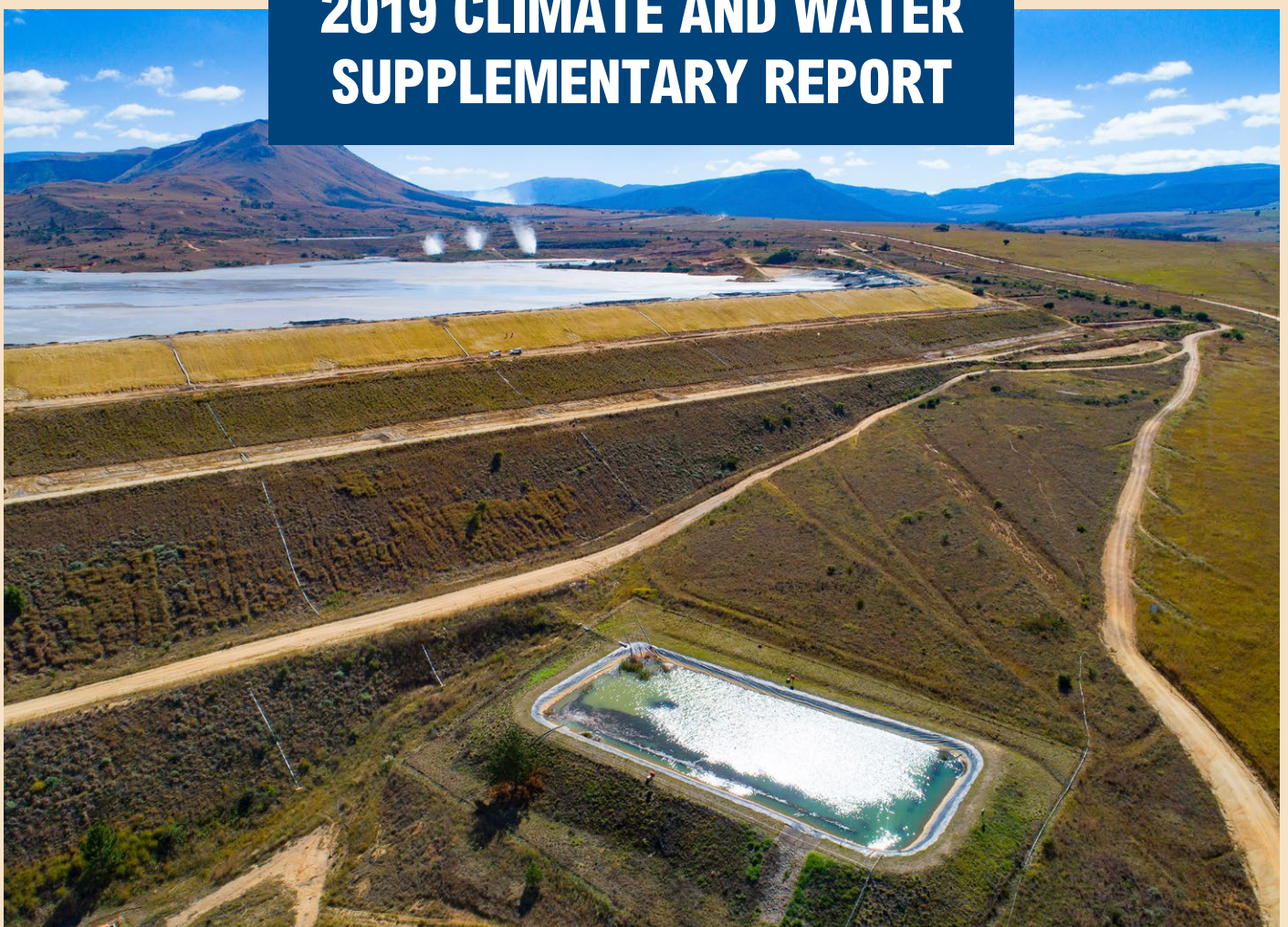


**ARM**  
African Rainbow Minerals



**2019 CLIMATE AND WATER  
SUPPLEMENTARY REPORT**





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## REFERENCES IN THIS REPORT

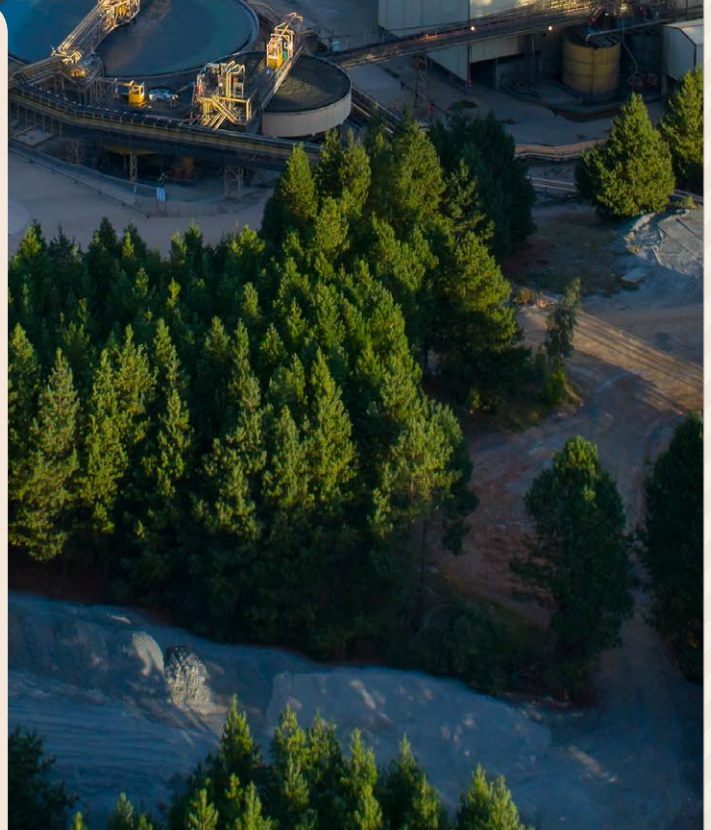
 IAR	 SR	 Section reference	 Page reference
<small>2019 Integrated annual report</small>	<small>2019 Sustainability report</small>		
		<a href="http://www.transitionpathwayinitiative.org/tpi">www.transitionpathwayinitiative.org/tpi</a>	
<a href="http://www.arm.co.za">www.arm.co.za</a>	Transition Pathways Initiative		



# INTRODUCTION

## 1.1 A revised approach to climate change and water reporting

This report is aimed at communicating more detail regarding our efforts towards improved performance and reporting on climate change and water management and should be read in conjunction with the 2019 ARM Sustainable Development Report (SDR) and Integrated Annual Report (IAR), available on our website at [www.arm.co.za](http://www.arm.co.za).





INTRODUCTION continued

Our climate change and water management strategies and reporting draw on various frameworks, guidelines, good practice and regulatory compliance requirements and also seek to meet multiple and evolving stakeholder reporting requirements.

This report uses the recommendations of the Task Force on Climate Related Financial Disclosures (TCFD) and the Position Statement of the International Council on Mining and Metals (ICMM) on Water Stewardship as the core framework. Consideration has also been given to:

- » The ICMM's membership requirements, performance expectations, and position statements;
- » The Transition Pathways Initiative (TPI);
- » The Carbon Disclosure Project (CDP);
- » The Johannesburg Stock Exchange (including the FTSE-Russel ESG Index);
- » The Global Reporting Initiative (GRI);
- » Engagements with Non-Governmental Organisations (NGOs) and Non-Profit Organisations (NPOs) and other stakeholders;
- » Regulatory reporting requirements; and
- » Other evolving reporting expectations.

This supplementary report replaces our prior disclosure via the Carbon Disclosure Project (CDP) in terms of climate change and water management and performance. A material consideration in this regard, was the timeframes of reporting of the CDP, which led to a delay of ARM's CDP submissions by 12 months since data collection, verification and external assurance of data for a specific financial year would still be underway when CDP reporting was due. This necessitated submission of a report on assured data regarding the performance during the previous financial year, which has been commented on by a number of stakeholders.



## 1.2 About this report

Information in this report covers those operations over which ARM has direct or joint management control, namely the operations that form part of the ARM Ferrous and ARM Platinum divisions. Consistent with reporting in the Sustainability Report, the report excludes those operations, joint ventures and investments that we do not manage directly (ARM Coal, the Sakura Ferroalloys Smelter and Harmony Gold), as well as projects that are in exploration, development or feasibility phases.

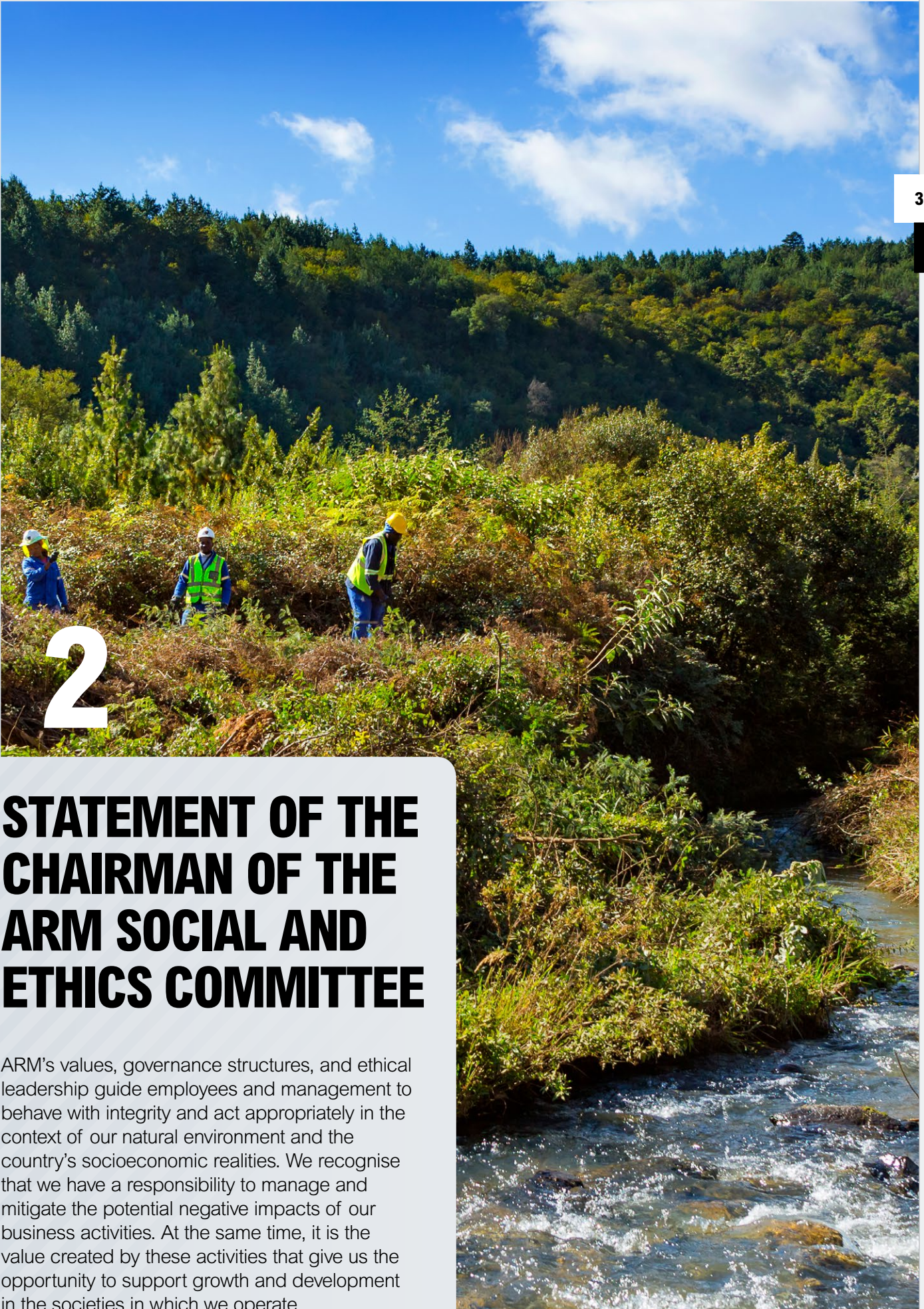
Carbon emissions have been calculated based on joint operational control and in accordance with the Greenhouse Gas (GHG) Reporting Protocol. This is also consistent with the operational boundary required by the Mandatory GHG Reporting Regulations.

Stakeholders have recently requested disclosure of GHG emissions from the ARM Coal operations, which form part of a joint venture

with Glencore. As the managing partner of the joint venture, Glencore reports on GHG emissions to the Department of Environment, Forestry and Fisheries (DEFF), consolidated with its reporting on all its South African operations. We have engaged Glencore with a view to receiving GHG emissions related data and expect to be in a position to report on these by the end of the current financial year which ends on 30 June 2020.

Climate change and water related information in this report covers ARM's activities for the year to 30 June 2019 on a 100% basis and is consistent throughout, with the exception of carbon emissions which are disclosed on an attributable basis (proportional to ARM's shareholding in the operations).





2

## **STATEMENT OF THE CHAIRMAN OF THE ARM SOCIAL AND ETHICS COMMITTEE**

ARM's values, governance structures, and ethical leadership guide employees and management to behave with integrity and act appropriately in the context of our natural environment and the country's socioeconomic realities. We recognise that we have a responsibility to manage and mitigate the potential negative impacts of our business activities. At the same time, it is the value created by these activities that give us the opportunity to support growth and development in the societies in which we operate.



STATEMENT OF THE CHAIRMAN OF THE ARM SOCIAL AND ETHICS COMMITTEE continued

Our ability to create value depends on the value realised for others, which underpins the good relationships we strive to sustain with all stakeholders. ARM's values commit us to the highest moral, ethical and legal compliance standards in dealing with our stakeholders, and are formalised through our Code of Conduct.

While the Board retains ultimate responsibility for sustainable development, it delegates responsibility for monitoring the effective management of this area to the Social and Ethics Committee. The Committee oversees the sustainability risks identified by the enterprise risk management programme and is supported by executive management and relevant Executive Committees and forums.

ARM is a member of the ICMM and shares its commitment to 'Mining with Principles'. Responsible social and environmental practices are integral to our strategic priorities to operate safely, responsibly and efficiently, and to partner with communities and other stakeholders.

We view the increasing focus on environmental and social responsibility by investors, funders, customers and civil society, among others, as a positive development towards the principle of sustainability.

The ICMM Performance Expectations, which were developed with input from a wide range of stakeholders including NGOs, international organisations and academia, will set a benchmark for responsible mining practices.

Tailings management and water reporting were particular areas of focus during F2019.

Water quality and availability are recognised as a top priority risk for the Group. ARM initiated a project in 2017 to align reporting regarding water with the ICMM's Position Statement on Water, which is based on the Water Accounting Framework for the Minerals Industry of the Minerals Council of Australia. The second phase of implementation of the ICMM Water Accounting Framework was completed during F2019. As part of the process, water accounting definitions were implemented which allowed for better reporting on harvested rainfall and runoff from mining operations. Additional flow meters were also installed to improve accuracy of measurement. A detailed water reporting flowsheet was developed for each operation in consultation with the engineering and environmental teams, to assist in this process.

As a result, F2019 water withdrawal volumes reported by operations increased by 19% to 21.7 million m<sup>3</sup> from 18.3 million m<sup>3</sup> in F2018. The most material increases include:

- » At Modikwa Mine, 2 million m<sup>3</sup> of groundwater, which was previously not reported, was accounted for;
- » A further 1.2 million m<sup>3</sup> increase in water withdrawal, mainly due to dewatering of the pit to ensure safe mining conditions, was reported at Beeshoek Mine;
- » Nkomati Mine reported a 0.7 million m<sup>3</sup> increase due to more efficient recovery of water from the tailings storage facility; and
- » Black Rock Mine reported an increase of 0.3 million m<sup>3</sup> as a result of new flow meters being installed and improved accuracy of measuring.

As a result of the implementation of the Water Accounting Framework, we have improved our understanding of water reuse efficiency, which is above 70% and is a key indicator in monitoring and managing consumption and losses.

ARM's F2019 estimated carbon footprint (Scope 1 and 2 attributable emissions) increased by 7% to 1.1 mtCO<sub>2</sub>e while electricity consumption remained in line with F2018 at 1 659 GWh.

We have set a revised greenhouse gas (GHG) emissions target to reduce absolute Scope 1 and 2 emissions by 5% by F2020 against the F2014 baseline through emission reduction initiatives (excluding divestments).

In closing, I would like to thank my fellow Social and Ethics Committee members and colleagues on the Board for their support during the year. We believe that operational excellence goes beyond financial returns and production targets to include acting with integrity and delivering on our environmental and social priorities. Achieving this is only possible with the buy-in and diligence of ARM's employees and management, and we thank them for their commitment in this regard.

We also appreciate the support of our broader stakeholders and look forward to working with them in the year ahead to continue to 'do it better'.

**Dr R V Simelane**

Chairman of the Social and Ethics Committee



# 3

## CLIMATE CHANGE

### 3.1 Climate change policy

Climate change is one of the most critical global challenges of our time. Warming of the climate is unequivocal, the human influence is clear and physical impacts are unavoidable. This will have a lasting impact on our business, our communities and the world. Climate change is a global challenge that requires a collaborative market, policy and societal response and ARM wants to be part of the solution to help address this challenge.







## CLIMATE CHANGE POLICY

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### ARM recognises:

- » The need for an urgent global response to the threat of climate change, across all areas of society and the economy. We are committed to being part of the solution.
- » The need for an effective binding global agreement on climate change which we support, and related efforts made under the Paris Agreement to hold the increase in the global average temperature to well below 2°C and to pursue efforts to limit the temperature increase to 1.5°C.
- » The need to reduce emissions from the use of fossil fuels and support collaborative approaches to accelerate the use of low-emission technologies as part of a transition to a lower-emissions energy mix.
- » The vital role in reducing GHG emissions that a broad-based, effective carbon pricing can play, alongside other market mechanisms that drive the reduction of greenhouse gas emissions and incentivise innovation.
- » The importance of providing climate-related disclosure to measure and respond to climate change risks and opportunities. ARM welcomes the transparency around climate-related risks that the TCFD has brought and sees value in its recommendations.

### We commit to:

- » Engage with our peers, governments, and others to develop effective climate change policies. ARM supports the movement towards a low carbon economy and is committed to constructive engagement with government on measures aimed at achieving this. Important issues still under consideration and discussions with government include the utilisation of carbon tax to support targeted mitigation actions, alignment with other mechanisms such as carbon budgets, and clarity around carbon tax allowances and offsets. 3.6.2.
- » Implement governance, engagement and disclosure processes to ensure climate change risks and opportunities are considered in business decision-making. 3.2.
- » Support carbon pricing and other market mechanisms that drive the reduction of greenhouse gas emissions and that incentivise innovation. We support global efforts to address systemic challenges that inhibit the transition (e.g. a lack of willingness to pay for lower carbon products, limited alternatives and options to reduce emissions especially in hard-to-abate industrial sectors, and a lack of incentives and support to facilitate expensive, long term investments in new technologies and processes.) These will require collective efforts. 3.3.2 and 3.5.6.
- » Demonstrate leadership by advancing operational level adaptation and mitigation solutions (through, for example, researching, developing and piloting new technologies). 3.4.2.
- » Engage with host communities on our shared climate change risks and opportunities and help host communities to adapt to the physical impacts of climate change. 3.6.1 and 4.5.2.
- » Support efforts to mitigate GHG emissions, both in collaboration with our peers and individually, by promoting innovation, developing and deploying low emissions technology, and implementing projects that improve energy efficiency and incorporate renewable energy supply in our energy mix. 3.4.2 and 3.5.5.
- » Disclose Scope 1 and 2 emissions on an annual basis and set emissions reduction targets informed by the scientific requirements to achieve the 1.5°C global temperature goal and associated efforts towards net zero carbon industry by 2050. 3.5.1 and 3.5.4.
- » Engage with external parties to determine a preferred approach to reporting Scope 3 emissions. 3.5.1 and 3.6.1.
- » Support the global transition to a low carbon economy, by continuing to contribute to the sustainable production of commodities essential to the energy and mobility transition, working with our partners and key suppliers along our value chains. 3.5.6 and 3.6.1.

**We support the TCFD's recommendations and this report presents our first attempt to report our performance in line with those recommendations.**

TPI TPI Questions 1 – 3, 10 and 19



CLIMATE CHANGE continued

## 3.2 Governance

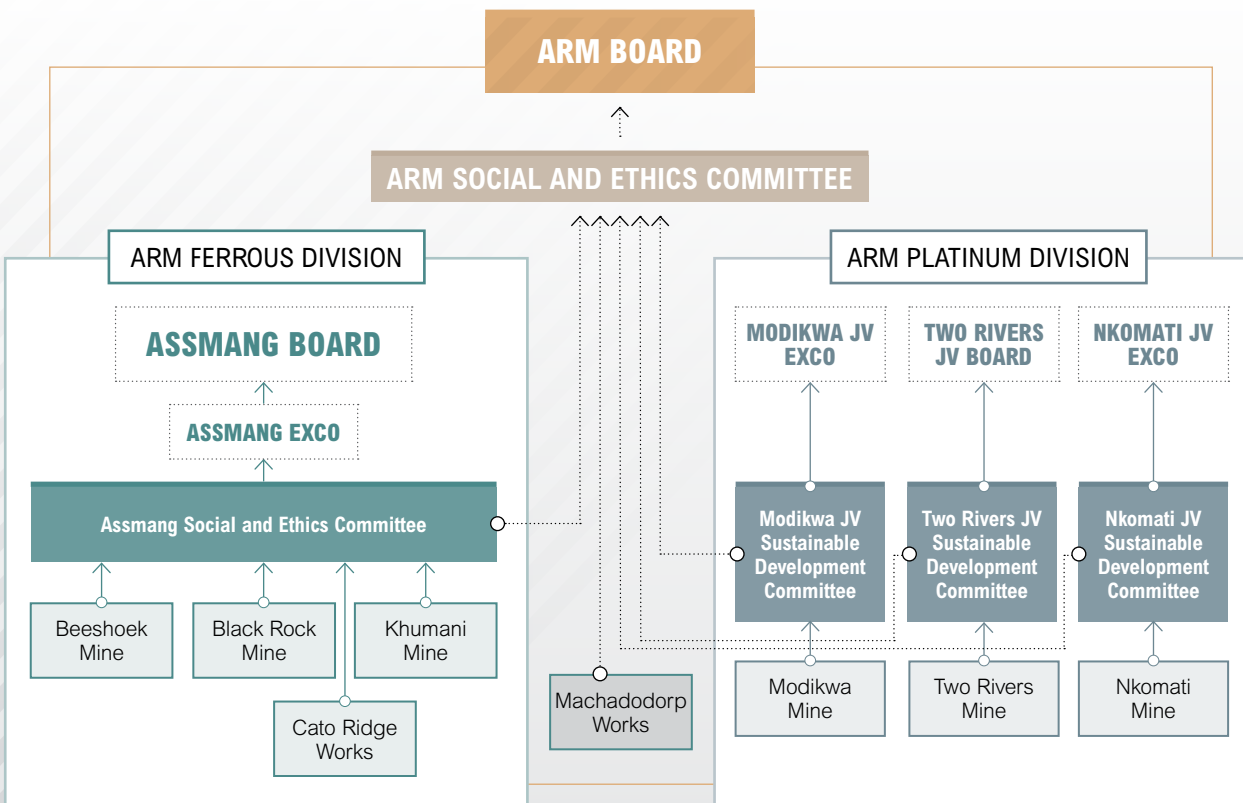
### 3.2.1 Board level oversight and management responsibility

ARM Board, through the Social and Ethics Committee, has ultimate responsibility for climate change management. The responsibility for implementation rests with the Chief Executive Officer; delegated to the Chief Executives of each division and the Executive Sustainable Development, who is responsible for reviewing sustainable development-related policies, strategies and targets (including ARM's revised greenhouse gas reduction target) and ensuring that these are aligned with the Board's commitment to zero tolerance to harm throughout ARM. The ARM Social and Ethics Committee provides oversight in this regard.

Climate change is an essential component of our strategic intent factor to remain responsible stewards of environmental resources.

The ARM Social and Ethics Committee monitors and reports on the manner and extent to which ARM protects, enhances and invests in the well-being of the economic, social and the natural environment in which ARM operates, to ensure that its business practices are sustainable. Climate-related issues, through the reporting of the Social and Ethics Committee and Operational Reviews of the Divisions, form part of the agenda of quarterly board meetings. Recent meetings have tabled the recently promulgated carbon tax and its impact on the company as well as this report and the decision to revise our climate change and water reporting approach aligned with the TCFD and the ICMM Position Statements.

The governance and reporting structure is illustrated below.



Assmang, a joint venture between ARM and Assore Ltd, has established a Social and Ethics Committee which monitors environmental performance in the ARM Ferrous Division and is chaired by the ARM Head of Investor Relations. Each operation in the ARM Platinum division has a Sustainable Development Committee, chaired by the ARM Executive Sustainable Development, which reports to the Exco or Board of the respective Joint Ventures, as appropriate.

The Executive Sustainable Development also reports to the Management Risk and Compliance Committee, a sub-committee of the Audit and Risk Committee of the Board, on matters and activities related to climate change and carbon emissions as a standard agenda item.



## CLIMATE CHANGE continued

### 3.2.2 Incentives

In F2019, carbon emission performance targets were included in ARM's Remuneration Policy and in the conditional share plan for ARM executives. The incentives are based on actual savings over three years, with a stretch target of 2%+ reduction from new and existing carbon reduction initiatives still active since the 2014 base year. The approach is based on the GHG Protocol's Policy and Action Standard (available at <https://ghgprotocol.org/policy-and-action-standard>).

**IAR**  Refer to page 113 of the Summarised Remuneration report in the Integrated Annual Report.

Engineers and production staff are incentivised on energy efficiency per tonne of ore milled, time of energy use and the use of alternative energy sources. Remuneration and incentive packages of production teams and other appropriate positions at the smelters include KPIs linked to emission reduction initiatives.

**TPI**  TPI Question 15

## 3.3 Strategy

### 3.3.1 Integrating climate change into the business strategy

ARM's strategy is to deliver competitive returns and sustainable value by: operating our portfolio of assets safely, responsibly and efficiently, applying disciplined capital allocation and focusing on value-enhancing and integrated growth. Climate change impacts our ability to transform natural capital into financial and other forms of capital as efficiently as possible while minimizing our negative impacts. We have integrated climate change considerations into our business strategy. This is done on an on-going basis by considering climate change risks and opportunities at the company and asset levels; measuring and managing our carbon footprint and acting to mitigate risks and take advantage of opportunities. Our emissions data and efficiencies, as appropriate to each operation's metrics, are reported quarterly, discussed at the individual operational, divisional and corporate sustainability meetings and assessed according to potential exposure, probability, and the consequence for the business.

Information on the level of risk or opportunity and capacity to manage these are reported on to the ARM Management Risk and Compliance Committee as well as the ARM Social and Ethics Committee whose outputs feed directly into the strategy development process. Climate change-related training takes place at all levels and annual climate and water workshops are conducted at ARM's operations. Climate change issues are discussed at the annual strategic planning session of the ARM Board and Executive Committee, considered by the Strategic Growth Committee and through other mechanisms that feed into our strategy development.

Managing increasing operating costs due to climate risks is consistent with, and reinforcing of, our short-term strategy (F2019 – F2020). The process of determining an appropriate target considered site-specific mitigation potential (most options resulting in reduced energy consumption and associated cost-savings).

Our long-term strategy (focusing on growth through new projects, acquisitions, JVs, and exploration) is influenced by expected long term (beyond 2020 to 2050) changes in regulation that will affect costs (particularly energy costs in geographies where fossil fuels have traditionally been dominant) and supply of energy and water. Certain geographies are more likely to be affected by climate

change and this will impact our ability to operate. Mines and smelters have long lifetimes and therefore adequate supplies of energy, water, and other resources have to be ensured while maintaining our social licence to operate.

The increasing impact of climate change on commodities and the markets into which our products are sold has further contributed to the increased focus on climate change in our boardrooms and in making strategic decisions.

Producing higher grade "cleaner" products that produce fewer emissions provides us with a competitive advantage in the growing Asian market. This demand is growing and increasingly provides opportunities to differentiate ourselves from our competitors. This trend was identified by the ARM and Assmang executive and marketing teams and has delivered a premium on these products over the past years. ARM expects, as the global economy becomes increasingly carbon-constrained, that this demand will become increasingly material.

Similarly, the demand for manganese is projected to increase as a component of some lithium-ion batteries used in mobile and stationary electricity storage applications.

Platinum will have a key role to play in the hydrogen economy and it is expected that demand will increase given climate-related drivers in the transport sector (increasing demand for Fuel Cell Electric Vehicles (FCEVs)) and in industry (increasing demand for hydrogen as a clean energy source and as a reductant that can reduce process emissions). Demand for platinum used in catalytic converters will decrease as demand for Internal Combustion Engine (ICE) vehicles is expected to decrease in the medium to long term.

Climate change concerns are recognised to have a material impact on the market demand, supply and price of thermal coal going forward.

We will undertake a climate scenario analysis in F2020/21 to explore the potential extent of these climate-related drivers on demand for our products as an input to our strategy.

**TPI**  TPI Question 16

### 3.3.2 Carbon pricing

There have been assessments of opportunities to reduce GHG emissions at our South African operations where carbon tax is effective from June 2019. This allows us to understand, plan and budget for initiatives that will reduce future carbon tax liability. We have also invested in a robust carbon footprint reporting system that has matured over a number of years. In 2018 we commenced a project to respond to evolving stakeholder and regulatory reporting requirements and expectations relating to climate change and water. This included a process to update the GHG reporting system to be able to report to different stakeholders based on their requirements, e.g. different reporting periods (calendar year versus financial year) and for different boundaries (e.g. excluding versus including emissions associated with purchased electricity and ARM's value chain). This should be considered when interpreting or comparing data from different sources and for different years.

During this process, we further explored evolving expectations, beyond reporting. This includes the use of scenario planning and setting an internal price on carbon.



CLIMATE CHANGE continued

Internal consideration is being given to establishing an internal carbon price to be used, initially, for evaluating new projects and acquisitions. This will require estimating the annual GHG emissions associated with proposed projects and acquisitions, applying a price in line with the South African carbon tax, and adding the carbon “cost” to OPEX calculations to evaluate the impact on the project’s Net Present Value (NPV) or Internal Rate of Return (IRR) on prospective investments. This process will inform the decision-making processes and will likely evolve based on clarity regarding the carbon tax (and international carbon markets) and lessons learned in the initial application.

We will also assess long-term carbon pricing scenarios that impact our business, including the demand for our products.

TPI  TPI Question 18

### 3.4 Risk management

#### 3.4.1 Integrating climate change into the risk management process

Our processes for identifying, assessing, and managing climate-related issues are integrated into the overall risk management process.

ARM’s Enterprise Risk Management (ERM) Policy aligns with the risk management requirements of the King Report on Corporate Governance for South Africa 2016 (King IV™) and assesses the risks and opportunities emanating from the triple context in which the Company operates as well as the capitals that we use and affect. The policy recognises the importance of protecting and

improving the health, safety, and wellbeing of everyone affected by our operations, as well as the need for responsible environmental management.

To continuously improve the risk management process, we initiated a review of the Company’s current risk management methodology, processes, maturity and culture in April 2018. A key output of this process has been the full alignment of the current risk methodology with ISO 31000. ARM developed an impact rating scale that required aligning ARM’s strategy to the strategic factors through which we drive and measure business performance. Climate change-related risks feature in ARM’s top ten risks identified through the ERM process.

Company level risks, such as the evolving climate change mitigation regulations (including the carbon tax and carbon budgets), are tracked by the Executive Technical Services, Group Electrical Engineer, the Executive Sustainable Development, the Environmental Specialist, the Divisional SHEQ managers, and the Engineering Managers. A bottom-up assessment of mitigation potential is considered and used to inform engagement with government and the development of the company GHG emission reduction target. At an asset level, a comprehensive risk register, which includes aspects of climate change, is compiled.

This process is supplemented by Board and management discussions, stakeholder needs and concerns raised, peer reporting, guidelines and frameworks (such as the TCFD), legislation (such as the Draft Climate Change Bill and Carbon Tax Act), and industry initiatives such as these of the Minerals Council South Africa (MCSA), often jointly with Business Unity South Africa (BUSA) and the National Business Initiative (NBI) climate change advocacy work and media monitoring.



#### ARM climate and water compliance and reporting programme

In 2017 ARM initiated a programme to comply with new climate change regulations as well as “non-negotiable” but voluntary requirements and reporting expectations related to climate change and water. The regulatory and “voluntary” requirements are related, and ARM sought to develop a systematic process for developing systems, reporting and building capacity to meet the current and evolving requirements.

The objectives of the programme included:

- » To comply with the requirements to submit a Climate Change Pollution Prevention Plan (CC-PPP) and greenhouse gas emissions to the Department of Environment, Forestry and Fisheries (DEFF), previously Department of Environmental Affairs (DEA);
- » To facilitate a process of identifying gaps in climate and water risk assessment, management and reporting to inform a practical and realistic strategy for filling gaps and to support immediate reporting needs; and
- » To comply with the ICMM member commitments related to water.



## Annual climate and water workshops to build skills and respond to evolving regulatory requirements and stakeholder expectations

As part of the climate and water compliance and reporting programme, ARM conducts annual climate change and water workshops at each operation. Representation at these includes senior management, engineers and environmental managers on-site, together with the Executive Sustainable Development and the divisional SHEQ Managers; and facilitated by an external specialist consultant.

These workshops explore evolving climate change and water risks and opportunities and include an explicit assessment of upstream (supply-chain) risks that have the potential to impact operations directly (e.g. through production stoppages or increased costs) and our stakeholders (e.g. particularly around the availability of water for communities). The workshops have also served to build awareness, gather data and inform the approach to complying with and responding to these requirements and expectations. The focus of workshops undertaken to date include:

### May 2017: Water risk assessment, reporting and water and carbon target/goal setting (Phase 1)

- » **Objective:** to assess current water management and reporting processes, to identify gaps in relation to ICMM and other stakeholder requirements/expectations (noting ARM operation-specific contexts and the need to consider value chain risks) and to move towards developing water and revised GHG targets.
- » **Outcomes:** set water goals at the operational level, elicited operational data to inform an ARM water target, agreed on a process for managing water risks in the supply chain, gathered data and enhanced strategies for stakeholder engagement (catchment-level collective action), gathered data to inform a revised GHG target at the corporate level.

### February, November and December 2018: GHG mitigation analysis, target setting and complying with Pollution Prevention Plan Regulations (Phase 2)

**Objectives:** take initial steps to implement the ICMM Position Statement on Water Stewardship, focusing on the application of consistent water reporting in line with ICMM metric definitions (based on the Australian Minerals Council's Water Accounting Framework).

**Outcomes:** initial application of consistent and comparable reporting using standardised metrics.

**Objectives:** building awareness of the evolving climate change regulatory and reporting requirements, determining potential, cost and implementation considerations of all GHG mitigation options at each operation to inform ARM's second GHG reduction target, Pollution Prevention Plan and the reporting of GHG reduction initiatives. Agreeing on a water target and gathering climate and water data for reporting purposes.

**Outcomes:** revised GHG target and agreed water target for ARM, final GHG Pollution Prevention Plan, as well as gathering and reporting of relevant data.

### February 2019: Implementing ICMM member commitments related to water

- » **Objectives:** implementing the ICMM Position Statement on Water Stewardship focusing on the application of consistent water reporting in line with ICMM metric definitions (based on the Australian Minerals Council's Water Accounting Framework).
- » **Outcomes:** application of consistent and comparable reporting using standardised metrics.

## Considering climate change risks in ARM's investments

### ARM Coal

ARM Coal has an effective 20.2% share in the Participative Coal Business (PCB) and an effective 26% in Goedgedonden (GGV). Our partner Glencore Operations South Africa (GOSA), owns the remaining stakes.

GGV is an open-pit mechanised mine producing 7Mt of saleable thermal coal per year with a Life-Of-Mine of 21 years. PCB includes Impunzi and Tweefontein operations, an open-pit and underground mechanised mine producing 15.3Mt of saleable thermal coal per year with a Life-Of-Mine of 20 years. Coal is marketed and sold by our joint-venture partner, Glencore, to various markets, mainly China and India.

Information on the coal resources and reserves can be found on page 90 of ARM's Integrated Annual Report.

GGV is governed by a management committee controlled by ARM Coal, with ARM and Glencore representatives. Operational

management is contracted to Glencore. PCB is governed by a supervisory committee with representatives from both ARM and Glencore. The operational management of PCB mines is contracted to Glencore.

Climate change risks are assessed and tabled as appropriate at the quarterly steering committee meetings. GHG emissions associated with the operations are measured and Glencore reports on these consolidated with its reporting on all its operations in South Africa as part of the mandatory reporting regulations.

ARM recognises that global emission reduction initiatives and the move to cleaner mobility and energy are expected to put pressure on demand for Platinum Group Metals (PGMs) and thermal coal but create opportunities for other commodities in our portfolio, including bulk and base metals.

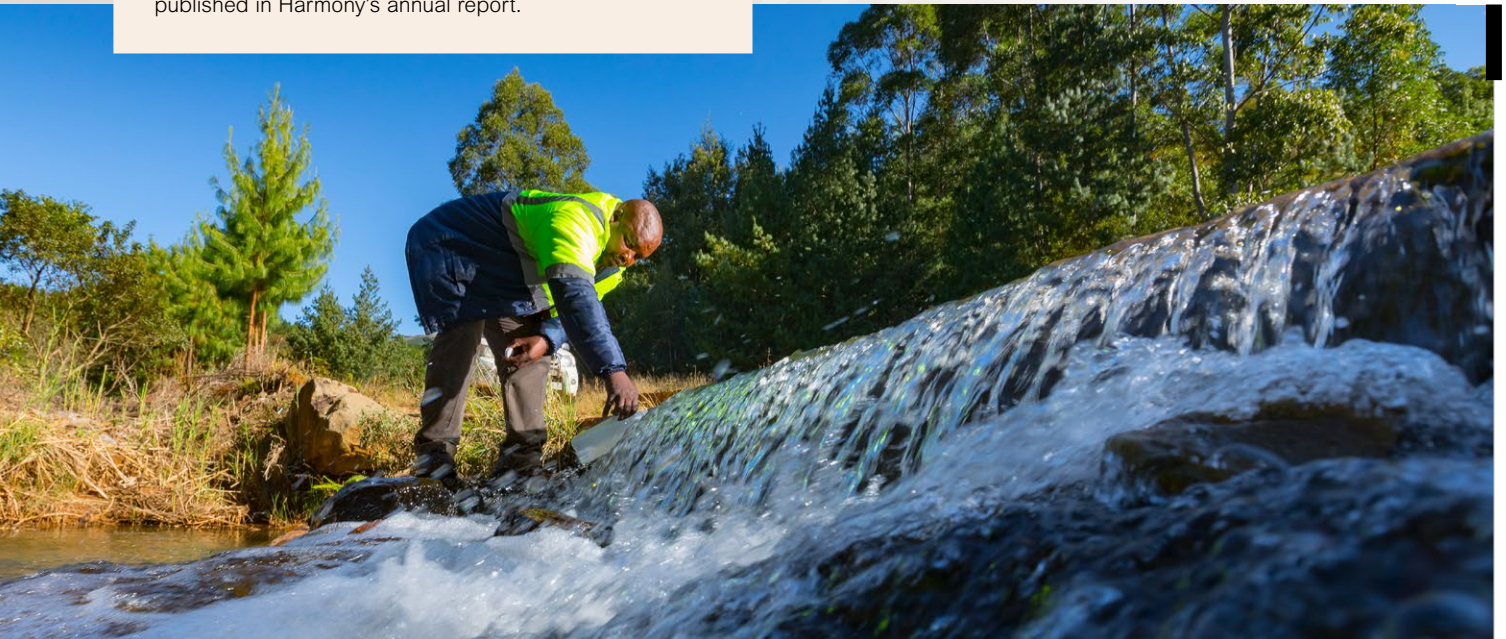
CLIMATE CHANGE continued

**Gold: Harmony**

ARM owns 13.83% of Harmony's issued share capital. Harmony is separately run by its own management team. Mineral Resources and Mineral Reserves of the Harmony mines are the responsibility of the Harmony team and are published in Harmony's annual report.

Risk processes are not linked to African Rainbow Capital and African Rainbow Energy and Power. These are separate companies with their own processes for assessing and managing climate change-related risks and opportunities.

TPI  TPI Question 12



**3.4.2 Material climate change risks**

TRANSITION RISKS

**Policy and legal risk**

**Risk**

**Carbon Tax:** all our South African operations face a carbon tax of R120/tCO<sub>2</sub>e on direct (scope 1) emissions. Tax-free “allowances” lower the effective rate in the first phase (Jun 2019 – Dec 2022) but are then phased out in the second phase (from 2023). The rate escalates at 2% above inflation (CPI) for the first phase and by CPI for the second. 7c/l on petrol and 8c per litre on diesel are passed on through the fuel levy. There is no electricity pass-through cost in the first phase.

The impact in the first phase (below R10m for 2019 increasing to an estimated maximum of R16m in 2022) is not expected to be significant. From 2023 onwards, with electricity price pass-through, costs could exceed R290m a year (based on current emissions).

**Response**

- » ARM has set a GHG reduction target, allocated budget to implement emission reduction initiatives, established incentives for executives linked to reduction initiatives as part of the GHG reduction target, and set incentives related to energy efficiency for engineers and production staff (at the mines) and related to GHG emission reductions for production teams (smelters).
- » Actively exploring opportunities to invest in renewable energy technologies or to procure clean energy from renewable sources.
- » Engaging transparently with government.
- » ARM has developed a climate change and energy working group and conducts annual workshops at operations that include assessments of energy reduction opportunities and reporting.
- » Evaluating carbon tax pass-through risks in the supply chain and actively engaging with suppliers to mitigate risk and enable operations to reduce their own energy consumption and GHG emissions.



## TRANSITION RISKS continued

## Policy and legal risk continued

## Risk

**Carbon Budgets and associated Pollution Prevention Plans:** The South African Government has published a draft Climate Change Bill (2018). The Bill aims to develop an effective climate change response (CCR) and to achieve the long term, just transition to a climate-resilient and lower carbon economy and society. The Bill includes, in line with achieving the country's targeted national GHG emissions trajectory, the establishment by government of Sectoral Emission Targets (SETs), the Sectoral Emissions Reduction Plans and the associated budgets that will be allocated to companies (a cap on emissions at the company level). The first phase of the carbon budgets (2016 – 2020) is non-mandatory but subject to government approval. It is being used as a pilot phase to test the system and structures required to move to a mandatory phase from 2021. Currently, there is uncertainty on how the mandatory phase will be implemented and aligned to the carbon tax, however, confirmation has been received that an alignment will take place.

Linked to the budget is a requirement to submit a GHG Pollution Prevention Plan (PPP) and to report on progress on an annual basis.

## Response

- » ARM submitted a proposed carbon budget for 2016 to 2020 and this was approved by government. The benefits of participating in the first phase include a 5% tax-free allowance for the first phase of the carbon tax.
- » ARM developed and submitted a GHG PPP which was also approved by government.
- » The first PPP progress report was submitted in March 2019.
- » Various efforts to reduce GHG emissions (as listed above) also mitigate risk associated with carbon budgets and the GHG-PPP.
- » Our mature GHG reporting system enables compliance with the GHG PPP progress reporting requirements.
- » Active engagement with government and, as a member of industry associations such as Business Unity South Africa, the Minerals Council South Africa and the National Business Initiative, creates awareness of the latest developments and enabling us to share and learn from peers.

## Risk

**Global policies and measures to reduce GHG emissions:** COP 21 concluded with the Paris Agreement, which has the purpose to hold the increase in global average temperatures to well below 2°C, and pursue efforts to achieve 1.5°C above pre-industrial levels; improve the ability to adapt to adverse climate change and foster low carbon emissions development; and support funding, consistent with a pathway towards low carbon emissions and climate-resilient development. The negotiated outcomes will influence national policies and energy technology choices for decades into the future. All countries will be required to contribute to the global effort to deliver on the Paris Agreement. Domestic policies will likely follow where they are not in place already. This may mean that Malaysia may implement some form of domestic climate change policy that could affect the Sakura operation in which ARM has equity. The Paris Agreement provides further signals that the global economy is becoming increasingly carbon-constrained and as such ARM needs to continue with efforts to reduce direct and value chain emissions to remain competitive.

## Response

- » ARM is investing in R&D to significantly reduce the climate impacts of our products and processes. Efforts include developing a technology that will enable a significant reduction in GHG emissions from smelting and with further potential cogeneration benefits; exploring alternate processing technologies that could reduce reliance on grid (Eskom) electricity, and looking at processing waste streams that might enable more efficient production.
- » The Enterprise Risk Management Process continuously monitors developments in climate-related domestic policy in the areas in which we operate as well as in primary customer markets.
- » ARM will undertake scenario analysis as a tool that is needed for understanding and reporting on the strategic implications of the transition to a lower carbon, climate-resilient economy. This will further feed into the climate risk assessment process as well as strategic, long term, business decisions.

TRANSITION RISKS continued

**Policy and legal risk continued**

**Risk**

**Mandatory reporting regulations:** DEFF introduced the National Greenhouse Gas Emission Reporting Regulations effective on 3 April 2017 and requiring submission of data at the end of March each year. In September 2019 DEFF proposed amendments to the regulations.

The Department of Energy (DoE) in South Africa indicated that it was developing regulations that will require companies to measure and report energy as well as develop and submit Energy Management Plans. ARM exceeds the proposed energy consumption threshold and would therefore have to measure and report energy and develop and report on Energy Management Plans. The Regulations remain in draft format and therefore uncertainty exists. If implemented, it is expected that these processes would attempt to align with those of DEFF.

**Response**

- » ARM has successfully submitted GHG data to the DEFF in March 2018 and 2019 and has a mature GHG reporting system that will enable ongoing reporting that complies with the regulations.
- » The ARM Ferrous Division, through our joint venture with Assore Ltd (trading as Assmang (Pty) Ltd), is part of the Energy Intensive Users' Association and has an Energy Efficiency Charter in place which includes targets for energy-efficient practices.
- » Energy reduction plans for the ARM Platinum Division were established in F2015.
- » Continuously improving and updating the ARM reporting system in 2018 and 2019, enabling a disaggregated reporting system that can package information to meet multiple regulatory (and other stakeholders) requirements.
- » The ongoing bottom-up assessment of GHG reduction opportunities will identify energy reduction initiatives that will serve to inform site-level Energy Management Plans in line with the Regulations, should the DoE's requirements come into effect.



**Technology risk**

**Risk**

**Technology substitution (electric vehicles):** Climate change and other drivers (e.g. air quality) are leading to an increased uptake of electric vehicles. This, coupled with new models of mobility (e.g. use of ride-sharing), could limit sales of internal combustion engine vehicles and the associated demand for PGMs in their catalytic converters. Roughly one-third of platinum is sold to the automotive industry (the remaining meeting the demands of the industrial and jewellery sectors). Limited impact is expected in the short term but the net impacts in the long term remain unclear.

**Response**

- » ARM will undertake scenario analysis to explore the potential impact of climate-related drivers on demand for internal combustion engines and the associated demand for platinum in autocatalysts. This will include an assessment of the potential role of platinum in Fuel Cell Electric Vehicles (FCEVs) and other industrial applications (for example in the broader hydrogen economy) that could represent positive drivers for demand, driven by climate change.



TRANSITION RISKS continued

**Reputational risk**

**Risk**

**Increased stakeholder concern or negative stakeholder feedback:** There is a reputational risk associated with not adequately responding to evolving, and increasing, climate change-related stakeholder expectations. Failure to demonstrate positive climate change performance would damage ARM's reputation and impact our relationships with customers, investors, business partners, regulators, and the broader society. ARM is experiencing increasing pressure from investors, in particular, to proactively manage climate change risks and opportunities which are increasingly seen as material to shareholder value.

For example, in 2019 the Raith Foundation and Just Share engaged ARM about a number of questions and concerns related to climate change. Key concerns raised included: the fact that ARM's GHG emission reporting excludes all of the emissions from its investment in ARM Coal (managed by Glencore), alleged non-compliance with water use licence conditions at Tweefontein and Goedgevonden mines (ARM Coal) and the concerted campaign by Business Unity South Africa (BUSA) to persuade the government to defer the implementation of the carbon tax, seeking clarity regarding ARM's position in this issue.

**Response**

- » ARM has been admitted to the FTSE4Good Emerging Markets Responsible Investment Index since inception and has retained a place in the FTSE 4 Good Index for the past three consecutive years (previously included in the JSE Socially Responsible Investment Index).
- » To manage our overall sustainability performance, ARM regularly engages with stakeholders and produces an annual integrated sustainability report. Additionally, in 2017 ARM initiated a programme to comply with new climate change regulations as well as "non-negotiable" but voluntary requirements and reporting expectations related to climate change and water. The regulatory and "voluntary" requirements are related, and ARM sought to develop a systematic process for developing systems, reporting and building capacity to meet the current and evolving requirements. This report represents one output of that process.
- » ARM engaged with the Raith Foundation and Just Share and has responded to formal requests for information. As part of the request to disclose GHG emissions related to the ARM/Glencore joint venture operations, ARM has engaged Glencore as the managing partner to provide emissions data related to those operations and expects to be in a position to report on these for the current financial year, which ends 30 June 2020.
- » Communities receive additional benefits from the mines and smelters through Corporate Social Responsibility (CSR) investment programmes. During F2019, ARM spent a total of R175.3 million on CSR and R16.4 million was provided to projects facilitated by the ARM Broad-Based Economic Empowerment Trust.

**Risk**

**Shifts in consumer preferences:** fossil fuels will be increasingly contested by society and, as a result, the role of thermal coal will decline. This could affect ARM's investment in coal, which currently contributes to the company's attributable headline earnings.

**Response**

- » ARM participates in the governance processes with our partner, Glencore, towards reducing the climate impact of the Goedgevonden and Participating Coal Business operations.
- » ARM will undertake scenario analysis to explore the potential impact of climate-related drivers on demand for thermal coal.
- » This risk is considered at a strategic level within the company.

## PHYSICAL RISKS

### Acute risk

#### Risk

**Increased severity of extreme weather events (affecting water availability):** Drought due to climate change is a material risk where water is a critical resource for operations. In locations where ARM currently operates, water is seen as a scarce resource, particularly in the Northern Cape and Limpopo Province. The availability of water determines our ability to continue operating and expanding mining, beneficiating and smelting operations in a sustainable manner. Drought coupled with periods of extreme rainfall (a risk in the Northern Cape) also poses the risk of sinkholes with the potential to affect production. The Khumani and Black Rock operations in the Northern Cape have already identified water as a strategic business risk and due to regional water infrastructure problems, lack of access to water has the potential to impact the business significantly. Two Rivers and Modikwa mines also face long term supply risks and would be susceptible to drought causing production disruptions. Investments in bulk water infrastructure result in higher water costs. If extreme climatic events do get worse as predicted by the climate models, further pro-active management and mitigation measures will have to be taken to ensure that operations do not experience business interruption and loss of production.

#### Response

- » ARM anticipates greater investment in bulk water infrastructure as part of industry – government collaboration.
- » Sedibeng (utility service provider) is responsible for supplying potable water from the Vaal Gamagara Water Supply Scheme (VGGWSS) to our Northern Cape mines. Mines are expected to fund a significant portion of the Scheme. A Mines' Leadership Forum was established in the Northern Cape Mines Leadership Forum as a Principal Committee of the Minerals Council South Africa, to among other things, collaboratively and proactively engage around the appropriate design and cost of the VGGWSS. [4.5.3.](#)
- » An ARM executive participates on the Lebelelo Water User Association (LWUA), a Section 12 entity set up by mining companies operating in the area. The association acts as a water utility supplying bulk raw water to member mines & other clients from the Olifants River and the Flag Boshielo Dam (and the De Hoop dam in the future). [4.5.2.2.](#)
- » Various investments have taken place at the mine level. For example, Khumani Mine funded the upgrade of the Olifantshoek bulk water infrastructure; and various investments in maintenance. Investment in on-site water storage; reduced consumption through efficiencies (e.g. reduced water consumption for mining activities through the use of "additives"); lining of dams and tailings facilities and improving return water infrastructure. [4.5.4.1.](#)

#### Risk

**Increased severity of extreme weather events (increasing the risk of discharges):** Climate change will likely result in an increase in extreme rainfall events. Extreme prolonged rainfall events could affect mining operations and also result in operations having to discharge water into the environment. This could result in legal non-compliance and potential fines which will have both reputational and financial consequences. Implications for the operations are, for example, greater investment in dewatering, increased capital costs to build water-related infrastructure with larger retention capacity and possibly increased requirements for water treatment facilities to treat process/mine water that may need to be discharged to the environment after extreme rainfall events. This is a potential risk for our Nkomati Mine and Machadodorp Works.

Reduced production activities due to economic and market conditions have impacted the system at Machadodorp Works. Due to reduced re-use and consumption, any rainwater poses a potential risk of controlled discharge and associated non-compliance with the waste management and water use licences.

#### Response

- » ARM manages its water use at all its operations proactively and in line with its Water Use Licences and EMPR commitments. All operations run closed water circuits. The operations have developed management tools such as water balances to allow them to further optimise the usage and management of water. Discharges only take place in line with permits in times of extreme precipitation or in emergency situations and these discharges are reported to authorities as required.
- » Nkomati has a dewatering programme in place. Various measures include borehole management, a code of practice for the tailings storage facility, continuous pumping excess water, monitoring of discharge points, a stormwater management plan and engagements with the authorities.
- » Machadodorp Works established a Water Management Project Team and has constructed cut off trenches to capture any dirty run-off water and redirect it to the sump and then to the stormwater dams.



## PHYSICAL RISKS continued

**Acute risk continued****Risk**

**Increased severity of extreme weather events (affecting electricity costs and supply):** The long-term cost and lack of security of a reliable and adequate supply of electricity, presents a top ten Group risk. Climate change has the potential to exacerbate this risk. Climate-related regulatory burdens could place additional strain on the already constrained national electricity generation utility affecting maintenance and investment in new generation capacity. Additionally, physical climate change impacts could affect the supply of coal (and other products used in the generation of power) and damage infrastructure which, given the lack of reserve margin, could exacerbate power supply risks.

**Response**

- » ARM has invested in diesel generators to mitigate load shedding and unplanned electricity supply constraints.
- » Emergency plans and monitoring systems are in place.
- » ARM engages in quarterly liaison meetings with Eskom. The group electrical engineer is the dedicated liaison person and remains in constant communication with Eskom and is made aware of possible power outages that may affect the various operations.
- » There is ring feed power supply at the operations. Khumani, Beeshoek, Two Rivers, Modikwa and Nkomati mines as well as Cato Ridge Works have ring feed capabilities and projects are underway at Black Rock Mine to improve power supply contingencies.
- » A service level agreement (SLA) is in place with Eskom and joint venture partners for the provision of generator capacity from Black Rock Mine when available.

**Chronic risk****Risk**

**Rising mean temperatures affecting our workforce:** Climate models project increases in the short term (2015 – 2025) of between 1°C and 2°C, in the medium term (2040 – 2060) of between 2°C and 3°C and in the long term (2080 – 2100) of between 2.5°C and 5°C, relative to 1970 – 2005, across South Africa, according to dynamically downscaled projections from the Long Term Adaptation Scenarios (LTAS). The risk of rising temperatures impacts water requirements for the Northern Cape operations as the higher the temperature, the greater the evaporative losses.

Higher temperatures could result in work disruption as staff may suffer from heat stress. For example, at the Beeshoek operation, historical weather data has shown that the weather patterns locally have changed considerably over time. The site experienced a high of 41°C in F2013, which was the highest temperature recorded in 10 years. It was indicated by the Beeshoek Mine team that temperatures rising to 45°C may result in the site stopping work or will at least result in rotation of staff to prevent heatstroke. For Black Rock Mine in the Northern Cape, higher temperatures may also necessitate additional cooling requirements in the underground workings (where applicable) and in all the Northern Cape operations, additional air conditioning for cooling of offices and buildings could lead to increased costs from additional energy, and result in rising greenhouse gas emissions.

**Response**

- » Operating sites monitor weather data on an on-going basis. Should temperatures exceed a threshold then action will be taken to ensure that staff are not exposed to heat stress. In order to mitigate the risk on water supply in water-scarce areas, it is likely that technology that uses less water than conventional tailings disposal (which entails slurring of waste in high volumes of water) will be investigated and implemented more (e.g. paste disposal as is the case at Khumani Mine).
- » Various other water conservation measures are described in [E 4.5.4](#).

**Risk**

**Increasing social unrest related to inadequate water service delivery (exacerbated by climate change):** Climate change will affect the livelihoods and well-being of vulnerable communities. The effect of reduced food security, negative health implications, higher costs and destruction of assets could indirectly influence our ability to source local skills, to secure our mining rights and could exacerbate employee relation problems leading to industrial action and production losses.

**Response**

- » We attempt to mitigate this risk through our employee relations policies, engagement with communities, government and other stakeholders, investments in line with our Social and Labour Plans, BBBEE compliance, and our broader contribution to economic development in the country.

## CLIMATE CHANGE continued

## PHYSICAL RISKS continued

## Chronic risk continued

## Risk

**Changes in precipitation patterns and extreme variability in weather patterns affecting ARM's suppliers:** Droughts and extreme rainfall events have the potential to impact our value chain. Our Northern Cape Operations (Beeshoek, Black Rock and Khumani mines) experienced floods in F2016. These followed a drought period. This combination resulted in sinkholes that affected mine logistics. For example, suppliers to Black Rock Mine had to travel an additional 100km for a period of four days. During F2016, nickel and chrome concentrate sales were negatively affected by poor weather conditions that caused delays in shipments from Maputo Port.

## Response

- » ARM has not identified our supply chain as presenting a material water-related risk to our organisation, based on experience and initial investigations into potential risks in the future (other than the need to secure the supply of water for the operations). Substitutes of critical supplies are available and water costs still represent a relatively small contribution to the cost of purchased goods and services. The most immediate concern relates to extreme weather events (floods and droughts) affecting logistics and the ability to receive goods and services in a timely manner.
- » We recognise the need to better inform our assessment of supply chain risk and have undertaken an initial assessment of risks associated with operations' top 5 suppliers by spend. [4.5.4.2.](#)
- » ARM also actively engages with key suppliers. [3.6.1.](#)

## 3.4.3 Material climate change opportunities

## Opportunity

**Resource efficiency incentives:** There are a number of tax incentives and cash grants in the area of energy and climate change which ARM could take advantage of: The Department of Trade and Industry (DTI) runs the Manufacturing Competitiveness Enhancement Programme (MCEP) which aims to provide enhanced manufacturing support, including Green Technology and Resource Efficiency; Section 12L Tax Incentive is managed by the Department of Energy and provides tax reduction incentives for businesses to claim if they can show measurable and verifiable savings in all energy forms. The tax relief was increased in 2016 to 95 cents deduction on taxable income per kilowatt-hour of energy saved.

## Strategy to realise the opportunity

- » Due to the fact that energy consumption and the management thereof is so important, tax incentives and grants will be investigated in order to aid the implementation of further energy efficiency measures.
- » A project was implemented to secure 12L benefits for the two projects implemented at Cato Ridge Works in F2014 (related to the installation of two variable speed drives (VSDs) on the suction fans serving the tapping room of electric furnaces). These initiatives saved 11 661 MWh of electricity and a net saving of over R2 million in F2019.

## Opportunity

**Access to new markets (high-quality iron and manganese ore):** Lumpy and high-grade iron ore enable steel producers to reduce energy consumption and GHG emissions associated with the sintering process. The lumpy premium is roughly 15% of the base price with an additional premium of roughly 4.8% due to the high ore grade. The high ore grade of fines is roughly 4% of the base price.

High-grade manganese ore also enables smelters to use less energy. In China, authorities have stopped local miners from mining low-grade manganese. This is the result of air pollution, energy efficiency, and climate change drivers. This has led to an increase in the import of the type of high-grade ore that ARM produces.

## Strategy to realise the opportunity

- » Assmang has positioned itself to meet developments in demand in this market.
- » Lumpy iron ore is upgraded to 65% (the industry benchmark is 62%). 56% of the total iron ore product is lumpy.
- » The climate-related drivers increasing demand for ARM's high-grade manganese ore in China have contributed to ARM's decision to modernise and expand Black Rock Mine.



Material climate change opportunities continued

**Opportunity**

**Access to new markets (Platinum):** Platinum will have a key role to play in the hydrogen economy and it is expected that demand will increase given climate-related drivers in the transport sector (increasing demand for Fuel Cell Electric Vehicles (FCEVs)) and in industry (increasing demand for hydrogen as a clean energy source and as a reductant that can reduce process emissions).

FCEVs are emerging as a viable technology particularly in the freight transport sector and some analysts see it as playing a significant role in the passenger transport sector where it competes with Battery Electric Vehicles (BEVs) as an alternative to internal combustion engines. This presents an opportunity in the short to medium term.

Industrial use of hydrogen is less mature and while uncertainty exists regarding its future application, it is expected that platinum will play an increasing role in facilitating the decarbonisation of the industry in the long term.

**Strategy to realise the opportunity**

- » ARM monitors developments in the platinum market as well as efforts underway to stimulate and support the hydrogen economy.
- » ARM's planned scenario analysis will help inform our understanding of these drivers in the market and the potential scale of this opportunity over time.
- » ARM continues to invest in the Platinum Division. Capital expenditure at ARM Platinum operations – on a 100% basis – increased slightly to R1.2 billion (F2018: R1.1 billion).

**Risk**

**Access to new markets (Nickel and Manganese):** The growth in demand for renewable energy has increased demand for battery storage to accommodate the variable nature of technologies such as solar PV. The significant momentum towards electromobility has also resulted in significant investment in battery storage for mobile applications. The battery remains one of the main reasons for a higher cost of electric vehicles relative to Internal Combustion Engines (ICE) but analysts predict significant reductions in the cost of batteries as R&D investments materialize and as producers achieve greater economies of scale. Some analysts suggest that passenger electric vehicles will reach price parity with ICE vehicles around 2025-2030. This would represent a tipping point which would see a significant increase in the demand for ARM's products used in the batteries of these vehicles.


**Response**

- » ARM monitors developments in the battery storage market.
- » ARM's planned scenario analysis will again help inform our understanding of these drivers in the market and the potential scale of this opportunity over time.
- » ARM continues to invest in Manganese. The modernisation and expansion of Black Rock Mine will increase production capacity from 2.6 million tonnes to 4.6 million tonnes in 2022. ARM has invested in excess of R5 billion to date and the full project will cost R10 billion.
- » ARM's production of nickel will decrease. Nkomati Mine's joint-venture partners have agreed to scale down production at this loss-making mine and place the open-pit operation on care and maintenance from September 2020 in preparation for closure.

CLIMATE CHANGE continued

### 3.4.4 The impact of risks and opportunities on business and financial planning

The operations have experienced a number of disruptions related to climate change that have impacted our operations, our suppliers and our communities.

Physical climate impacts have resulted in production stoppages at our mines in the Northern Cape. During F2019 electricity supply interruptions affected water supply to the ARM Ferrous operations in the Northern Cape. Flooding in the area occurred due to excessive thunderstorms in January 2017, which is not normal and affected both Beeshoek and Khumani mines. Plant stoppages occurred at Beeshoek Mine in January and February 2019, due to flooding. At Khumani Mine, the excessive rain led to seven days of lost production due to unsafe haul road conditions. Between December 2016 and February 2017, Khumani Plant experienced downtime due to water shortage of 113 hours and 92 hours, for the off-grade plant and the on-grade plant respectively. Extreme weather events also contributed to incidents of water discharge at Nkomati and Two Rivers mines.  4.5.2.3.

Production at Cato Ridge Works was affected by load shedding at the start of 2019 and inconsistent electricity supply could have a negative effect on refractory linings and costs. Operations have reported increased use of the backup generators that support critical functions, such as ventilation fans, increasing diesel consumption and emissions.

Floods and sinkholes (likely caused by earlier droughts) affected Black Rock mine logistics in F2017. Suppliers had to travel an additional 100km, resulting in increased transport costs and delays. There were no production losses associated with the event and no significant financial impact (impacts on Black Rock Mine's logistics resulted in an estimated increase in costs of R 122 000).

Social unrest and strikes have impacted the resilience of our operations and of the communities in which we operate, e.g. community unrest and vandalism of water supply infrastructure that could impact water supply to Modikwa Mine. The Lebalelo pipeline was damaged during 2015 by local communities (remote from mining operations), whose actions were generally based on social funding expectations beyond the prescripts of mines' Social Labour Plans. This was driven by frustrations with potable water service delivery. Incidents continue sporadically but have not been as significant as those experienced in 2015.

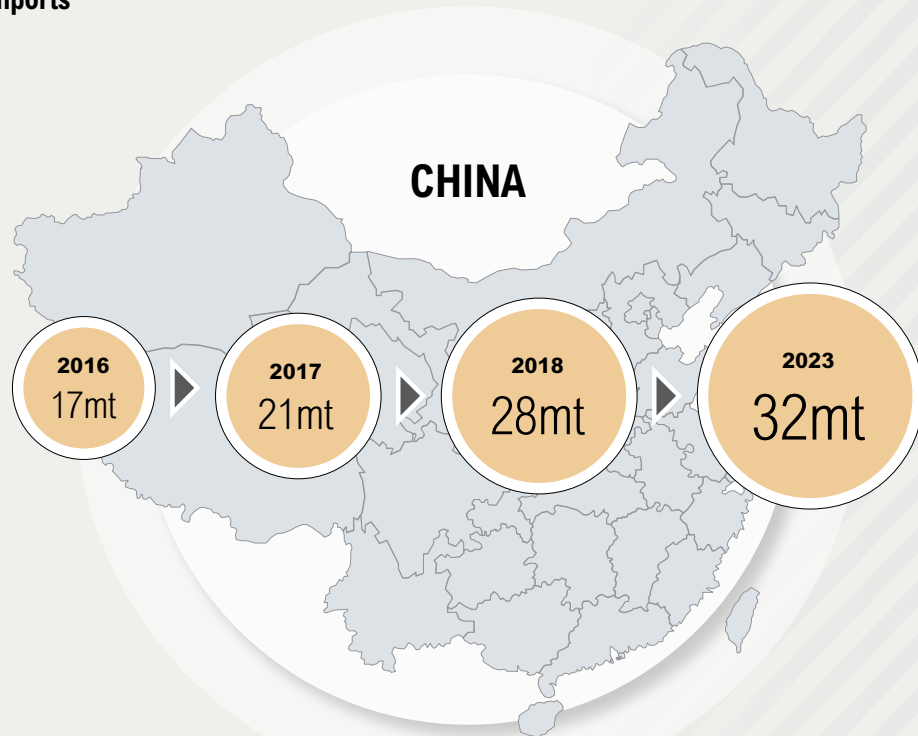
On the positive side, market trends driven by climate change, among other things, have seen an increase in demand for certain commodities.

ARM continues to invest in PGMs and while climate change presents a risk to demand for catalytic converters used in ICE vehicles, we anticipate an increase in demand for platinum associated with hydrogen as a key source of energy and reductants to enable reduced GHG emissions in the transport and hard-to-abate industrial sectors.

Assmang has experienced a higher demand for better quality iron and manganese ores as steel producers are driven to reduce their GHG emissions. Demand for our quality products has for example, increased significantly in areas like China which is seeking to urgently address its pollution challenges. Steel producers in China have accordingly increased the consumption of high-quality ores in the effort to improve efficiencies, reduce emissions, and curb air pollution, as illustrated in the graphic below.

Climate change risks and opportunities have also contributed to the impetus to invest in innovation. For example, ARM is investigating and testing technology which may reduce the energy requirements in the smelting process.

#### China Manganese Imports





CLIMATE CHANGE continued

### 3.5 Metrics and targets

#### 3.5.1 GHG emissions

##### 3.5.1.1 Scope 1 & 2 emissions

ARM's GHG calculations are based on the Greenhouse Gas Protocol – Corporate Standard (GHG Protocol), published by the World Resources Institute and World Business Council for Sustainable Development in March 2004. The data collection process complies with the data quality requirements set out in ISO 14044, as well as the GRI Standards, and is verified externally on an annual basis.

Scope 1 and 2 emissions have been calculated on an equity share basis in accordance with the GHG Protocol Corporate Accounting and Reporting Standard. Data reported separately to the Department of Environment, Forestry and Fisheries (DEFF) is reported on an operational control basis (for the operations where ARM has operational or joint operational control) and based on a calendar year, as per the regulatory requirements.

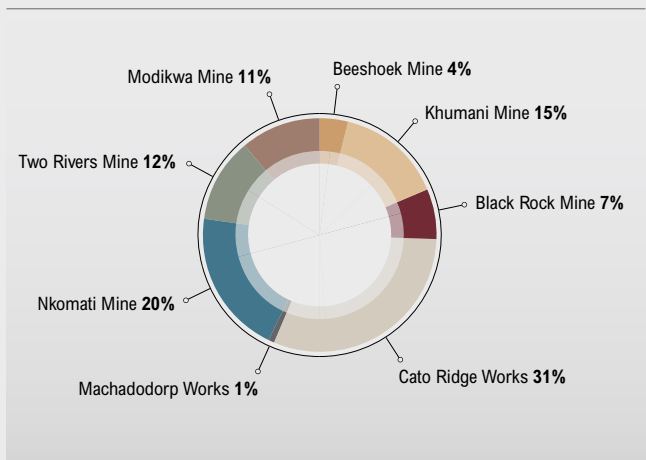
ARM's base year is F2014. The target base year excludes divested operations (Dwarsrivier and Lubambe mines).

Emissions attributable to our operations arise primarily from the consumption of electricity produced by coal-fired power stations and the combustion of fossil fuels during mining, load and haul, materials handling, and processing activities. Emissions data is monitored and reported internally every quarter, discussed at operational sustainability meetings and assessed as part of quarterly risk management workshops.

Scope 1 emissions mainly relate to diesel consumption (for load and haul activities) and reductants (Cato Ridge Works). Electricity consumption (Scope 2 emissions) comprises 79% of ARM's total carbon footprint.

The F2019 estimated carbon footprint (Scope 1 and 2 attributable emissions) increased 7% to 1.10 million equivalent tonnes of CO<sub>2</sub> (mtCO<sub>2</sub>e) from 1.03 mtCO<sub>2</sub>e in F2018.

#### SCOPE 1 AND 2 CARBON EMISSION CONTRIBUTION BY OPERATION (%)



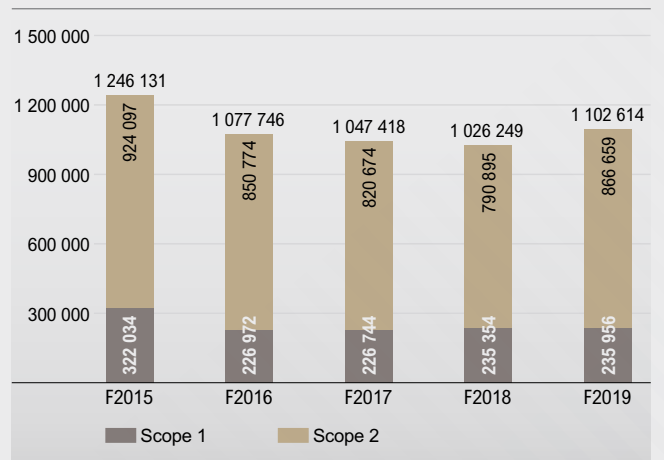
This represents a 10% decrease compared to the F2014 baseline. Scope 1 emissions increased by 0.26% year-on-year. The increase year-on-year in Scope 2 emissions (9.58%) is largely attributable to the increased Eskom grid emission factor: from 0.97 to 1.06 kgCO<sub>2</sub>/kWh (9% increase). Eskom has not provided an explanation for this increase which contrasts the expectation for a reduction in the grid emission factor due to the increased share of renewables in the South African electricity supply mix. It is possible that transmission losses and decreasing coal-fired power plant efficiency, due to a lack of maintenance and investment, have played a role in this increase. A robust and transparent grid emission factor in South Africa remains a concern but collective efforts are underway to address the challenges. ARM's electricity consumption (MWh) increased by 0.14%.

Changes in emissions over time are primarily due to the following reasons:

- » **Investments:** The disposal of ARM's 50% effective interest in Dwarsrivier Mine was completed in July 2016. The disposal of ARM's 40% effective interest in Lubambe Mine and Lubambe Extension Area was completed on 22 December 2017.
- » **Changes in production output:** Production of manganese alloy at Cato Ridge Works decreased by 36% in F2016 compared to F2015 due to operating fewer furnaces at Cato Ridge Works. Production changes at various operations contributed to other changes over time.
- » **Electricity supply disruptions:** Load shedding in 2015 necessitated the use of generator sets, particularly at Black Rock Mine which has a 12MW capacity diesel generator.
- » **GHG emission reduction initiatives:** initiatives implemented since F2014 (and still actively contributing to savings) resulted in a saving of 42 720 tCO<sub>2</sub>e in F2019 (contributing a 2% reduction to the change in ARM's Scope 1 and 2 emissions).

During F2019, Cato Ridge Works contributed 31% of the Group's total Scope 1 and 2 emissions. Nkomati Mine contributed 20% and Khumani Mine 15%, mainly as a result of diesel consumption during mining, load and haul activities in the open pits.

#### SCOPE 1 AND 2 CARBON EMISSIONS (tCO<sub>2</sub>e)



CLIMATE CHANGE continued

ARM F2019 GHG EMISSIONS (ATTRIBUTABLE BASIS)

	Scope 1 (tCO <sub>2</sub> e)	Scope 2 (tCO <sub>2</sub> e)	Scope 1 & 2 (tCO <sub>2</sub> e)
<b>Ferrous Division</b>			
Beeshoek Mine	22 066	20 286	42 352
Khumani Mine	56 742	103 667	160 409
Black Rock Mine	9 985	67 280	77 265
Cato Ridge Works	97 051	240 439	337 490
Machadodorp Works	456	6 058	6 514
<b>Total</b>	<b>186 300</b>	<b>437 730</b>	<b>624 030</b>
<b>Platinum Division</b>			
Nkomati Mine	37 133	187 771	224 904
Modikwa Mine	4 565	117 118	121 683
Two Rivers Mine	7 958	123 313	131 271
<b>Total</b>	<b>49 656</b>	<b>428 202</b>	<b>477 858</b>
<b>ARM Corporate Office</b>	–	726	726
<b>ARM Total</b>	<b>235 956</b>	<b>866 659</b>	<b>1 102 614</b>

GHG emissions intensity

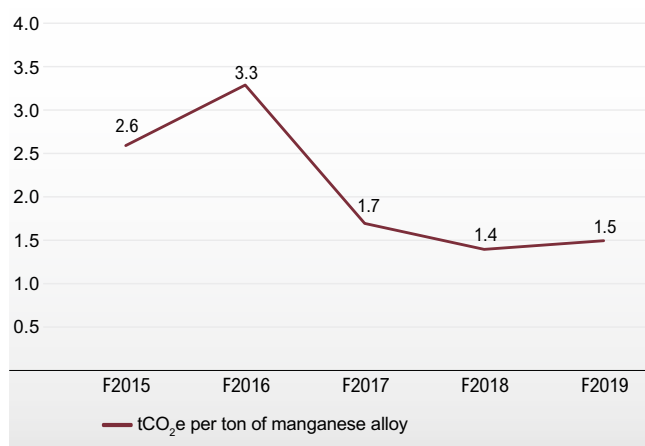
We calculate and track carbon emissions intensity ratios per full-time employee and per unit of production or processing to adjust for changes in production activity levels. Scope 1 and 2 carbon emissions per tonne of manganese alloy produced, increased by 2.4% to 1.5 tCO<sub>2</sub>e/tonne in F2019 from 1.4 tCO<sub>2</sub>e/tonne.

Scope 1 and 2 emissions per tonne of iron ore produced was 0.023 tCO<sub>2</sub>e/tonne (F0218: 0.020 tCO<sub>2</sub>e/tonne). Scope 1 and 2 emissions per tonne of manganese ore produced increased to 0.045 tCO<sub>2</sub>e/tonne from 0.038 tCO<sub>2</sub>e/tonne in F2017.

Carbon emissions per tonne of ore milled at our two primary platinum mines, Modikwa and Two Rivers mines, increased to 0.098 tCO<sub>2</sub>e/tonne (F2018: 0.089 tCO<sub>2</sub>e/tonne). Scope 1 and 2 emissions per full-time employee (FTE) increased by 16% to 197.1 tonnes CO<sub>2</sub>e (F2018: 169.4 tCO<sub>2</sub>e).

Scope 1 and 2 emissions per man-hour worked increased to 52 kg CO<sub>2</sub>e (F2018: 43 kg CO<sub>2</sub>e).

SCOPE 1 AND 2 CARBON EMISSIONS PER TONNE PRODUCED – SMELTERS (tCO<sub>2</sub>e)



3.5.1.2 Scope 3 emissions

Reducing operational emissions is vital and while emissions from our value chain are significant, we are working to mitigate risks and take advantage of opportunities arising from the global transition to a lower-carbon, climate-resilient economy. We are assessing supply chain risks and engaging with suppliers to mitigate carbon price pass-through effects and to access goods and services that enable operations to reduce energy consumption and associated emissions. We also see downstream opportunities driven by the increasing demand for high-grade iron and manganese ore that enables efficiencies and reduced emissions in the processing of ore by our customers, as well as increasing demand for products such as PGMs and nickel that are used in the growing deployment of low carbon technologies.

The TCFD recommends that organisations should assess not only the potential direct effects of climate change on their operations, but also the “potential second and third-order effects on their supply and distribution chains”, and explicitly recommends that organisations disclose Scope 3 emissions associated with their business and the related risks. Scope 3 emissions are the indirect emissions not included in Scope 2 that occur in the upstream and downstream value chain.

Scope 3 emissions are calculated according to the GHG Protocol – Corporate Value Chain (scope 3) Accounting and Reporting Standard. The latest UK Department for Business, Energy & Industrial Strategy’s emission conversion factors are used. Source data is gathered directly or estimated depending on the availability of data or the materiality of the Scope 3 category. ARM’s approach to addressing Scope 3 emissions is evolving and includes efforts to improve data gathering and reporting but more significantly to focus on material sources in recognition of our stewardship role to collaborate with stakeholders to reduce emissions across the lifecycle of our products.

Performance

ARM’s most material sources of Scope 3 emissions arise from the processing of our sold products (particularly iron ore), transport and distribution (both upstream and downstream) and our investments, and we work closely with our joint venture partners to ensure risks are mitigated.




CLIMATE CHANGE continued

Category	Scope 3 (tCO <sub>2</sub> e)	
	F2019	F2018
1 Purchased goods and services	<b>61 955</b>	59 260
2 Capital goods	Relevant-not calculated	
3 Fuel and energy-related activities	<b>53 092</b>	52 088
4 Upstream Transport and distribution	<b>1 123 996</b>	1 019 187
5 Waste Generated in Operations	<b>1 473</b>	859
6 Business Travel	<b>1 456</b>	3 073
7 Employee Commuting	<b>14 831</b>	16 076
8* Upstream leased assets	-	-
9 Transport and distribution of sold products	<b>570 669</b>	652 146
10 Processing of sold products	<b>41 195 525</b>	43 030 053
11* Use of sold products	-	-
12* End of life treatment of sold products	-	-
13* Downstream leased assets	-	-
14* Franchises	-	-
15* Investments	Relevant-not calculated	

\* Not relevant or not material. ARM makes limited use of leased assets and associated emissions are estimated to be immaterial (Category 8); the commodities produced from operations within ARM's operational or joint operational control do not consume energy or produce emissions (Category 11); ARM's products feed into various end uses, many are recycled and we have limited influence over the end-use (Category 12); ARM has no leased assets (Category 13); ARM does not have any franchises (Category 14).

Emissions associated with Capital Goods are relevant particularly given the investments in the Northern Cape. These include the commissioning of a new cell in the tailings (paste) storage facility and the start of construction of three additional lined water storage dams at Khumani Mine in F2019 and investing in a new, lined, tailings facility at Two Rivers Mine. Most significantly, ARM continued to modernise and expand Black Rock Mine. The project began in 2013 and will be completed mid-2022 resulting in an increase in production from 2.6m tonnes to 4.6m tonnes of manganese ore. This also includes the commissioning of a new lined tailings facility at the mine and investment in Black Rock Mine's private rail facilities. Going forward, we will look to assess emissions associated with capital goods which form part of our efforts to integrate carbon pricing into our investment decisions. To date, we have not experienced carbon price pass-through that has materially impacted the feasibility of our current and planned capital investments.

Category 15 (investments) includes emissions associated with ARM's investments in ARM Coal and ARM's equity share in Harmony.  pages 10 and 11.

ARM Coal has an effective 20.2% in the Participative Coal Business (PCB) and an effective 26% in Goedgevonden (GGV). As the managing partner of ARM's joint venture with it, Glencore reports the GHG emissions to the DEFF, consolidated with its reporting on all its operations in South Africa. ARM has engaged Glencore with a view to receiving emissions-related data of the ARM/Glencore joint venture operations and expect to be in a position to report on these by the end of our current financial year which is 30 June 2020.

TPI  TPI Question 8 & 13

CLIMATE CHANGE continued

3.5.2 Energy

Primary sources of energy consumed in our value chain are electricity and diesel. Electricity is used in mining activities to power ventilation fans, pumps for processing and dewatering, conveyor belt motors and the machines that crush and mill ore. The energy used for heating is one of the biggest cost inputs in the smelting process at Cato Ridge Works.

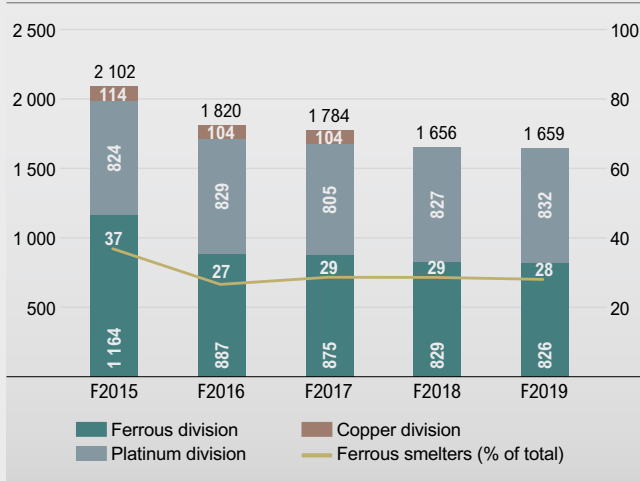
The ARM Platinum division contributed 50% to total Group electricity consumption, the three ARM Ferrous mines 22%, Cato Works Ridge Works 27% and Machadodorp Works 1%.

Operations consumed 1 659 GWh (reported on a 100% basis), in line with F2018 (1 656 GWh). Electricity consumed by the Ferrous

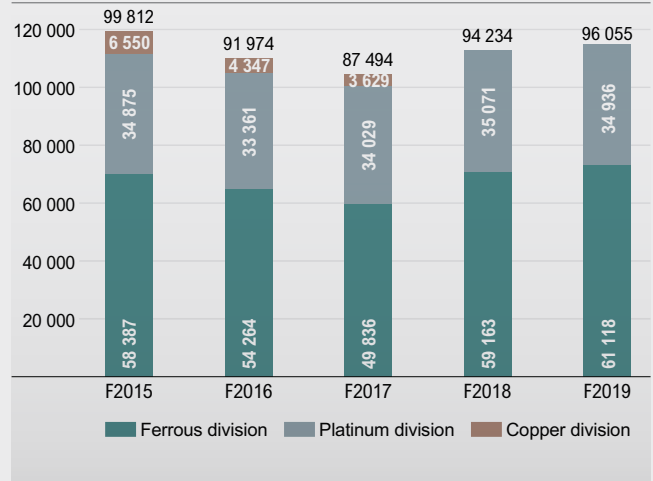
and Platinum divisions was largely unchanged year on year. Nkomati Mine accounted for 21% of total electricity consumption, Modikwa Mine 16%, Two Rivers Mine 13%, Khumani Mine 12%, and Cato Ridge Works 27%.

Diesel is used to power mobile equipment (trackless machines and vehicles used for mining, loading, hauling and logistics) and standby electricity generators. Diesel consumption contributed 56% to total Scope 1 carbon emissions in F2019. Total Group diesel consumption increased by 2% to 96.1 million litres in F2019 (F2018: 94.2 million litres). Khumani (40% of total Group diesel use), Nkomati (27%) and Beeshoek (16%) are large open pit mines that use diesel mainly to haul run-of-mine material to the concentrator plants.

**ELECTRICITY CONSUMPTION (100% BASIS)**  
(GWh)



**DIESEL CONSUMPTION BY DIVISION (100% BASIS)**  
(000 litres)



\* Smelting operations at Cato Ridge Works accounted for 27% of the electricity consumption while metal recovery at Machadodorp Works consumed ±1%.





CLIMATE CHANGE continued

**Exploring renewable energy opportunities**

ARM is exploring options to invest in renewable energy generation technologies or to procure electricity from renewable sources.

The capital cost of renewable electricity, particularly solar PV, has decreased significantly in recent years and ARM is aware that, in a growing number of contexts, it is becoming an increasingly viable option with significant potential energy security and GHG emission reduction benefits.

South Africa's Integrated Resource Plan 2019 (IRP 2019) was gazetted by the Minister of Mineral Resources and Energy, on 18 October 2019, updating the energy forecast for South Africa from the current period to the year 2030. The plan includes a total of 6,422MW under the government led Renewable Energy Independent Power Producers Programme (RE IPP Procurement Programme), with 3,876MW currently operational and made available to the grid. This is a positive development and, although additional fossil fuel generation capacity is also included in the IRP 2019, it is expected that the carbon intensity of purchased electricity from the grid will decrease over time. This will contribute to reducing ARM's Scope 2 emissions but will not be enough to meet ARM's long term GHG mitigation objectives.

ARM is investigating renewable technologies. Feasibility considerations include capital and operational costs (and associated levelized cost of electricity), electricity generation in relation to the operations' load requirements (security of supply benefits), greenhouse gas and environmental impacts, and the remaining economic life of the asset. To date, we have not found a viable option. A key driver is to align potential green

investments with the remaining life of operations. Operations with a short Life-Of-Mine (LOM) are not suitable candidates. At other operations, self-generated renewable energy will not meet the load requirements and therefore cannot fully mitigate against grid electricity supply risks. Storage technologies remain uneconomical at this stage, but prices are expected to drop significantly given the R&D investment and economies of scale driven by recent and projected increases in Battery Electric Vehicle (BEV) deployment and embedded or decentralised generation.

Options exist to procure renewable energy from Independent Power Producers (IPPs) via arrangements that "wheel" power through the grid. LOM remains a constraint as IPPs require long term Power Purchase Agreements in place. There are also some regulatory challenges associated with large scale generation capacity and stakeholders are engaging with government and the regulator to create a more enabling environment for renewable energy generation and trading.

We continue to track developments in this space. Given trends, ARM is optimistic that direct investment in, or procurement of, renewable energy will play an increasing role in the efforts to reduce greenhouse gas emissions and enhance the resilience of our operations. To date we have explored relatively small installations as part of better understanding technologies:

- » A 52.8 kWp (kilowatt peak) solar PV solution was installed at ARM's Corporate Offices in F2019. The installation generates 7 419 kWh of electricity per month.
- » Khumani Mine has a solar PV plant installed in F2014. The plant generated approximately 120 000 kWh during F2019.

**3.5.3 Verification**

ARM's annual Scope 1 and 2 emissions are assured by a third party. Scope 3 emissions are not externally assured.

IBIS ESG Assurance (Pty) Ltd provided independent assurance over ARM's Sustainability Report and the engagement was performed in accordance with the AccountAbility AA1000AS guidelines (assurance Type II, moderate). This includes a review of the reporting process and an assessment of the report against AccountAbility's guiding principles of inclusivity, materiality, and responsiveness.

The assurance process includes the year-on-year change in emissions (Scope 1 and 2). Change is measured based on the annual assurance process. Additional climate change-related indicators assured include electricity consumption (GWh), total fuels consumed, the total volume of water withdrawal from all sources, and total water discharged from sites.

SR   ARM's Independent Assurance Statement can be found on page 90 of the 2019 ARM Sustainable Development Report, available on our website at [www.arm.co.za](http://www.arm.co.za).

TPI  TPI Question 9

**3.5.4 GHG emission reduction target**

**Target:** 5% absolute reduction of Scope 1 and 2 emissions by F2020 against a F2014 baseline through emission reduction initiatives (excluding divestments).

During F2018, ARM set a revised carbon emission reduction target based on both a bottom-up assessment of opportunities to reduce GHG emissions at operations and a top-down assessment that included benchmarking of peer company targets and stakeholder expectations. Data collected during workshops and subsequently reported by each operation was coupled with a benchmark of other company targets and stakeholder expectations to determine an appropriate, more ambitious GHG reduction target at the company-level. The target considers GHG emission reduction initiatives implemented since F2015 and still actively reducing emissions in the target year. The "ex-post" baseline represents what would have been emitted had the emission reduction initiatives not been implemented, in line with the GHG Protocol's Policy and Action Standard.

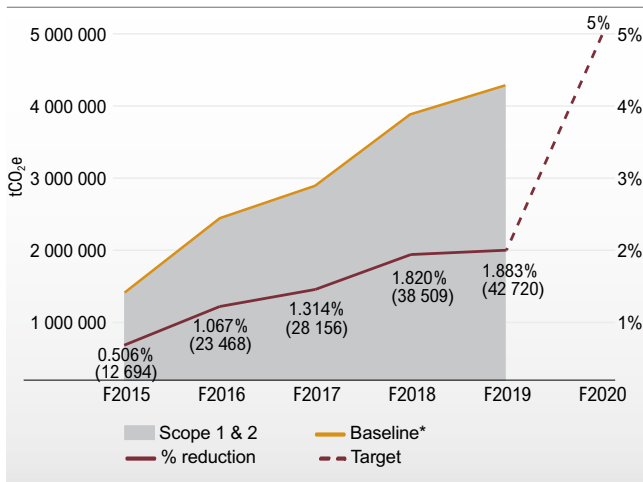
ARM's previous target was to achieve a 5% decrease in Scope 1 and 2 emissions by F2018 relative to a F2014 baseline. This target was achieved and exceeded due to reduced production at Machadodorp Works, the divestments of Dwarsrivier and Lubambe

CLIMATE CHANGE continued

mines and due to emission reduction initiatives. The revised target is seen as a more ambitious target along ARM's journey as it is expressed in terms of emission reduction initiatives achieved and it is informed by a more detailed bottom-up assessment of GHG mitigation potential at the operations.

Progress

ARM GHG EMISSIONS  
(Excluding divested operations)



Note: Scope 1 and 2 emissions and emission reductions achieved are the total emissions resulting from operations where ARM has operational or joint operational control.

\* The "baseline" reflects what ARM would have emitted had it not implemented emission reduction initiatives (referred to as an "ex-post" baseline according to the GHG Protocol Policy and Action Standard)

Achieving the target of a 5% reduction by F2020 will be a challenge, as evidenced in the figure above. However, a number of new initiatives have commenced in F2019 that will deliver savings by the end of the target period. Some reduction opportunities involve capital investment and a budgeting process over more than one financial year.

We have also identified challenges in measuring and reporting of savings at the operational level. Systems and training need to be enhanced to ensure that operations recognise, measure and report savings, especially where projects are driven by efficiency considerations but have additional energy or carbon emission reduction implications. Importantly, the 2018 conditional share plan includes this climate change performance target, as set out in the summarised Remuneration Report.

IAR Refer to page 113 of the 2019 ARM Integrated Report, available at [www.arm.co.za](http://www.arm.co.za).

In terms of current regulatory timeframes, ARM will be allocated a new carbon budget for the period 2021 to 2026 and will have to develop a plan to stay within that budget. This will require a detailed understanding of mitigation options over the period and for a budget to be allocated to achieving the plan. A new target that covers the period 2021 to 2026 will align with the company's budget (additional target elements related to sources of emissions not included in the carbon budget, such as electricity, will also be included). A long-term target will also be developed during F2020/21. The lessons learned in setting the existing target, improving the system of identifying opportunities and reporting on progress, and practical realities around implementing projects will inform the new target setting process. The new target will be more ambitious and will consider the scientific requirements to achieve the 1.5°C global temperature goal and associated efforts towards net zero carbon industry by 2050.

ARM also set a target to engage with operations' supply chains to better understand climate and water-related risks that could result in an increase in costs or a delay in the supply of critical commodities and to better understand products that could reduce the mines' direct climate and water impacts. We have undertaken a study to assess potential supply chain risk. 3.6.

TPI TPI Question 4, 7 & 14

3.5.5 GHG emission reduction initiatives

The strategic focus on cost efficiencies and operational cost reduction projects support the focus on reducing energy consumption and emissions. Our energy and climate change strategy aims to identify and develop opportunities for long-term achievable emission reductions through investigating energy efficiency initiatives, alternative energy sources, new technologies, and diversification into less energy-intensive products.

ARM drives investment in emission reduction activities through the following methods:

- » **Incentives:** The 2018 Conditional Share Plan links corporate executive share incentives to the GHG emission reduction target. At the operations, remuneration and incentive packages for engineers and production staff are linked to energy efficiency and GHG emission reductions.
- » **Dedicated budget:** there is a capital allowance for energy efficiency projects at the operations.
- » **Energy efficiency plans:** The ARM Ferrous division has an Energy Efficiency Charter that includes targets for efficient practices. Energy reduction plans are also in place at the operations in the Platinum division.
- » **Engagement workshops:** annual climate and water workshops at the operations include a focus on identifying and implementing GHG emission reduction initiatives. In F2020 these workshops will focus on identifying opportunities, improving reporting systems as part of preparing for the revision of ARM's carbon budget and the related setting of new GHG reduction targets.
- » **Leveraging incentives and innovative models:** ARM has benefitted from Section 12L energy efficiency incentives offered by the South African government and continues to explore direct support opportunities as well as engaging with third parties around innovative models for procuring renewable energy.
- » **R&D and supply chain engagement:** ARM is exploring, internally and with partners, innovative technologies that deliver low carbon products or assist the operations indirectly reducing energy consumption and environmental impacts.

ARM has been tracking and reporting on GHG emission reduction initiatives to the Carbon Disclosure Project since 2010. Performance, as measured by emission reductions achieved, improved between F2013 and F2018 but has slowed in F2019 due to challenging market conditions, limited viable options having implemented many of the "low hanging" fruits already as well as financial and governance processes associated with capital investments. This process, which involves feasibility or product comparison, followed by budgeting and capital allocation and finally procurement or construction, depending on the nature of the project, spans over multiple financial years, e.g. the implementation of electric vehicles at Black Rock Mine over three years.

GHG SAVINGS FROM NEW INITIATIVES PER YEAR  
(tCO<sub>2</sub>e per year)

F2019	F2018	F2017	F2016	F2015
4 211	10 353	4 688	10 774	12 694

CLIMATE CHANGE continued

Various saving and carbon emission reduction initiatives were implemented in F2018 and F2019.

New initiatives implemented in F2018 and F2019	Additional savings per year		
	Energy	Unit	tCO <sub>2</sub> e
Using fuel additives to reduce emissions, maintenance costs and diesel usage at Beeshoek and Khumani mines	149 7104	litres of diesel	3 485
Replacing of lights with LED lights (additional rollout) at Beeshoek and Khumani mines	136 212	kWh	157
Energy efficiency replacement programme (fans/motors) at Beeshoek and Black Rock mines	7 040 500	kWh	662
The fabrication of a bridle, enabling the transport of metal ladles with a slag hauler, now allows Cato Ridge Works to transfer molten metal to Cato Ridge Alloys from all operating furnaces using an electric winch rather than a system relying on diesel	28 099	litres of diesel	65
Nkomati Mine scrapped 35 old light duty vehicles and encouraged walking and ride-sharing instead	29 575	litres of diesel	69
Leaving vehicles underground (rigs, bolters, and haulage vehicles) instead of driving them up after each shift to surface at Modikwa and Two Rivers mines	152 723	litres of diesel	244
Two Rivers mine changed all Tier S2 engines on Rham equipment to Cummins Q7 common rail engines. Diesel consumption per Load-Haul Dump vehicle decreased from 26 l/hour to 17 l/hour (19 machines)	544 200	litres of diesel	1 267
Rooftop solar PV at ARM corporate offices: (52.8 kWp generating 7 419 kWh per month)	7 419	kWh	8



Some projects have a payback period of less than three years. Additional projects being developed include:

- » Energy efficiency: Motion detectors for LED lights, automatically stopping conveyors when not in use, further investments in LED lighting;
- » Optimization: surface fan relocation, right-sizing hauling vehicles;
- » Reducing diesel consumption through the use of additives;
- » Reducing emissions in our value chain (Scope 3 –transportation);
- » Piloting electric vehicles with multiple benefits; and
- » Increasing energy efficiency with the Black Rock modernisation and expansion project.

**Reducing diesel consumption**

The ARM Ferrous division is investigating a catalyst (additive) which promises to:

- » Reduce fuel consumption;
- » Reduce maintenance activities;
- » Reduce emissions; and
- » Improve combustion efficiency.

Laboratory tests are currently being conducted on this product to verify the claims before performing a trial on any of the operations.

Two Rivers Mine is also exploring diesel additives.



CLIMATE CHANGE continued

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**Reducing emissions in our value chain (Scope 3)**

ARM is partnering with suppliers to reduce transport emissions (upstream and downstream).

In the Northern Cape, Assmang has engaged proactively with Transnet and other mining companies leading to the upgrade of the rail line from the Northern Cape to Saldanha Bay. This has increased rail capacity and reduced road transport as well as emissions associated with transporting iron ore from Beeshoek and Khumani mines.

Black Rock Mine has been shifting from road to rail for the transport of manganese ore. In F2015 approximately 58% of product was transported by road from the Northern Cape to Port Elizabeth. Now 100% of product is transported by rail and a new initiative is underway to improve the efficiency of that transport. Black Rock Mine is working with Transnet and other mining companies to optimise rail transport to reduce trips per tonne of product transported. Trains transporting manganese to port

have been lengthened resulting in fewer trips and therefore reduced energy consumption associated with product transport. Transnet will upgrade the major line and port facilities. Black Rock Mine needs to upgrade its private rail facilities at a capital cost of R500m. This project is scheduled to be completed by 2022 if all role players keep to their schedules and commitments. Currently, there is no quantitative estimate of the expected transport energy saving but it is expected that GHG emissions per tonne of manganese ore transported will be significantly reduced. This project is critical in ensuring the production ramp-up at Black Rock Mine is synchronised with Transnet's rail and port capacity expansions from F2022. This will therefore help accommodate increased production without having to invest in significant additional rail infrastructure and has the energy/GHG emission benefits. ARM and other industry players were fundamentally involved in driving this project.

**Piloting electric vehicles with multiple benefits**

Black Rock Mine ordered two 42t electric haul trucks and an electric front loader during F2019, to be operational underground in approximately one year. Capital costs compare well with conventional vehicles and the battery costs will be equivalent to diesel costs due to a contractual arrangement with the third party service provider, which will provide batteries "as a service" (rented). The mine will cover the cost of charging the batteries that will be "swapped" out once during a shift.

The vehicles are expected to deliver multiple benefits:

- » Reduced energy consumption: the vehicles are 70-80% efficient as compared to 30% efficiency of diesel vehicles. Even with a carbon intensive electricity grid, this will result in reduced GHG emissions;
- » Reduced need for ventilation: vehicles generate no particulate emissions and nitrous oxide gases, and reduce heat generation thereby reducing the need for ventilation (also saving energy and associated emissions). In the case of Black Rock Mine, the absence of heat generated by conventional

vehicles has resulted in eliminating the initial need for an additional ventilation shaft;

- » Occupational health benefits by eliminating harmful exhaust gases, especially diesel particulate matter which is a known carcinogen. In addition, electric vehicles do not emit high levels of noise, which is significant in terms of the mining industry's focus on hearing conservation;
- » Reduced service intervals and costs: motors require less servicing than diesel engines reducing preventative maintenance costs by 25 – 30%; and
- » Predictable running costs.

The mine is also testing an electric personal carrier (with regenerative charging) and has commissioned an EV drill rig.

If the pilot is successful, it will inform the model for the sustainable capital replacement strategy going forward at Black Rock Mine and may be explored at ARM's other underground mines.

**Increasing energy efficiency with the Black Rock Mine modernisation and expansion project**

One component of the modernisation and expansion project at Black Rock Mine is to move ore tipping faces closer to loading areas. This will reduce haul distances significantly and, while saving costs, also reduces energy consumption and associated GHG emissions.

CLIMATE CHANGE continued

**3.5.6 How our products contribute to the transition to a low-carbon economy**

**3.5.6.1 High grade ores that save customers energy and reduce emissions**

China's focus on addressing its pollution challenges through improved efficiencies in heavy industries has increased demand for higher quality ores, which produce lower emissions when processed. Our high-quality iron and manganese ores offer customers the ability to optimise production and reduce emissions. For example, the use of lumpy iron ore in the steel making process reduces Scope 1 emissions associated with the sintering process. Lumpy iron is also more concentrated and therefore results in lower product transport emissions. High grade manganese ore also enables smelters to use less energy.

**3.5.6.2 Platinum enabling the hydrogen economy**

Hydrogen fuel cells are a promising source of clean energy that use platinum to generate energy from hydrogen and oxygen, with water being the only emission. Hydrogen fuel cell electric vehicles (FCEVs) offer a zero emissions alternative to internal combustion engine (ICE) vehicles, without the need for consumers to change their behaviour. ARM expects PGM-based FCEVs to contribute to the electrified drivetrain for vehicles, especially in the heavy duty segment of the market.

Industry is increasingly recognising the need to aim for net zero carbon emissions by 2050. In hard to abate sectors such as iron and steel and chemicals production, hydrogen offers a potential clean source of energy (if generated using renewable energy for electrolysis) as well as a reductant that can reduce process emissions.

**3.5.6.3 Metals used in energy storage**

Nickel and manganese are used in certain types of lithium-ion energy storage technologies, which play a role in the growth in renewable energy and electromobility. Batteries enable the storage of variable renewable power and therefore facilitate greater consumption of renewable energy that reduces customer emissions.

Electric vehicles are three to four times more efficient than petrol and diesel Internal Combustion Engine (ICE) vehicles. Even charging vehicles with the carbon intensive electricity from South Africa's grid delivers GHG reduction benefits. These benefits are most significant when vehicle owners can charge batteries with renewable power.

Climate scenario analysis is needed to better understand the role of these commodities in the global transition to a lower carbon economy. ARM plans to undertake an initial qualitative scenario analysis in F2020/21.

**3.6 Engagement around climate change**

**3.6.1 Value chain engagement**

**3.6.1.1 Supply chain engagement**

ARM has always engaged with key suppliers relevant to the operations and strategic objectives. These engagements relate to efforts to mitigate climate risk in the supply chain but also to ensure that we are able to procure best available technologies that enable our operations to increase energy efficiency, reduce GHG emissions and increase resilience to physical climate change risks.

For example, the Ferrous and Platinum divisions are working with suppliers to explore diesel additives to, among other things, reduce diesel consumption at our mines.

In the Northern Cape, Assmang has engaged extensively with Transnet regarding climate related risks to product transport and expanding and optimising transport infrastructure to reduce emissions and accommodate increased production at Black Rock Mine.

The security of electricity supply in South Africa is a top ten risk in the Group Risk Dashboard, specifically the reliability and cost of power from Eskom. To help mitigate electricity supply risk quarterly liaison meetings are held with Eskom representatives.

In F2019 ARM undertook an assessment of each operation's top five suppliers by spend. The assessment sought to better understand suppliers' performance with respect to climate change as part of assessing climate-related risks to the operations. This included a review of publicly available documentation (e.g. Carbon Disclosure Project responses and Sustainable Development Reports) and assessments of the companies by third parties (e.g. news sources and research/advocacy reports). Information was available on larger suppliers but limited public information could be obtained for the smaller, more local suppliers.


It is evident that larger suppliers are aware of material climate change risks (notably the carbon tax and physical climate change impacts affecting production and the delivery of goods). There are however concerns around the ability of some of these suppliers to mitigate these risks. In the case of chemical production, for example, there are few opportunities to decarbonise the process and although global efforts are underway to explore viable alternatives, no significant reductions are expected in the short to medium term. Similar challenges are faced in steelmaking and cement production which will affect ARM's ability to source low carbon alternative materials to support expansion and capital investments.

Eskom, as our primary supplier of electricity, presents a risk due to demonstrated and reported deficiencies related to financial and operational management. Uncertainty around the utility's future, the high level of debt and a lack of proven reduction in emissions historically, associated with the production of electricity, present a significant risk to ARM's GHG reduction target and long-term objectives.

## CLIMATE CHANGE continued

Large suppliers report on annual GHG emissions but do not provide information on emissions at the product level. Smaller operations do not always report publicly on GHG emissions and climate-related risk.

Going forward, we will identify additional suppliers to engage with directly. There is a need to further analyse our suppliers and consider the best way in which to gather data on those suppliers which produce material GHG emissions, towards adequately assessing climate-related risks in our supply chain on an ongoing basis.

ARM also measures upstream emissions (Scope 3) associated with purchased goods and services (currently limited to water treatment and supply and production of explosives), fuel-related and energy related activities and the purchase of transport services (associated with some goods purchased and with the transport of product by third parties).  3.5.1.2.

### 3.6.1.2 Customer engagement

We encourage responsible use, re-use, recycling and disposal of our products. We do not sell to general consumers, but rather to industrial customers with whom we engage contractually. Material climate change mitigation risks associated with the use of our products are discussed and addressed through these engagements. There is also an increasing desire from downstream end users of our products (our customers' customers) to see upstream emissions reduced, and more broadly to ensure that the raw materials they procure are sustainably and responsibly produced.

ARM is a member of the ICMM's Product Stewardship Programme Committee and, together with its joint venture partners, participates in a number of relevant industry forums to monitor developments regarding the properties of metals and minerals and their lifecycle effects on human health and the environment. Ore and Metal, the marketing company for Assore, ARM's joint venture partner in the ARM Ferrous division (trading as Assmang), monitors changes in national and international legislation that could influence the mining, beneficiation, sale or transportation of its products and proactively responds as necessary. Ore and Metal also facilitated customer ESG audits of operations as required.

ARM engages indirectly with partners through Assmang's participation in industry associations such as the Life Cycle Assessment (LCA) study on manganese commissioned by the International Manganese Institute (IMnI) and the International Chrome Development Association (ICDA) LCA study on chrome reported on in previous Carbon Disclosure Project submissions. The intended application of gaining a company-specific life cycle inventory and impact data, as well as a global average for benchmarking, is to allow the group to be able to communicate the aspects and impacts of manganese production with downstream steel producers (the customers and users of the group's product), governments, key stakeholders and the general public. An outcome of the IMnI LCA study, that Assmang participated in, was the agreement that detailed LCA data, including greenhouse gas emissions, could be shared with other member organisations in order for them to better understand the impacts associated with their value chain (upstream). This agreement is on the basis that these organisations also share their own emissions profile/data such that the group is able to understand the impacts across its own value chain (downstream) in terms of the use of its products.

## 3.6.2 Public policy engagement

ARM supports the movement towards a low carbon economy and is committed to constructive engagement with government on measures aimed at achieving this. Important issues to consider in South Africa, however, would be the utilisation of carbon tax to support targeted mitigation actions, alignment with other mechanisms such as carbon budgets, and clarity around carbon tax allowances and offsets.

ARM has engaged directly with the DEFF and has been supportive in disclosing information and that has fed into the design of various climate-related policy developments. There is also further engagement in these processes through industry associations.

Participation in business and industry initiatives enables collective engagement with regulators and stakeholders and promotes benchmarking and sharing of good environmental practice. ARM participates in a number of such initiatives, including the MCSA (including the Environmental Policy Committee), Business Unity South Africa (BUSAs), The Ferro Alloy Producers' Association and the ICMM.

Stakeholders and various reporting frameworks have highlighted the importance of ensuring consistency between our climate change policy and the positions taken by industry associations of which we are a member. Involvement in these associations also serves as a sharing and learning opportunity and not only as an advocacy mechanism for engaging with climate policy development processes.

TPI  TPI Question 10,11 & 19

## 3.6.3 Engagement with our partners

We work with our joint venture partners to collectively assess and mitigate climate change risks and take advantage of climate-related opportunities. This is achieved through ongoing management interaction during the ordinary course of business and monthly executive management and quarterly Board meetings.

The joint venture partnership in the ARM Ferrous division with Assore provides access to important industry initiatives such as the Life Cycle Assessment and Life Cycle Inventory studies, waste management initiatives and energy efficiency initiatives of the IMnI and the ICDA.

Stakeholders have recently requested disclosure of GHG emissions from the ARM Coal operations, which form part of a joint venture with Glencore. Glencore is the managing partner and reports on GHG emissions to the Department of Environment, Forestry and Fisheries (DEFF), consolidated with its reporting on all its South African operations. We have engaged Glencore with a view to receiving GHG emissions related data for the relevant operations and expect to be in a position to report on these by the end of the current financial year which ends on 30 June 2020.

ARM holds itself to the highest ethical and governance standards in dealings with all stakeholders, including joint venture partners.



CLIMATE CHANGE continued

## 3.7 Future climate change focus areas

### AREAS OF FOCUS IN F2020/F2021 INCLUDE:

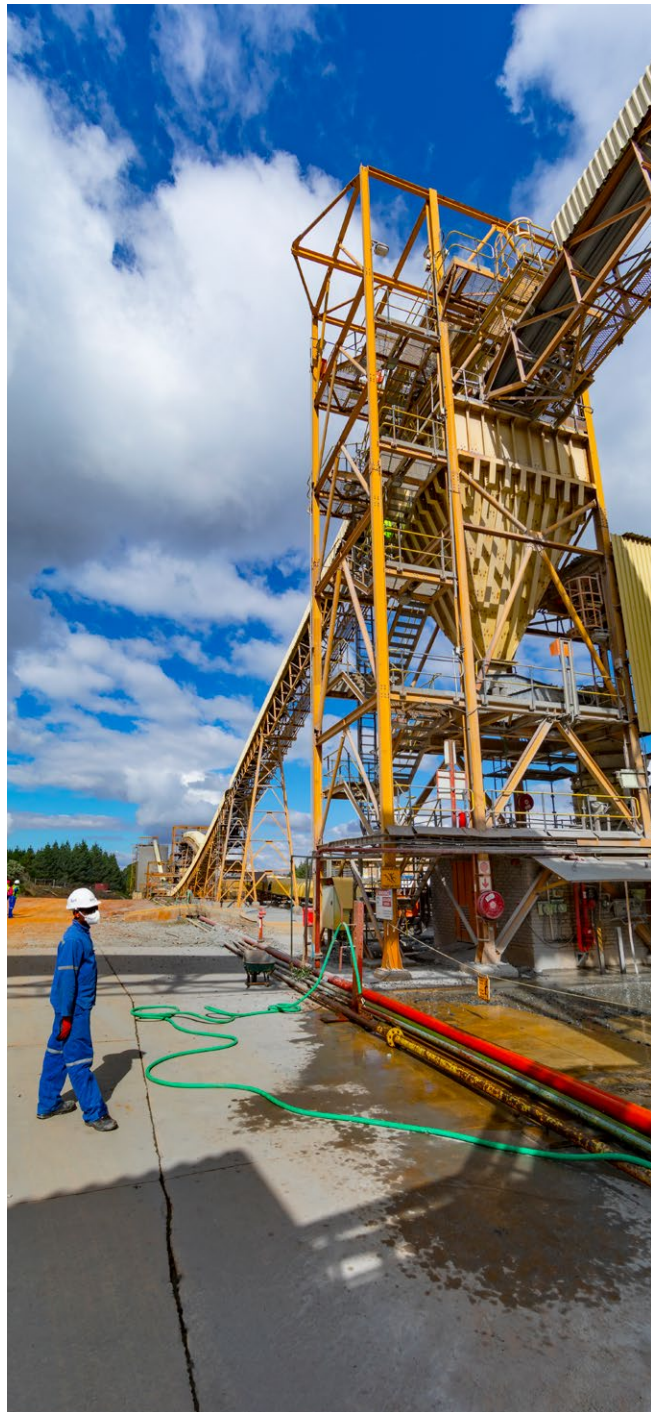
- » Setting a new GHG emission reduction target aligned with the second phase of the carbon budget process and a long-term target that will consider the scientific requirements to achieve the 1.5°C global temperature goal and associated efforts towards net zero carbon industry by 2050.
- » Undertake a climate scenario analysis to assess the resilience of ARM's strategy.
- » Engaging with Glencore and providing additional reporting related to the ARM coal operations which form part of the ARM/Glencore joint venture.

#### Undertaking climate scenario analysis in F2020/21

ARM has identified scenario analysis as a tool that is needed for understanding and reporting on the strategic implications of the transition to a lower carbon, climate resilient economy. Consistent with the recommendations of the TCFD, ARM will be exploring a form of scenario analysis appropriate for the company. The intention will be to:

- » Initiate a dialogue about the strategic consequences of a changing climate and the transition to a low-carbon economy;
- » Structure the dialogue and involve key decision-makers and technical experts with the aim of leading to more robust strategies under a wider range of uncertain future scenarios;
- » Use the qualitative outputs of the dialogue for external reporting through this supplementary report and other public reporting processes.
- » Based on a first iteration ARM will be in a better position to assess the form that scenario analysis should take in order to be valuable in shaping ARM's climate change and water stewardship journey.
- » The outcomes of this process will feed into ARM's risk assessment process and inform the company's low carbon transition plan.

TPI  TPI Question 17







# 4

## WATER MANAGEMENT

### 4.1 Water stewardship policy

Water is vital and the earth’s water systems are under significant threat from rising water consumption, greater pollution, weak governance, and climate change. We are seeing shifting weather patterns, altering water supplies and intensifying extreme weather events such as floods and droughts. ARM is exposed to increased water-related risks that could affect production, increase costs, constrain growth, disrupt our supply chains and place our communities under significant strain. We need to contribute to, and focus our efforts on, ensuring a water-secure future that is socially and culturally equitable, environmentally sustainable, and economically beneficial.





## WATER STEWARDSHIP POLICY

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### ARM recognises that:

- » Water is a precious shared resource with high social, cultural, environmental and economic value. Access to water has been recognised as a human right; integral to wellbeing and livelihoods and the spiritual and cultural practices of many communities. It is also essential to the healthy functioning of ecosystems and the services they provide.
- » Water is a vital input for all mining and metals operations – required for the health and wellbeing of employees and at every stage of an operation's life cycle including closure. The dependency and impact on a shared resource creates a material risk for ARM's operations that requires effective management.
- » Water challenges are increasing around the world. The earth's freshwater resources are finite and under pressure from industrialisation, urbanisation, climate change, and the needs of a growing global population.
- » These challenges are shared across countries, industry sectors, and society. In order to meet demand, a change is needed in the way water is used, managed and shared. This will require collaboration and concerted action from all parties, including government, civil society, business, and local communities.
- » Through the Sustainable Development Goals, world leaders have publicly acknowledged the urgency of using and managing water sustainably. ARM can play a significant role in supporting this approach including ensuring access to clean water, sanitation, and hygiene (WASH) for employees in the workplace. There is further opportunity to support government initiatives through leveraging capital or expertise to improve community WASH and other water related outcomes.
- » Water-related risks and impacts are predominantly experienced by people and ecosystems at the local/catchment level. Therefore, we look beyond traditional operations-based water management to the dynamics and interactions of various water users in the wider catchment.
- » ARM has an important role to play in the sustainable management of water resources where we operate. Proactive and holistic water management strategies will create substantial competitive advantage through reducing water-related risk, identifying opportunities, attracting investment and building trust through improved transparency.

### ARM commits to:

- » Apply strong and transparent corporate water governance by:
  - Publicly disclosing the company's approach to water stewardship (this report as well as ARM's Sustainable Development and Integrated Annual Reports).
  - Allocating clear responsibilities and accountabilities for water – from the Board to our operations. [4.5.1](#).
  - Integrating water considerations in business planning – including ARM's strategy, life of asset and investment planning. [4.5.2](#).
  - Publicly reporting our water performance, material risks, opportunities, and management response using consistent industry metrics and recognised approaches. [4.3.1](#) and [4.5.4](#).
- » Manage water at our operations effectively by:
  - Maintaining a water balance and understanding how it relates to the cumulative impact of other users at each operation. All operations maintain a water balance, considered in the context of a catchment balance. [4.5.2.2](#) and [4.5.2.3](#).
  - Setting context-relevant water targets or objectives for operations with material water-related risks. [4.5.2.1](#).
  - Proactively managing water quantity and quality to reduce potential socio-environmental impacts and realise opportunities. ARM started to report publicly on water quality in F2019. [4.5.2](#).
  - Ensuring all our employees have access to clean drinking water, gender-appropriate sanitation facilities, and hygiene at their workplace. WASH facilities are in place for all our employees. [4.2.2](#).
- » Collaborate to achieve responsible and sustainable water use by:
  - Identifying, evaluating, and responding to catchment-level water-related risks and opportunities. [4.5.2.2](#).
  - Identifying and engaging proactively and inclusively with stakeholders that may influence or be affected by our operations' water use and discharge. [4.5.3](#) and [4.5.4.2](#).
  - Actively engaging on external water governance issues, with governments, local authorities and other stakeholders, to support predictable, consistent and effective regulation that underpins integrated water resource management. [3.6.2](#) and [4.5.3](#).
  - Supporting water stewardship initiatives that promote better water use, effective catchment management and by contributing to improved water security and sanitation. [4.5.3](#).

**We support the ICMM position statement on water stewardship and have begun to report our performance against the commitments in this report.**



WATER MANAGEMENT continued

## 4.2 Interactions with water

### 4.2.1 The importance of water

Water is a vital input for all mining and metals operations. Without access to water, our business could not operate. Water is consequently a material operational and strategic concern, and water stewardship is fundamental to achieving our strategic objectives.

### 4.2.2 How we use and impact water

Water is used for milling, beneficiation, cooling and for dust suppression during blasting, on haul roads, and at ore transfer points. Our employees need access to sufficient potable water for drinking and water, sanitation and hygiene (WASH) services. Water is critical for various users in the wider catchments, it is a critical supply chain commodity and is needed in the production of other critical supply chain commodities such as electricity, chemicals, and explosives.

The main consumptive uses of water include evaporation, water entrained in tailings and interstitial water in product, seepage, and outputs to 3rd parties. Evaporation is high at Cato Ridge Works which requires water for cooling of the furnaces (however only three out of the six furnaces at Cato Ridge Works are operating). The Northern Cape mines in the ARM Ferrous division record high evaporation rates and a number of these operations supply water to 3rd parties (e.g. villages and farms) within their operational boundaries (and thus not classified as “diversions”).

While all operations run closed water circuits in order to maximise recycling and re-use; discharges are unavoidable in certain instances, e.g. heavy rainfall events or successive heavy rainfall events. Discharges have also occurred during F2019 due to production stoppages, as a result of electricity supply interruptions, which necessitated the management of water that would normally be used in the production processes.

Water uses at the operations have not changed significantly over time except in the case of Machadodorp Works where no smelting operations were conducted after F2017.

### Main operational water activities at ARM’s operations

Operation	Catchment	Main operational water activities
Beeshoek Mine (Iron Ore)	Vaal Water Management Area (WMA)	<ul style="list-style-type: none"> <li>» Dewatering</li> <li>» Dust suppression</li> <li>» Ore processing</li> <li>» Tailings management</li> </ul>
Khumani Mine (Iron Ore)	Vaal WMA	<ul style="list-style-type: none"> <li>» Dust suppression</li> <li>» Ore processing</li> <li>» Tailings management</li> </ul>
Black Rock Mine (Manganese Ore)	Vaal WMA	<ul style="list-style-type: none"> <li>» Dewatering</li> <li>» Dust suppression</li> <li>» Mining + screening &amp; washing</li> <li>» Tailings management</li> <li>» Domestic use (village &amp; irrigation)</li> </ul>
Cato Ridge Works (Ferro Alloys)	Pongola-Uzimkulu WMA	<ul style="list-style-type: none"> <li>» Cooling</li> <li>» Dust suppression</li> <li>» Scrubbing (air quality requirement)</li> <li>» Jigging (in the Metals Recovery Plant)</li> </ul>
Machadodorp Works		<ul style="list-style-type: none"> <li>» Jigging (in the ferrochrome Metal Recovery Plant)</li> <li>» Dust suppression</li> </ul>
Nkomati Mine (Nickel, PGMs, and Chrome)	Inkomati-Usuthu WMA	<ul style="list-style-type: none"> <li>» Dewatering</li> <li>» Ore processing</li> <li>» Dust suppression</li> <li>» Tailings management</li> </ul>
Modikwa Mine (PGMs)	Olifants WMA	<ul style="list-style-type: none"> <li>» Dewatering</li> <li>» Dust suppression</li> <li>» Ore processing</li> <li>» Tailings management</li> <li>» Domestic use in mine villages &amp; farms/3rd parties</li> </ul>
Two Rivers Mine (PGMs)	Olifants WMA	<ul style="list-style-type: none"> <li>» Dust suppression</li> <li>» Ore processing</li> <li>» Tailings management</li> </ul>

WATER MANAGEMENT continued



### 4.2.3 Water metrics

Operations withdraw water from a range of sources defined in the terms of their water use licences, which include rivers, boreholes and municipal supplies.

The second phase of implementation of the ICMM Water Accounting Framework was completed during F2019. As part of the process, water accounting definitions were implemented which allowed for better reporting on harvested rainfall and runoff from mining operations. Additional flow meters were also installed to improve accuracy of measurement. A detailed water reporting flowsheet was developed for each operation in consultation with the engineering and environmental teams, to assist in this process.

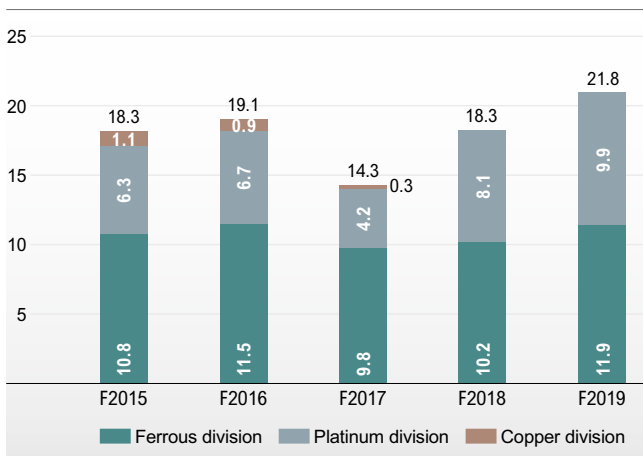
As a result, F2019 water withdrawal volumes reported by operations increased by 19% to 21.8 million m<sup>3</sup> from 18.3 million m<sup>3</sup> in F2018.

The most material increases include:

- » At Modikwa Mine, 2 million m<sup>3</sup> of groundwater, which was previously not reported, was accounted for;
- » A further 1.2 million m<sup>3</sup> increase in water withdrawal was reported at Beeshoek Mine, mainly due to dewatering of the pit to ensure safe mining conditions;
- » Nkomati Mine reported a 0.7 million m<sup>3</sup> increase due to more efficient recovery of water from the tailings storage facility; and
- » Black Rock Mine reported an increase of 0.3 million m<sup>3</sup> as a result of new flow meters being installed and improved accuracy of measuring.

As a result of the implementation of the Water Accounting Framework, we have improved our understanding of water reuse efficiency, which is above 70% and is a key indicator in monitoring and managing consumption and losses.

#### WATER WITHDRAWAL BY DIVISION (100% BASIS) (m<sup>3</sup> million)



### Case study – Improving our water reporting

The ICMM released a Position Statement on Water Stewardship in January 2017, followed by the “Practical guide to consistent water reporting” in March 2017. The comprehensive guideline, based on the Water Accounting Framework (WAF) for the Minerals Industry of the Minerals Council of Australia, is at the core of Water Accounting Principles referred to in the Position Statement.

During May 2017, ARM commissioned a project to ensure that our water management and reporting methodology aligns fully with the commitments of the ICMM. One of the key commitments is for members to report consistently and transparently on water management and accounting. Phase 1 of the project (which was completed in F2018), focused on the quantitative water accounting process which included aligning the detailed water balances and classification of sources of water withdrawal at each operation. While each operation has an approved water balance which is used to report to the Department of Water and Sanitation, there is more detail in the Guidance from the ICMM and hence additional sources such as stormwater were included in the water balances. This led to the identification of water withdrawal sources not previously included in the operational water balances, specifically in the Platinum division.

Phase 2 of the project (completed in F2019) focused mainly on the qualitative aspects of reporting, while further refining the water balances and ensuring consistent application of the methodology. This report and ARM’s 2019 Sustainable Develop Report represent the first publication of our water performance according to the WAF and ICMM requirements.

As part of the next phase, we will continue to improve reporting as efforts to align frameworks, such as the ICMM and the GRI Standards, evolve and the MCA WAF user guide is updated.

Beeshoek Mine accounted for 24% of total Group water withdrawal, Nkomati Mine 20% and Khumani Mine 21%. Water withdrawal by the Ferrous division increased by 17% to 11.9 million m<sup>3</sup> (F2018: 10.2 million m<sup>3</sup>) and 22% in the Platinum division to 9.9 million m<sup>3</sup> (F2018: 8.1 million m<sup>3</sup>). The reason for general increases is due, in part, to better reporting of harvested rainfall and runoff as a result of implementing the new ICMM-based water reporting system.

Outputs include flows to surface water, groundwater, and supply to third parties as per ICMM definitions (volume of water which is removed from the operational facility after it has been through a task, treated or stored for use). “Discharges” in this report refer to discharges at operations as defined in their Water Use Licences (WULs).



WATER MANAGEMENT continued

**Discharges – Nkomati Mine**

A number of discharges of mixed water occurred from the Pit 2 water storage facility during January 2019. The mine has a positive water balance and further received a total of 421 mm rainfall during the three months from November 2018 to January 2019, resulting in a high volume of stormwater and seepage collected within the Pit 2 storage facility. This high rainfall added to the normal daily volumes of water from dewatering of open cast mine working areas for safe continuation of mining activities, filled the available storage space in Pit 2 and caused it to overflow. The most significant incident involved discharge of 28 000 m<sup>3</sup> to the Adit stream, which is a tributary of the Gladdespruit. These incidents were reported to the Inkomati-Usuthu Catchment Management Agency (IUCMA).

On 31 January 2019, following a forced plant shut down due to electricity interruptions, floatation cells in the processing plant had to be drained to avoid blockages during startup. During this process, the tailings line leaked into the stormwater trench which is connected to the Slaaihoek stream. A temporary paddock was immediately created to stop tailings from reaching the stream, while the tailings pipeline was being blanked off. The area was cleaned up and the incident was reported to the IUCMA.

On the same day, following a heavy rainstorm, stormwater ingressed into a sewer manhole at the MMZ plant, causing an overflow of sewage into the clean stormwater trench which is connected to the Slaaihoek stream. This occurred during a prolonged electricity interruption, which resulted in the sewage plant being unable to pump the effluent back into the plant process water system. The incident was reported to the IUCMA and samples were taken to determine the impact, which was not significant in the context of the high rainfall and associated dilution.

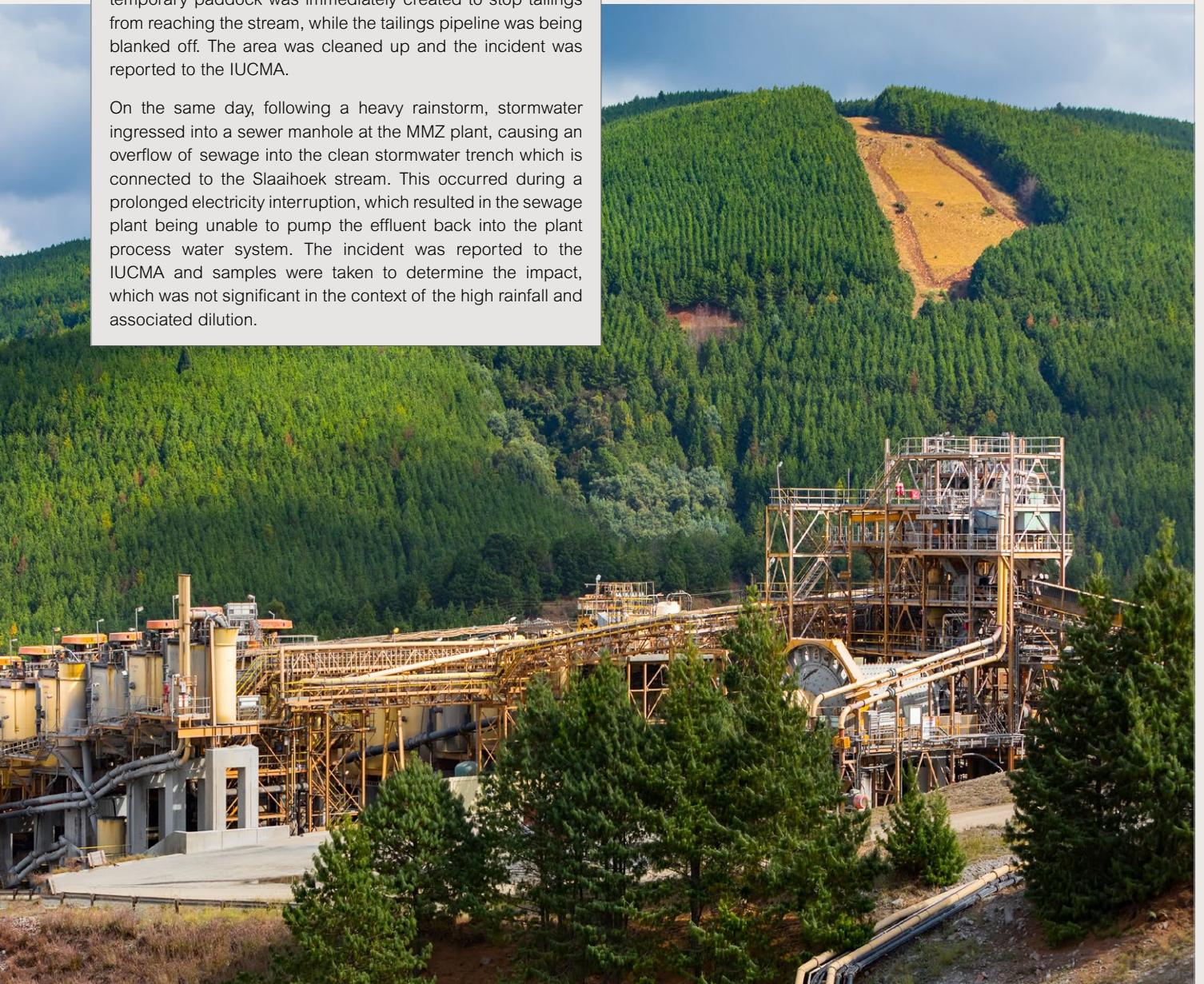
**Discharges – Two Rivers Mine**

On 4 December 2018 and on 13 January 2019, the plant pollution control dam discharged approximately 500 m<sup>3</sup> and 1 000 m<sup>3</sup> respectively into the natural environment when severe thunderstorms caused power supply interruptions across the mine. It was not possible to pump process water from the pollution control dam back to the plant until backup measures were implemented.

On 13 January 2019, electricity interruptions due to a severe thunderstorm event also resulted in the North decline pollution control dam discharging approximately 1 000 m<sup>3</sup> into the Klein Dwars River.

On 13 May 2019, a blockage in the main decline sewage plant caused an overflow of approximately 50 m<sup>3</sup> of sewage to the natural environment. The area was cleaned up and the sludge was removed as hazardous waste.

Incidents were reported to the relevant authorities.





WATER MANAGEMENT continued

Consumption includes evaporation (and transpiration), water incorporated into product and/or waste streams (entrainment), and other operational losses.

Re-use efficiency is the volume of untreated water used in tasks which has already been worked by the site as a percentage of the total volume of all water used in tasks. Re-use efficiency varies across the operations and is underreported as some operations do not measure flows of worked water back into tasks. Some

operations supply water to neighbouring communities, farms and other users. This is water not intended for primary mining activity use and is classified as a “diversion”.

We aim to continually improve our measurement and reporting of water metrics according to the new ICMM framework and significant expenditure has been committed to the installation of flow meters. F2020 will include a focus on capturing all worked water flows, consumption sources, outputs and changes in water storage.

ARM WATER BALANCE SUMMARY F2019\*

Metric	Source/destination/type	Volume of water by quality		
		High (m³)	Low (m³)	Total (m³)
<b>Withdrawal</b>	Surface water (m³)	4 720 458	2 285 234	7 094 735
	Groundwater (m³)	7 869 186	6 809 520	14 678 706
	<b>Total withdrawal (m³)</b>	<b>12 589 643</b>	<b>9 094 754</b>	<b>21 773 441</b>
<b>Output</b>	Surface water (m³)	4 534	429 279	433 813
	Groundwater (m³)	0	215	215
	Supply to third party (m³)	0	3 840	3 840
	<b>Total output (m³)</b>	<b>4 534</b>	<b>433 334</b>	<b>437 868</b>
<b>Consumption</b>	Evaporation (m³)	350 888	1 607 272	1 918 247
	Entrainment (m³)	0	4 680 141	4 680 141
	Other (m³)	0	165 123	165 123
	<b>Total consumption (m³)</b>	<b>350 888</b>	<b>6 452 536</b>	<b>6 763 511</b>
<b>Re-use efficiency</b>	Total of all flows to tasks (m³/a)	6 946 468	63 912 089	70 858 557
	Total worked water flows to tasks (m³/a)	na	49 749 766	49 749 766
	<b>Reuse efficiency (%)</b>	<b>na</b>	<b>na</b>	<b>70%</b>
<b>Diversions</b>	<b>Water diverted to neighbouring communities, farms and other users (m³)</b>	<b>504 376</b>	<b>942 348</b>	<b>1 446 724</b>

\* Reported according to ICMM water reporting metrics.

### 4.3 Water challenges and opportunities

Certain of our operations face significant catchment-level water risks that arise from poor existing water infrastructure, a lack of funding and capacity to deliver new infrastructure, and the impacts of climate change on supply of water to adequately meet the growing need. Water availability, consumption, and pollution are regarded as key risks to the Group and are included in both the operational and the corporate risk registers. We see water-related opportunities particularly through collective action at the catchment level.

#### 4.3.1 Material water risks

##### 4.3.1.1 Corporate level

Water is a material matter across the Group, although for different reasons at different operations. Key risks to business value and performance relate to potential non-compliance with WULs (especially where mines have a positive water balance and risk discharge events), risks to adequate water supply and climate and water-related disruptions that affect our operations and suppliers and can result in production stoppages. The key risk areas are water availability, uncertainty in the existing policy environment, the state of existing water infrastructure and the related socio-economic impacts. The security of the supply of water in the Northern Cape is a material risk at the Group level (high residual risk).

ARM anticipates that the likelihood and impact of these risks will increase over time as climate change results in more extreme weather events and drought. At the same time ARM has taken steps to mitigate these risks. For example, in the Northern Cape, at the corporate level ARM has played a leading role in securing long term bulk water supplies (see 4.5.3) in addition to the operations investing in water purification and storage, and implementing various efficiency measures.

##### 4.3.1.2 Operational level

Seven of the eight operations under ARM’s direct or joint control are located in water stressed areas. In the Vaal Water Management Area (WMA) this includes Beeshoek, Khumani and Black Rock mines in the Northern Cape (representing 85% of EBITDA). In the Olifants WMA, this includes Two Rivers and Modikwa mines (representing 17% of EBITDA). In the Inkomati-Usuthu WMA, this includes Nkomati Mine and Machadodorp Works. Cato Ridge Works, in the Pongola-Uzimkulu WMA, is not in a water stressed area.

#### PROPORTION OF OPERATIONS IN WATER STRESSED AREAS


Catchments	Operations	
	Number	% of ARM total*
Inkomati-Usuthu WMA	2	25%
Olifants WMA	2	25%
Vaal WMA	3	38%

\* Operations under ARM’s direct or joint operational control.


WATER MANAGEMENT continued

Summary catchment and operational risks within the Vaal WMA

<b>Catchment Stress</b>	<ul style="list-style-type: none"> <li>» Moderate according to the Water Risk Filter* (risk rating 2.8).</li> <li>» ARM's company-specific risk assessment rates the basin risk higher as the Sedibeng pipeline infrastructure requires investment and the source catchment faces water stress.</li> <li>» There is limited catchment management (no Catchment Management Agency (CMA)). Operations technically need to contribute to the establishment and effective functioning of a CMA as part of their WULs but failure to achieve this is due to governance challenges and capacity constraints of the regulator. This issue therefore does not present a risk of non-compliance but rather a risk with respect to effective catchment management (mitigated to some extent by the Tshiping Water Users Association (WUA)).</li> </ul>
<b>Beeshoek Mine</b>	<ul style="list-style-type: none"> <li>» <b>Overall risk rating</b> (Water Risk Filter): 3.9 (high).</li> <li>» <b>Primary Risk – Physical:</b> water shortage (need for long term supply and storage).</li> <li>» <b>Secondary Risk – Regulatory:</b> limited catchment management.</li> <li>» <b>Secondary Risk – Physical:</b> flooding (resulting in production disruptions) and other extreme weather events and periodic excess of supply.</li> </ul>
<b>Khumani Mine</b>	<ul style="list-style-type: none"> <li>» <b>Overall risk rating</b> (Water Risk Filter): 4.0 (high).</li> <li>» <b>Primary Risk – Physical:</b> water shortage (need for long term supply and storage).</li> <li>» <b>Secondary Risk – Regulatory:</b> limited catchment management.</li> </ul>
<b>Black Rock Mine</b>	<ul style="list-style-type: none"> <li>» <b>Overall risk rating</b> (Water Risk Filter): 4.0 (high).</li> <li>» <b>Primary Risk – Physical:</b> water shortage (including future depletion of underground source – particularly in shallow aquifers (boreholes)).</li> <li>» <b>Secondary Risk – Regulatory:</b> limited catchment management, pending WUL amendments</li> </ul>

\* WWF's Water Risk Filter (<https://waterriskfilter.panda.org/>) is an online tool that helps companies and investors assess and respond to water-related risks facing their operations and investments across the globe. The tool rates operational and basin risk on a scale of 1 – 5.  4.5.4.

At our operations in the Northern Cape (Beeshoek, Black Rock and Khumani mines), issues around water scarcity can potentially impact on current operations as well as potential future expansion or growth plans. In addition, this presents a core concern for local communities and employees. The key risk areas are water availability, uncertainty in the existing policy environment, the state of existing water infrastructure, Eskom power disruptions (impacting water supply) and the related socio-economic impact.

Water supply restrictions have been experienced at Khumani Mine and this has affected the mine's ability to pursue capacity expansion initiatives. Since April, Sedibeng municipality has supplied sufficient water to run the operations which was expected during the winter season due to decreased demand by other users; the sustainability of the current supply is however not guaranteed after the winter season. Assmang has offered to contribute a portion of the capital required for the Sedibeng infrastructure upgrade.  4.5.3.

Black Rock Mine has procured a Reverse Osmosis (RO) plant which will impact the use of water, therefore the new activity must be approved as part of the Water Use Licence by the Department of Water and Sanitation. The mine has submitted an application and awaits approval.

There is limited catchment management in the area and while Tshiping Water User Association (WUA) mitigates this risk, there is not a good understanding of the catchment-level water balance. Water restrictions have been experienced at the operations. During the year water had to be trucked in and water bottles purchased for employees working underground at Black Rock Mine. The operations also face a relatively minor risk of flooding during extreme weather events.



WATER MANAGEMENT continued

**Summary catchment and operational risks within the Inkomati-Usuthu WMA**

<b>Catchment Stress</b>	<ul style="list-style-type: none"> <li>» High according to the Water Risk Filter* (risk rating 4).</li> <li>» The catchment has one of the few effective CMA's in the country and this helps to mitigate overall catchment risk.</li> </ul>
<b>Machadodorp Works</b>	<ul style="list-style-type: none"> <li>» <b>Overall risk rating</b> (Water Risk Filter): 3.8 (high).</li> <li>» <b>Primary Risk – Physical:</b> surface water contamination (limited production activities to manage high rainfall events).</li> </ul>
<b>Nkomati Mine</b>	<ul style="list-style-type: none"> <li>» <b>Overall risk rating</b> (Water Risk Filter): 4.0 (high).</li> <li>» <b>Primary Risk – Physical:</b> surface water contamination (too much water, inadequate storage/space).</li> <li>» <b>Secondary Risk – Regulatory:</b> non-compliance with WUL.</li> <li>» <b>Secondary Risk – Reputational:</b> due to discharge perceived to affect local farmers and the Vygeboom Dam.</li> </ul>

At Nkomati Mine, excess water requires de-watering of the area around the open pit mine to keep it safe. Our priority is to minimise abstraction from other sources by recycling water and using groundwater from the de-watering process. The physical risk of surface water contamination also presents a regulatory risk of non-compliance with the Water Use License (WUL) and reputational risk as discharge is perceived to affect local farmers and the Vygeboom dam. Reduced production activities due to economic and market conditions have resulted in pressure put on the system at Machadodorp Works. There is reduced re-use and consumption and therefore any rainwater poses a potential risk of controlled discharge and associated non-compliance with the waste management and water use licences.

**Summary catchment and operational risks within the Olifants WMA**

<b>Catchment Stress</b>	<ul style="list-style-type: none"> <li>» Moderate according to the Water Risk Filter* (risk rating 2.6).</li> <li>» There is limited catchment management (no CMA). Operations technically need to contribute to the establishment and effective functioning of a CMA as part of their WULs but failure to achieve this is due mainly to governance challenges and capacity constraints of the regulator.</li> </ul>
<b>Modikwa Mine</b>	<ul style="list-style-type: none"> <li>» <b>Overall risk rating</b> (Water Risk Filter): 4.0 (high).</li> <li>» <b>Primary Risk – Physical:</b> water shortage (driven more by socio-economic dynamics around access to water and services rather than drought).</li> <li>» <b>Secondary risk – Physical:</b> underground flooding due to a positive water balance underground.</li> <li>» <b>Secondary Risk – Regulatory:</b> lack of established CMA.</li> <li>» <b>Secondary Risk – Reputational:</b> vandalism (pipeline) and poor quality supply to villages/third parties.</li> </ul>
<b>Two Rivers Mine</b>	<ul style="list-style-type: none"> <li>» <b>Overall risk rating</b> (Water Risk Filter): 4.1 (high).</li> <li>» <b>Primary Risk – Physical:</b> water scarcity; extreme weather events (including increased spillages).</li> <li>» <b>Secondary Risk – Regulatory:</b> lack of established CMA: poor catchment management (the mine tried to develop a sub-catchment balance but other users reluctant to contribute).</li> </ul>

Water availability is at risk at Modikwa Mine due to socio-economic reasons rather than drought. Community unrest and vandalism could impact the water supply to the mine. The inadvertent discharge also presents a regulatory and reputational risk. Two Rivers Mine is less exposed to water supply risks, but the area faces poor catchment management and efforts to develop a sub-catchment balance have not been successful.

**4.3.1.3 Joint venture and investment level**

ARM Coal has an effective 20.2% in the Participative Coal Business (PCB) and an effective 26% in Goedgevonden (GGV). Our partner Glencore Operations South Africa (GOSA), owns the remaining stakes. 3.4.1.1. Water risks are considered and reported on where appropriate during the quarterly steering committee meetings of GGV and PCB.

There has been engagement between Glencore and the Centre for Environmental Rights (CER), which has requested information regarding Water Use Licence audits conducted on these operations. The Minerals Council South Africa (MCSA) provided an industry response to CER after the publication of their Full Disclosure Report "The Truth about Mpumalanga Coal Mines' Failure to Comply with their Water Use Licenses."

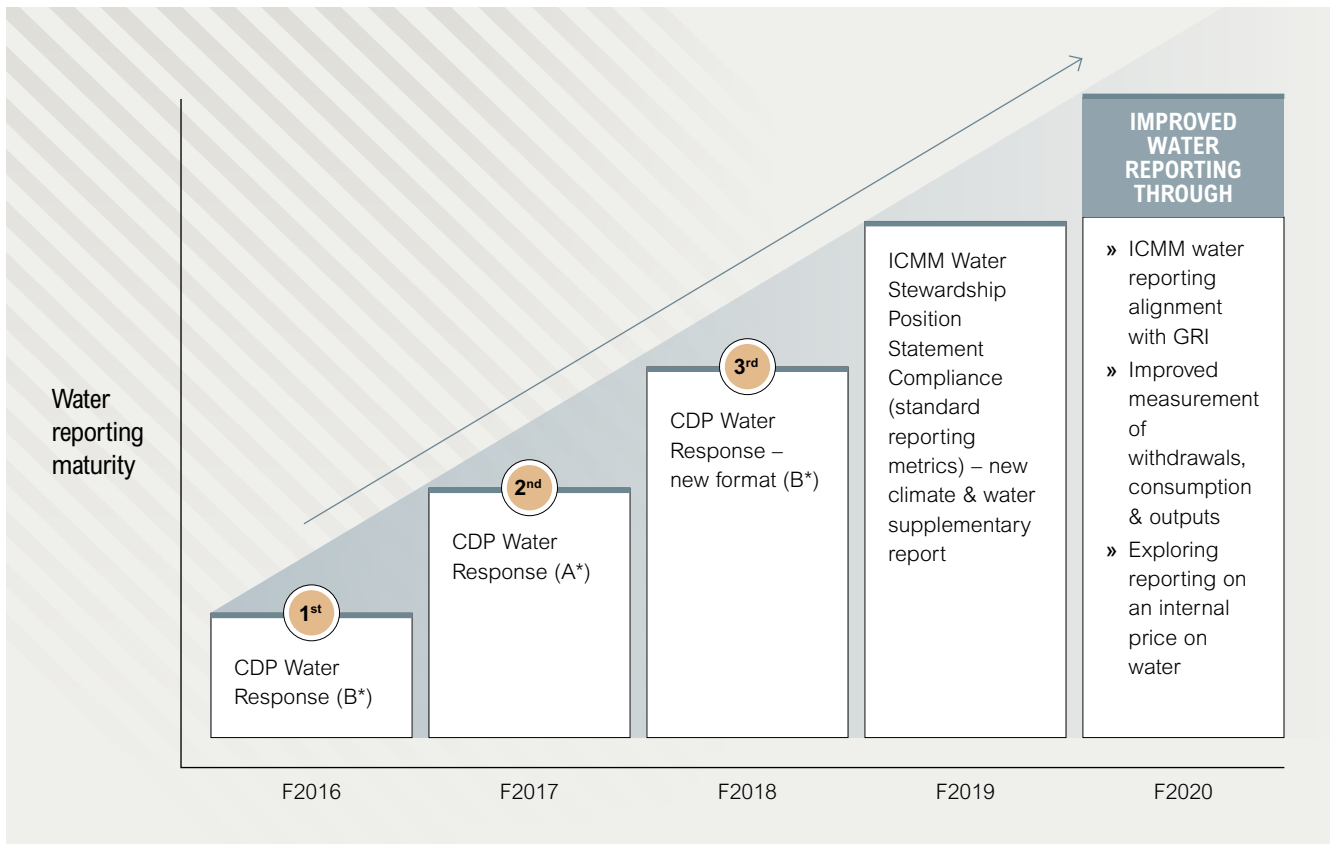
Glencore responded to the CER directly with respect to concerns raised regarding Tweefontein (part of PCB) and GGV operations' Water Use Licences (WUL).

The MCSA is facilitating further engagement with the CER regarding the 2019 Full Disclosure Report.



WATER MANAGEMENT continued

4.3.1.4 Water risk reporting



\*The Carbon Disclosure Project (CDP) scores responses as an incentive and guide for companies on a journey through disclosure towards becoming a leader on environmental transparency and action. The scoring methodology changed significantly in 2018 as part of the CDP’s “re-imagining disclosure” process.

4.3.2 Material water opportunities

Our focus on improving operational efficiency includes identifying opportunities to reduce water use. Investment in bulk water schemes affecting our Northern Cape operations, via the Sedibeng pipeline, and Modikwa Mine, as part of the Lebalale Water User Association and the Olifants River Water Resource Development Project (ORWRDP) phase 2 investments, have the potential to increase costs between four and fivefold. Reducing water consumption reduces costs and the need for investment in bulk water supply infrastructure in areas where water is scarce.

We are also increasingly looking beyond our operational borders to contribute to collective action at the catchment level. Ensuring an adequate supply of water will build community resilience to adapt to a changing climate where projected water availability is expected to decrease (and demand is expected to grow). This is an opportunity to improve community relations and strengthen our social licence to operate.

4.3.3 Water and tailings

Tailings management and water reporting were particular areas of focus during F2019. Reviews were conducted at all tailings storage facilities (TSFs) to assess legal compliance, risk assessments and emergency response plans, and progress undertaken was reported to the ARM CEO and divisional Chief Executives at a workshop in May 2019. Independent external review of the TSFs is being conducted in line with global best practice and dam break analyses have been commissioned to inform enhanced emergency response planning.

ARM engaged with a coalition of investors represented by the Church of England Pension Fund and the Council of Ethics for the Swedish National Pension Funds that wrote to 680 mining companies requesting disclosure of information on tailings storage facilities.

ARM’s comprehensive TSF disclosure is available on our website at [www.arm.co.za](http://www.arm.co.za).

We are committed to ensuring the stability of our TSFs and a professional engineer is appointed to perform this specialised function for each of our TSFs. The most recent structural stability reports confirm the TSFs at ARM’s managed operations as stable. In line with global best practices, an independent external review of the TSFs is being implemented to enhance our TSF management systems.



WATER MANAGEMENT continued

Tailings storage facilities\*

40

Catchment	Number of tailings dams in operation	Number of inactive tailings dams	
Vaal WMA	4	0	This includes tailings dams at Beeshoek (1 active), Khumani (1 active) and Black Rock mines (3 active including a new TSF operational from March 2019)
Pongola-Uzimkulu	0	0	This includes Cato Ridge Works which does not have any tailings dams
Inkomati-Usuthi	2	2	This includes Mochadodorp Works (no tailings dams) and Nkomati Mine (2 active and 2 inactive). One of the inactive facilities at Nkomati Mine has been closed
Olifants WMA	2	0	This includes Two Rivers (1 active) and Modikwa mines (1 active)

South Africa

\* For operations under ARM's direct or joint operational control.

ARM manages potential impacts on human health or water ecosystems associated with the tailings dams in our control at the operational and corporate levels.

At each operation managed by ARM (excluding coal operations managed and reported on by Glencore), an internal competent person (in most cases the manager of the process plant) is appointed as the responsible manager (the Manager) in terms of the Mine Health and Safety Act (MHSA), to oversee the operation of each tailings storage facility (TSF). Legislative requirements are assessed and incorporated into the TSF management system. Each operation has submitted and implemented the requisite mandatory Code of Practice (COP) on the operation of mine residue facilities according to the guidelines of the South African Department of Mineral Resources (DMR). Internal and external reviews take place. Operating manuals and procedures have been developed and are aligned with the COPs. A professional civil/geotechnical engineer (the Engineer) is appointed at each operation to conduct annual structural stability audits and quarterly surveillance monitoring of the TSFs. A specialist TSF operating company (the Operator) has been appointed at all mines (with the exception of Beeshoek Mine) to operate the TSF in close cooperation with the Manager and audited by the Engineer on a quarterly basis. Routine daily, weekly and monthly inspections are performed both by the operating company and the operation.

At the corporate level, a multi-disciplinary internal team conducts an annual review of management controls at ARM's operational TSFs. The scope of the review includes management controls and governance systems in place to ensure that TSFs are legally compliant and that each risk profile is understood and managed; and during 2018 also included a review of alignment with the Position Statement on Tailings Management, published by the International Council on Mining and Metals (ICMM), of which ARM is a member. In addition, a review of tailings management at each

TSF is conducted annually by the risk engineer from the International Mining Industry Underwriters (IMI) during the annual risk survey. Detailed comments and recommendations relevant to TSFs are added to each operational risk profile and progress is tracked on a quarterly basis.

### 4.4 Water-related detrimental impacts

During F2019, electricity supply interruptions affected water supply to the operations in the ARM Ferrous division in the Northern Cape and water had to be trucked in and bottled water procured for employees working at Black Rock Mine.

Previously reported detrimental water-related impacts included:

- » Flooding in the Northern Cape occurred due to excessive thunderstorms in January 2017. This is not normal for the area and affected both Beeshoek and Khumani mines. Plant stoppages occurred at Beeshoek Mine in January and February 2017 due to flooding. At Khumani Mine, the excessive rain led to seven days of lost production due to unsafe haul road conditions.
- » Between December 2016 and February 2017, the Khumani Plant experienced downtime due to water shortages of 113 hours and 93 hours, for the off-grade plant and the on-grade plant respectively. The downtimes consequently resulted in a loss amounting to 259 900 tons off-grade feed and 124 605 tons on-grade feed at an expected off-grade product output of 163 737 tons and 102 176 tons for on-grade material.
- » Floods and sinkholes (caused by earlier droughts) affected Black Rock Mine logistics in F2016: suppliers had to travel an additional 100km, resulting in increased transport costs and causing delays. There were no production losses associated with the event.

WATER MANAGEMENT continued

## 4.5 Commitment and response

Water challenges are shared and require collaboration by governments, civil society, businesses, and local communities. We recognise that we need to manage water impacts at our operations but that responsible water stewardship and holistic risk mitigation requires collective action at the catchment level.

### 4.5.1 Responsibility for water

ARM Board, through the ARM Social and Ethics Committee, has ultimate responsibility for water management at ARM. The responsibility for implementation rests with the Chief Executive Officer; delegated to the Chief Executives of each division and the Executive Sustainable Development, who is responsible for reviewing sustainable development-related policies, strategies and targets (including ARM’s water consumption reduction target) and ensuring that these are aligned with the Board’s commitment to zero tolerance to harm.

Water is recognised in our Enterprise Risk Management system as one of our principal risks with associated opportunities and is therefore a key input into our sustainable business strategy, which is ultimately the responsibility of ARM’s CEO.

The ARM Social and Ethics Committee monitors and reports on the manner and extent to which ARM protects, enhances and invests in the wellbeing of the economic, social and the natural environment in which ARM operates.

The Company’s governance and reporting structure is displayed on page 10. Assmang, a joint venture between ARM and Assore Ltd, has established a Social and Ethics Committee which monitors environmental performance in the ARM Ferrous division and is chaired by the ARM Head of Investor Relations. Each operation in the ARM Platinum division has a Sustainable Development Committee, chaired by the ARM Executive Sustainable Development, which reports to the Exco or Board of the respective Joint Ventures, as appropriate.


The responsibility for implementation of climate and water related activities rests with the Chief Executive and the Chief Executives of each division and the Executive Sustainable Development, who reports to the Chief Executive Officer of ARM with oversight from the Social and Ethics Committee. The Executive Sustainable Development also reports to the Management Risk and Compliance Committee, a sub-committee of the Audit and Risk Committee of the Board, on matters and activities related to water as a standard agenda item.


ARM does not currently have incentives for C-suite employees or board members related to water performance. Water management forms part of the KPIs of relevant engineers at the operations. For example, the moisture content in tailings is linked to employee bonuses at Khumani Mine.

### 4.5.2 Integrating water stewardship into our strategy

We have integrated water considerations into the business strategy by considering water risks and opportunities at the company and asset levels, measuring and managing our water withdrawals, consumption, outputs and re-use efficiency and taking actions to mitigate risks and take advantage of opportunities. Information on the level of risk or opportunity and capacity to manage these are tabled and discussed at the ARM Management Risk and Compliance Committee as well as the Social and Ethics Committee whose outputs feed directly into the strategy development process.

We have an important role to play in the sustainable management of water resources and aim to achieve this through a proactive and holistic water management strategy built around identifying and mitigating water-related risks, exploring opportunities and engaging with partners to achieve collective action. We focus on water balances; a hierarchy of water use and minimising withdrawal of clean/potable/ municipal water. Our goal is to reuse 100% of water and to have no discharges.

In F2019 we developed a water policy for integrating water stewardship into our business strategy.  4.1.

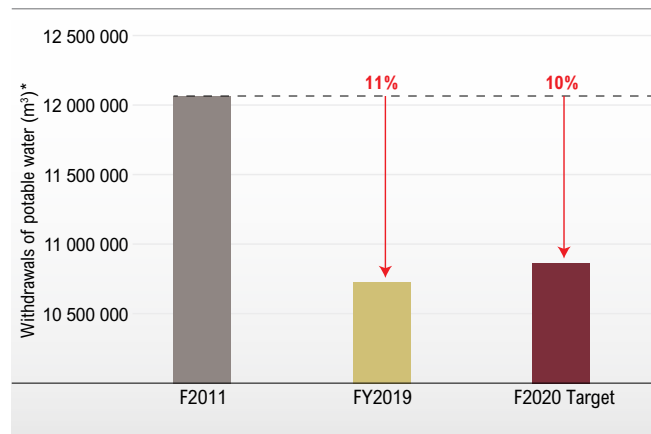
Additionally, ARM intends to conduct a climate scenario analysis to understand the impact of climate change on the resilience of the business. This will include consideration of different water-related futures influenced by climate change.  3.7.

#### 4.5.2.1 Our water target

**Target:** To reduce withdrawals of potable water (surface and municipal sources) by 10% by FY2020 relative to FY2011 (excluding Machadodorp Works and divested operations)

We have set a water target to reduce withdrawals of potable water (surface and municipal sources) by 10% by FY2020 relative to FY2011. This target includes all existing ARM operations except Machadodorp Works (which is on care and maintenance) and excludes divested operations since FY2011 (Dwarsrivier and Lubambe Mines). As part of annual workshops at our operations, focusing on climate and water compliance, we explored the development of a new water target related to withdrawals. Operations were consulted on what would constitute an appropriate water target for ARM based on site-specific considerations of what is realistic but ambitious. A realistic target has been set and represents the first step on the water target setting journey. Based on lessons learned in setting our first target, the process of measuring performance in achieving the target and any new developments and best practices that emerge, we will set new more ambitious targets going forward. The new water reporting system, in line with the ICMM framework, has delivered more consistent metrics across the operations and will allow ARM to set more appropriate water targets in the future.

#### PROGRESS TOWARDS ARM’S WATER TARGET



\* “Potable water” includes surface and municipal surface water (excluding precipitation and runoff).

We are on track to achieve our F2020 water target. A revised target will be developed during the coming financial year.



WATER MANAGEMENT continued

**4.5.2.2 A catchment-based approach**

We have also adopted a more catchment-based approach and have thus become more collaborative in delivering on our strategic objectives. For example, at Khumani Mine, the team engaged in the project management and engineering and maintenance issues around the provision of water (public/maintenance service). This is fundamental to our growth objectives. Similarly, we have increasingly recognized the value of water and resultant efficiencies achieved are therefore aligned with our strategic objectives relating to operational efficiencies and relevant KPIs have been introduced at the operational level.

**42** At the corporate level, ARM recognises the strategic imperative in understanding the bulk water suppliers and as such, participates in active platforms. The operations engage with catchment level forums that estimate current and future catchment balances. The Inkomati-Usuthu CMA where Nkomati Mine operates is effective in facilitating this. Tshiping Water User Association (WUA) in the Northern Cape serves this function reasonably well but other forums or CMAs are less effective and catchment-level water availability and quality are less well understood.

**Case study: a viable Water Public-Private Partnership contributing to meeting catchment needs**

The Lebalelo Water User Association (LWUA) is a Section 12 entity set up by mining companies operating in Limpopo. The association acts as a water utility supplying bulk raw water to member mines and other clients from the Olifants River and the Flag Boshielo dam (and the De Hoop dam in the future). The establishment of the LWUA was preceded by a number of requests for water out of the Olifants River for urban and industrial use, by Water Authorities and mining companies situated in the area of jurisdiction of the Sekhukhune District Municipality, Limpopo Province. This includes Modikwa Mine.

In 2016 the disestablishment of LWUA was gazetted. Government cannot buy out the scheme at present and therefore LWUA continues to operate it successfully. Further, the successful

operation of the Public Private Partnership has positioned the LWUA to play a bigger strategic role in the Olifants Water Resources Development Project (OWRDP) and the delivery of water to the appropriate catchments.

An ARM Executive is currently the vice chair of the association (previously the chair) on behalf of Modikwa Mine. ARM's interests are in securing adequate water supply for the mine and other users in the catchment and ensuring the mine does not get burdened with unnecessary costs and that costs are appropriately apportioned. Involvement in the LWUA is also important from a strategic expansion perspective, providing the potential flexibility to enable ARM's growth in the area).

The operations engage with the Department of Water and Sanitation (DWS), local communities, local, provincial and national authorities, irrigation boards, catchment management agencies, and other industry users to ensure the sustainability of water resources for all stakeholders. We have also invested in borehole sinking and equipping for local social use through the ARM BBEE Trust Water Provision Projects.

The future impacts of climate change are expected to impact the availability of water which, in the river basins where we share water resources with other users, has the potential to create conflict with local communities. Future changes in the availability, quality, and price of water and the associated impacts on communities are assessed as part of risk management and strategic planning processes. Appropriate technology is considered during feasibility studies to reduce our own water requirements.

**Community water**

Access to water is a challenge in the Northern Cape and the ARM Ferrous division mines support various projects that aim to address these challenges. Khumani and Black Rock mines contributed to the construction of the new Kuruman bulk water reservoir to replace the old reservoir and help to address the bulk water storage challenges in Kuruman, which will benefit around 11 000 households. Khumani Mine implemented a project in partnership with the Gamagara municipality to upgrade the wastewater treatment plant that services the Dibeng area (approximately 7 800 residents).

The mine also provided R14.5 million to construct 321 water-borne toilets for 321 stands in the Olifantshoek community and upgraded and secured sewerage pump stations in Kathu and Mopoteng. Beeshoek Mine upgraded water infrastructure at Postmasburg Hospital, which serves Tsantsabane. The project improved water availability and included the renovation of 14 ablution facilities. The mine also erected a fence around the hospital to improve security.

WATER MANAGEMENT continued

4.5.2.3 Metrics

This is the first year that ARM has reported data according to the definitions and formats prescribed by the ICMM. Going forward ARM will be able to report year-on-year and trend data using consistent metrics.

**WATER BALANCE SUMMARY FOR ARM OPERATIONS IN THE VAAL WMA\* F2019**

Metric	Source/destination/type	Volume of water by quality		
		High (m³)	Low (m³)	Total (m³)
<b>Withdrawal</b>	Surface water	2 598 233	157 354	2 755 587
	Groundwater	7 000 110	1 786 502	8 786 612
	<b>Total withdrawal</b>	<b>9 598 343</b>	<b>1 943 856</b>	<b>11 542 199</b>
<b>Output</b>	Surface water	0	0	0
	Groundwater	0	215	215
	Supply to third party	0	3 840	3 840
	<b>Total output</b>	<b>0</b>	<b>4 055</b>	<b>4 055</b>
<b>Consumption</b>	Evaporation	0	530 245	530 245
	Entrainment	0	1 816 590	1 816 590
	Other	0	165 123	165 123
	<b>Total consumption</b>	<b>0</b>	<b>2 511 958</b>	<b>2 511 958</b>
<b>Re-use efficiency</b>	Total of all flows to tasks (ML/a)	4 839 677	42 268 545	47 108 222
	Total worked water flows to tasks (ML/a)	na	35 746 612	35 746 612
	<b>Reuse efficiency (%)</b>	<b>na</b>	<b>na</b>	<b>76%</b>
<b>Diversions</b>	<b>Water diverted to neighbouring communities, farms and other users</b>	<b>504 376</b>	<b>0</b>	<b>504 376</b>

\* Includes Beeshoek, Khumani, and Black Rock mines.

**WATER BALANCE SUMMARY FOR ARM OPERATIONS IN THE PONGOLA-UZIMKULU WMA TOTAL\*F2019**

Metric	Source/destination/type	Volume of water by quality		
		High (m³)	Low (m³)	Total (m³)
<b>Withdrawal</b>	Surface water	293 499	0	293 499
	Groundwater	0	0	0
	<b>Total withdrawal</b>	<b>293 499</b>	<b>0</b>	<b>293 499</b>
<b>Output</b>	Surface water	4 534	0	4 534
	Groundwater	0	0	0
	Supply to third party	0	0	0
	<b>Total output</b>	<b>4 534</b>	<b>0</b>	<b>4 534</b>
<b>Consumption</b>	Evaporation	282 264	134 599	416 863
	Entrainment	0	0	0
	Other	0	0	0
	<b>Total consumption</b>	<b>282 264</b>	<b>134 599</b>	<b>416 863</b>
<b>Re-use efficiency</b>	Total of all flows to tasks (ML/a)	293 499	134 599	428 098
	Total worked water flows to tasks (ML/a)	na	134 599	134 599
	<b>Reuse efficiency (%)</b>	<b>na</b>	<b>na</b>	<b>31%</b>
<b>Diversions</b>	<b>Water diverted to neighbouring communities, farms and other users</b>	<b>0</b>	<b>0</b>	<b>0</b>

\* Includes Cato Ridge Works. (note that the operation is not in a water stressed area).

WATER MANAGEMENT continued

**WATER BALANCE SUMMARY FOR ARM OPERATIONS IN THE INKOMATI-USUTHI WMA TOTAL\* F2019**

Metric	Source/destination/type	Volume of water by quality		
		High (m³)	Low (m³)	Total (m³)
<b>Withdrawal</b>	Surface water	236 395	487 521	723 916
	Groundwater	664 660	2 974 530	3 639 190
	<b>Total withdrawal</b>	<b>901 055</b>	<b>3 462 051</b>	<b>4 363 106</b>
<b>Output</b>	Surface water	0	424 279	424 279
	Groundwater	0	0	0
	Supply to third party	0	0	0
	<b>Total output</b>	<b>0</b>	<b>424 279</b>	<b>424 279</b>
<b>Consumption</b>	Evaporation	68 624	909 836	978 461
	Entrainment	0	53 289	53 289
	Other	0	0	0
	<b>Total consumption</b>	<b>68 624</b>	<b>963 125</b>	<b>1 031 750</b>
<b>Re-use efficiency</b>	Total of all flows to tasks (ML/a)	466 731	13 431 185	13 897 916
	Total worked water flows to tasks (ML/a)	na	8 112 975	8 112 975
	<b>Reuse efficiency (%)</b>	<b>na</b>	<b>na</b>	<b>58%</b>
<b>Diversions</b>	<b>Water diverted to neighbouring communities, farms and other users</b>	<b>0</b>	<b>942 348</b>	<b>942 348</b>

\* Includes Machadodorp Works and Nkomati Mine.

**WATER BALANCE SUMMARY FOR ARM OPERATIONS IN THE OLIFANTS WMA TOTAL\***

Metric	Source/destination/type	Volume of water by quality		
		High (m³)	Low (m³)	Total (m³)
<b>Withdrawal</b>	Surface water	1 681 374	1 640 359	3 321 733
	Groundwater	204 415	2 048 488	2 252 904
	<b>Total withdrawal</b>	<b>1 885 789</b>	<b>3 688 847</b>	<b>5 574 637</b>
<b>Output</b>	Surface water	0	5 000	5 000
	Groundwater	0	0	0
	Supply to third party	0	0	0
	<b>Total output</b>	<b>0</b>	<b>5 000</b>	<b>5 000</b>
<b>Consumption</b>	Evaporation	0	32 592	32 592
	Entrainment	0	2 810 262	2 810 262
	Other	0	0	0
	<b>Total consumption</b>	<b>0</b>	<b>2 842 854</b>	<b>2 842 854</b>
<b>Re-use efficiency</b>	Total of all flows to tasks (ML/a)	1 435 603	8 077 761	9 513 364
	Total worked water flows to tasks (ML/a)	na	5 755 580	5 755 580
	<b>Reuse efficiency (%)</b>	<b>na</b>	<b>na</b>	<b>60%</b>
<b>Diversions</b>	<b>Water diverted to neighbouring communities, farms and other users</b>	<b>0</b>	<b>0</b>	<b>0</b>

\* Includes Modikwa and Two Rivers mines.

ARM is not currently able to report on the proportion of sites with water performance targets as the existing water target applies only at the ARM level. Although the target is informed by site-level assessments, the approach is intended to enable flexibility to accommodate different operational and market contexts that influence our operations' ability to reduce withdrawals of potable water.



WATER MANAGEMENT continued

**4.5.2.3 Verification**

ARM's annual water data are assured by a third party.

IBIS ESG Assurance (Pty) Ltd provided independent assurance over ARM's Sustainability Report and the engagement was performed in accordance with the AccountAbility AA1000AS guidelines (assurance Type II, moderate). This includes a review of the reporting process and an assessment of the report against AccountAbility's guiding principles of inclusivity, materiality, and responsiveness.

The assurance process includes the total volume of water withdrawal from all sources and total water discharged from sites.

 The Independent Assurance Statement can be found on page 90 of the 2019 Sustainable Development Report.

**4.5.3 Engagement around water**

There is a growing awareness of the need for collective action to reduce water usage, use water more efficiently, repair leaks, restore ecosystem health, and to identify and manage water risks through stakeholder engagement. Investors and other stakeholders are increasingly calling for greater insight into catchment-level water balances, including projected demand and supply as well as water quality elements.

ARM's commitment to water stewardship drives our engagements with various stakeholders to find solutions appropriate to all water users' needs. We engage with a broad range of water-related stakeholders to ensure the sustainability of water resources and that all operations have the necessary controls in place to ensure that the quality of water around them is not negatively affected. These stakeholders include the Department of Water and Sanitation, local communities, authorities at the local, provincial and national levels, water forums, irrigation boards, catchment management

agencies, farmers and other industry users. Engagements with communities help us to understand and mitigate their concerns, identify how ARM can contribute to community water security and increase transparency regarding our operations. We partner with local and regional government structures where appropriate to mitigate water risks that arise outside mine boundaries.

Operations participate in forums that discuss issues relating to sustainable water supply in the region. These include climate change and the potential influence of changing climate and potential regulation could have on the supply and cost of water.

Operations engage with catchment level forums that estimate current and future catchment balances. The Inkomati-Usuthu Catchment Management Agency (CMA) where Nkomati Mine operates is effective in facilitating this. Tshiping Water User Association (WUA) in the Northern Cape serves this function reasonably well but other forums or CMAs are less effective and catchment-level water availability and quality are less well understood.

**WATER-RELATED FORUMS IN WHICH ARM OPERATIONS PARTICIPATE OR INTERACT INCLUDE:**

- » The Gladdespruit Forum;
- » The Tubatse Environmental Forum;
- » The Lebalelo Water User Association;
- » The Olifants River Water Resources Development Project;
- » The Tshiping Water User Association; and
- » The Manganese Leadership Forum (engaging around the appropriate design of the Vaal Gamagara Water Supply Scheme).

**Case study: leading collective investments in bulk water infrastructure in the Northern Cape**

The increasing cost and unreliable supply of water in the Northern Cape present a material risk to our operations in the area. We have been leading a process to proactively mitigate this risk.

In 2017 Assmang was instrumental in setting up the Mines Leadership Forum (MLF) as a collaborative platform under the Minerals Council of South Africa. Funds were raised through the MLF/Mines to support ongoing technical, legal and financial engagements with the municipal water provider, Sedibeng. Due to the protracted finalization of the Offtake Agreement, a Capital Raising Fee was proposed by the MLF to address immediate funding requirements on the Vaal Gamagara Water Supply Scheme (VGGWSS), and a Steering Committee has been convened with Sedibeng Water to provide oversight on the ongoing VGGWSS work. An ARM executive is the vice chair of this committee.

Work is ongoing to agree on contributions from various stakeholders and to clarify the scope, expenditure outlook and available funds for subsequent investments. Assmang continues to collaborate with Sedibeng water to deliver this project. In the absence of the offtake

agreements, parties have agreed on a Capital Raising Fee of R17.58/kl in addition to consumptive charges (as of September 2019). This will raise around R500m additional funds from the industry over 24 months and will provide some relief to the immediate VGGWSS replacement funding costs.

To mitigate supply disruptions, mines are maximising stockpiling at the mines and at the port. This has been driven by the Mine Leadership Forum and allows "catching up" if there are water supply disruptions. For example, Khumani mine has invested in additional capacity to accommodate the need to "catch up" as a result of water supply interruptions. There are however limits to this measure and therefore sustaining funding and moving forward with the development of the project is needed to secure long-term bulk water supplies.

Mines continue to participate through a steering committee and are committed to supporting Sedibeng to ensure appropriate governance to take this project forward.

## WATER MANAGEMENT continued

ARM is a member of the ICMM and is committed to implementing the ICMM Sustainable Development Framework and the ICMM's Position Statement on Water Stewardship (2017). The Executive Sustainable Development is a member of the Water Working Group which considers emerging issues driven by new legislation or society and translates this into the need to develop collective industry/good practice, policy or position statements as appropriate.

#### 4.5.4 Identifying and managing water risks and opportunities at the operational level

ARM's Enterprise Risk Management (ERM) process links the strategic intent factors to the water risks that may help or hinder the operation from achieving its objectives. Water is inherently included in the strategic intent factors. Water availability is considered as part of each operation's five-year business plan and these assess the availability and use of appropriate technology to address water requirements or manage impacts.

In 2017 and 2018 ARM undertook site-specific risk assessments at Beeshoek, Black Rock, Khumani, Nkomati, Modikwa, and Two Rivers mines as part of a water performance and reporting gap analysis and compliance project. In F2019 the WWF Water Risk Filter was used to support the identification and assessment of water-related risks at the operations.

At the corporate level, ARM has embarked on a process to identify risk associated with critical suppliers that may result in a business continuity impact on the operations. We have not identified our supply chain as presenting a material water-related risk to our organisation, based on experience and initial investigations into potential risks in the future (other than the need to secure the supply of water for the operations).

##### 4.5.4.1 Direct water risks

Our focus on operational efficiencies emphasises the value of water and the need to use it efficiently. Water balances at operations manage and optimise water use and, where water is material, relevant KPIs are in place to incentivise increased water efficiency.

All operations run closed-circuit water systems to the extent possible to maximise reuse and minimise discharge into the environment. Dirty and clean water are separated, and operations implement a hierarchy of water use to ensure that "dirty" or process water is recycled for re-use before clean water is abstracted from the natural environment. Where appropriate, technologies such as reverse osmosis (RO) have been implemented to clean process water and we continue to investigate natural, sustainable alternatives such as wetland formation, particularly for mine closure plans and objectives. Surface water and groundwater quality are monitored to measure compliance with WUL conditions, assess our impact on the receiving environment and flag the need for mitigation. Biomonitoring of aquatic/riverine environments is performed as appropriate and as stipulated in each operation's WUL conditions.

Mines use dust suppression surfactants to reduce evaporation as well as various other measures to reduce consumption, increase storage and mitigate production downtime.

Beeshoek Mine has invested in mobile pumps, a new stormwater dam and plans to build a new return water dam. Additionally, an improvement in the current plant is proposed that will include a thickening facility with significant associated water saving benefits.

Black Rock Mine has invested in a reverse osmosis (RO) plant and filters and reuses process water for gland services. The modernisation and expansion project at the mine will also include an ultra-thickened tailings facility. Permitting is complete and the facility is being commissioned. A new lined tailings storage facility is being commissioned and once functional, will improve water performance by reducing the loss of water through seepage. Additionally, the mine has undertaken significant capital expenditure on water metering. While this has resulted an "increase" in water withdrawals being reported, it actually reflects an improvement in measurement and understating of water impacts on the mine.

In addition to a design that uses a paste technology for tailings disposal (recovering up to 85% of water), Khumani Mine has invested in long term on-site water storage and built additional stormwater trenches and dams which also reduces safety risks during extreme weather, thus limiting production downtime. The mine also commissioned a new cell in its tailings storage facility in F2019. This will have a negative water management impact for the first six months as the mine will not be able to recover the water during the commissioning phase. Thereafter there will be significant water saving benefits. A further three additional lined water storage dams are being built (not yet completed) to provide a holding facility to mitigate the risk of water supply disruptions from Sedibeng (municipal water source). Khumani Mine has also upsized production capacity on the mine to allow for an ability to catch up in the case of stoppages due to water and electricity supply disruptions. During summer, production has to decrease but can ramp up in winter to reach the production target.

Nkomati Mine has invested in additional water storage and evaporation fans to manage excess water in an attempt to eliminate discharge. The mine has also achieved improved reuse and recycling of water from the Onverwacht tailings storage facility (TSF) through the utilisation of the old tailings pipeline as an additional new return water pipeline, effectively doubling the pumping capacity of excess water from the TSF to the plant. Additional benefits include a significant reduction in the requirement for freshwater make-up to the processing plant as well as reducing water containment on the TSF which is a known stability risk on tailings dams.

At Machadodorp Works, a water management project team has been established. The smelter has constructed cut off trenches, doubled the sump size and is investigating a RO plant to mitigate the risk of discharges to the environment.

Two Rivers Mine has optimised flocculent and increased pump and pipe sizes to reduce spillage. A new lined tailings facility will reduce losses from seepage.

We are increasingly looking beyond our operational borders to contribute to collective action at the catchment level. For both our Northern Cape and Platinum division operations we are engaging in collective actions to ensure long term bulk water supplies.

ARM and its joint venture partners, through its operations, invest in local water infrastructure through their Social Labour Plans (SLPs) to improve community access to sufficient potable water and increase community resilience. The ARM BBEE Trust funds water provision projects including the sinking and equipping of boreholes for various schools and communities around South Africa.

WATER MANAGEMENT continued

4.5.4.2 Water risk in the value chain

Management has embarked on a process to identify risk associated with critical suppliers that may result in a business continuity impact on the operations. Our supply chain has not been identified as presenting a material water-related risk to our organisation, based on experience and initial investigations into potential risks in the future (other than the need to secure the supply of water for the operations). Substitutes of critical supplies are available and water

costs still represent a relatively small contribution to the cost of purchased goods and services.

The most immediate concern relates to extreme weather events (floods and droughts) affecting logistics and the ability to receive goods and services in a timely manner. We recognise the need to better inform our assessment of supply chain risk and have undertaken a more comprehensive assessment of water risk in our supply chain.

Assessing water risk in our supply chain

In F2019 ARM undertook an assessment of each operation's top five suppliers by spend. The assessment sought to better understand suppliers' performance with respect to water as part of assessing water-related risks to ARM's operations. This included a review of publicly available documentation (e.g. Carbon Disclosure Project Responses and Sustainable Development Reports) and assessments of the companies by third parties (e.g. news sources and research/advocacy reports). Information was available on big suppliers but limited public information could be obtained for the smaller, more local suppliers. This information, together with locations of suppliers' primary operations, was used to assess operational and basin level water risks using the WWF's Water Risk Filter (<https://waterriskfilter.panda.org/>). This is an online tool that helps companies and investors assess and respond to water-related risks facing their operations and investments across the globe.

Eskom, Total SA, and Sasol were found to have high basin and operational water risks. Only one supplier was found to have an operational risk rating lower than the basin risk in their key area of operation. Applying the Water Risk Filter, the analysis suggests that many suppliers may not be adequately considering and managing water risks.

Large suppliers report on water impact and performance but do not provide information on water impacts at the product level. There is no evidence that smaller operations assess and manage water-related risks.

Going forward ARM will identify additional relevant suppliers to engage with directly and will consider the best way in which to gather data on suppliers' water performance measures that can help to adequately assesses water-related risks in our supply chain on an ongoing basis.

4.6 Future water focus areas

AREAS OF FOCUS IN F2020/F2021 INCLUDE:

- » Incorporating recent and ongoing work by the ICMM on alignment with GRI Standard 303. ARM will focus on addressing some of the gaps related to reporting on the change in water storage.
- » Addressing gaps in reporting with respect to the ICMM water reporting guidelines. This includes an increased focus on withdrawals from water entrained in ore as ("groundwater") and capturing all consumption and output values.
- » Developing a revised ARM water target beyond F2020.







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