

Climate change and water report



2022

Our 2022 suite of reports

IAR 2022 integrated annual report

A holistic assessment of ARM's ability to create sustainable value, with relevant extracts from the annual financial statements, the environmental, social and governance (ESG) report and Mineral Resources and Mineral Reserves report.

AFS 2022 annual financial statements

The audited annual financial statements have been prepared according to International Financial Reporting Standards (IFRS).

ESG 2022 ESG report

A detailed review of our performance on key environmental, social and governance matters. The ESG report includes the full remuneration report and should be read in conjunction with the GRI Index.

CCW 2022 climate change and water report

A detailed review of our performance on our key climate change and water matters, in line with the Taskforce on Climate-related Financial Disclosures (TCFD).

KING 2022 King IV™* application register

A summary of how ARM implements the principles and practices in King IV to achieve the governance outcomes envisaged.

MRMR 2022 Mineral Resources and Mineral Reserves report

In line with JSE Listings Requirements, ARM prepares Mineral Resources and Mineral Reserves statements for all its mining operations as per SAMREC guidelines and definitions (2016).

AGM 2022 notice to shareholders

- Notice of annual general meeting
- Form of proxy
- Commitment to good governance
- Board of directors
- Report of the audit and risk committee
- Report of the social and ethics committee chairman
- Summarised remuneration report
- Summarised directors' report
- Summarised consolidated financial statements

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Information available on our website at www.arm.co.za



Information available elsewhere in our reports

All monetary values in this report are in South African rand unless otherwise stated. Rounding may result in computational discrepancies on management and operational review tabulations.



African Rainbow Minerals (ARM) is a **leading South African diversified mining and minerals company** with operations in South Africa and Malaysia. ARM mines and beneficiates iron ore, manganese ore, chrome ore, platinum group metals (PGMs), nickel and coal and also has a strategic investment in gold through Harmony Gold Mining Company.

Contents



Overview

About this report	2
Social and ethics committee chairman's report	4
Our approach	8
Our climate-change journey to date	8
Our water journey to date	11
Risk management	13
Climate and water compliance and reporting programme	14
Annual climate change and water workshops	15

Governance

Oversight	17
Executive remuneration	19
Assurances	19
Stakeholder engagement	20
Supply chain engagement	20
Public/policy engagement	20
Engaging with our partners	21

Climate change

Our position on climate change	23
Strategy	24
Scenario analysis	24
Operation-specific decarbonisation pathways	25
Exploring renewable energy opportunities	26
Managing change	27
Carbon pricing	27
Risk management	28
Climate transition risks and opportunities	28
Physical climate risks and opportunities	32
Integration of climate change risk into ARM's ERM processes	36

Climate change continued

The impact of risks and opportunities on business and financial planning	36
Considering climate-change risks in ARM's investments	37
Targets and performance	38
GHG emissions	38
Energy	50
Future climate-change focus areas	51
TCFD index	52

Water

Water stewardship policy	55
How we use and manage water	56
Strategy	58
Context-based water targets	58
Water stewardship	58
Risk management	59
ARM's water risks	59
Catchment-level risks	63
Mainstreaming water risks into ARM's ERM processes	67
ARM's water opportunities	67
Detrimental water-related impacts	67
Targets and performance	68
Progress towards ARM's water target	68
Water withdrawals	69
Future water focus areas	74
List of acronyms	75
Contact details	IBC
Forward-looking statements	IBC

About this report

ARM's 2022 climate change and water report offers detailed insight into our initiatives to improve our performance and reporting on climate change and water management.

This report details our climate change and water strategies, risk-management efforts, and targets and performance measurements between 1 July 2021 and 30 June 2022 (F2022). It should be read with our 2022 IAR and ESG reports, which are available on our website at www.arm.co.za.

It covers operations that we either directly control or jointly manage, including those that form part of our ferrous and platinum divisions. Like our ESG report, this report does not address the operations, joint ventures or investments that we do not manage directly – such as ARM Coal, the Sakura Ferroalloys smelter and Harmony Gold – or projects that are in exploration, development or feasibility phases. These investments are part of our scope 3 greenhouse gas (GHG) emissions inventory and included in our assessment and management of indirect climate and water-related risks and opportunities. All information is provided on a 100% basis throughout.

In our climate change and water-management strategies and reporting, we draw on various frameworks, guidelines, good-

practice measures and regulatory compliance requirements. We also seek to continually meet the reporting expectations of our varied and evolving stakeholder base.

As its core framework, this report uses the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) and the position statements of the International Council on Mining and Metals (ICMM) on water stewardship and climate change. We have also considered:

- ICMM membership requirements and principles and related-performance expectations
- JSE sustainability and climate disclosure guidance
- The International Sustainability Standards Board (ISSB) exposure drafts for Disclosure of Sustainability-related Financial

Information and Climate-related Disclosures

- CDP (formerly the Carbon Disclosure Project)
- The FTSE-Russell ESG Index
- GRI standards and mining and metals sector supplement disclosures
- World Economic Forum's (WEF) stakeholder capitalism metrics
- Engagements with non-governmental organisations (NGOs), non-profit organisations and other stakeholders
- Regulatory reporting requirements
- Other evolving reporting expectations.

Throughout this report we justify and explain how and where we have used a comparative basis of reporting with previous years. We also cross reference content to relevant TCFD recommendations.



Social and ethics committee chairman's report



Dr Rejoice Simelane

Chairman of the social and ethics committee

ARM's strategic priorities to operate safely, responsibly, and efficiently, and to partner with communities and other stakeholders, are founded on responsible environmental, social, and governance practices and our commitment, as ICMM members, to Mining with Principles. Living our motto of **We do it better** includes an unwavering commitment to ethical and responsible practices.

Responsibilities

Ultimate responsibility for monitoring the effective management of sustainable development lies with the ARM board. The board delegates this responsibility to the social and ethics committee.

The committee is constituted under regulation 43(5)(c) of the Companies Regulations promulgated under the Companies Act. Its purpose is to monitor and report on the manner and extent to which ARM protects, enhances and invests in the economy, society and natural environment in which it operates to ensure its business practices are sustainable.

The committee is responsible for monitoring specific activities under relevant legislation, other legal requirements and codes of best practice including:

- Social and economic development
- Responsible corporate citizenship, including promoting equality, preventing unfair discrimination and measures to address any incidents, and contributing to the development of communities in which ARM operates
- Sustainable development, including environmental management, occupational health and wellness and safety
- Stakeholder relationships
- Labour and employment.

The committee operates according to its terms of reference, which are regularly updated, and assumes responsibility for matters assigned by the board. It draws relevant matters to the attention of the board and reports to shareholders at annual general meetings.

The committee is supported by executive management and relevant executive committees and governance structures, including the employment equity and skills development committee. It oversees

the management of ESG risks, which are identified by internal and external stakeholders and governance processes, including the enterprise risk management programme.

Composition

The committee's terms of reference provide for a minimum of three members, with a majority of independent non-executive directors. Currently, the committee has five non-executive directors, all of whom are independent. Members have extensive experience in mining operations, human capital, sustainable development, and stakeholder relations.

Invitees to meetings include the chief executive officer (CEO), executive director: investor relations and new business development, divisional chief executives, executive: risk and sustainability, group executive: human resources, group executive: legal and group executive: compliance and stakeholder relations.

Engaging and collaborating to promote good ESG practice

Mining and processing unlock the value in mineral reserves, catalysing growth and development. As we conduct our activities, we never lose sight of our responsibility to manage and mitigate any potential negative impacts. We recognise that we operate in a broader context and endeavour to build on our good relationships with stakeholders and engage them in open dialogue.

We share learnings and implement industry good practice across operations and with our peers in industry associations. ARM is a member of the ICMM, shares its commitment to mining with principles, and has implemented its sustainable development framework. Since 2019, ARM operations and the corporate

office have completed self-assessments against the ICMM's 38 performance expectations (PEs). For the past two years, these self-assessments were validated as part of the external assurance over ESG data performed by IBIS ESG Consulting Africa Pty Ltd. Gaps identified are being addressed as part of our preparation to report on the PEs in F2023.

ARM's commitment to responsible ESG practices is demonstrated by the 25% weighting of relevant indicators in the performance criteria for the 2018 conditional share plan (CSP) and 2018 cash-settled CSP. These criteria include safety, transformation and climate change performance conditions (see page 164 of the ESG report). Cash bonuses for senior executives also include a safety modifier, with a further downward adjustment in the case of fatalities.

We regard the increased focus on environmental and social responsibility as a positive development that signals the maturing of sustainability as a concept and a growing priority for investors and other providers of capital, customers and civil society, among others. We are extremely pleased that ARM's ESG practices continue to be recognised by our inclusion in the FTSE/JSE Responsible Investment Top 30 Index and the FTSE4Good Index Series.

Responsible stewardship of natural resources

ARM recognises the critical global challenges that climate change presents and the effects that these may have on our business, our stakeholders and the world. We are committed to participating in the global response to reduce carbon emissions and to mitigating the physical impacts caused by climate change.

F2022 focus

In the review period, the committee:

- Monitored tailings storage facilities at our managed operations
- Monitored safety improvement and rollout of a critical control management system to enhance risk controls
- Received reports on and monitored the company's Covid-19 response
- Oversaw transformation, gender mainstreaming and talent management initiatives
- Monitored continued implementation of enterprise development programmes, including supplier development initiatives
- Monitored ongoing efforts to reduce carbon emissions and further improve our corporate water and climate-change reporting process, including development of the long-term decarbonisation pathways, operational GHG emission-reduction targets and finalisation of the context-based water targets
- Monitored allegations received via ARM's whistleblower facility, including complaints or concerns on sustainable development matters
- Considered management reports on compliance with legal requirements in terms of the company's legal compliance policy
- Received reports on the Competition Act online compliance training programme and annual compliance certification
- Received reports on the company's performance against the B-BBEE codes of good practice
- Received reports on compliance with the National Environmental Management Act, National Water Act and other safety, health and environmental legislation
- Monitored risk areas affecting the sustainability of the business, together with the audit and risk committee, and received a report on the findings of the annual corporate risk workshop
- Monitored compliance with the mining charter and Department of Trade, Industry and Competition targets, as well as the company's adoption of standards of good practice, in terms of its membership of the ICMM.

Social and ethics committee chairman's report continued

We announced our long-term GHG emission reduction target at the start of F2022, which aims to achieve net-zero GHG emissions (scope 1 and 2) mining by 2050. This year we focused on developing operation-specific decarbonisation pathways that detail the short- and medium-term steps that need to be taken to achieve that target. We recognise that decarbonisation cannot happen at all costs, particularly in the context of a developing country. Based on this recognition, we are working to identify contextually appropriate and just mitigation options for each operation.

ARM's F2022 estimated carbon footprint (scope 1 and 2 emissions on a 100% basis) decreased 6.8% to 1.9 million tonnes of carbon dioxide equivalent (tCO₂e), and electricity consumption decreased 11% to 1 381GWh. These decreases are largely due to Nkomati Mine moving to care and maintenance in the second half of F2021. Our current target is a 4% absolute reduction of scope 1 and 2 emissions by F2023 against a F2018 baseline through emission-reduction initiatives (excluding divestments and Nkomati Mine). Despite increased production and reduced furnace efficiency, we achieved a 1.6% reduction against this target in F2022.

One of the areas we are focusing on as we work to mitigate climate change is improving our accounting and reporting processes. In addition to making significant strides in improving the completeness and accuracy of our scope 3 inventory, a notable change in F2022 has been a shift from calculating and reporting on ARM's GHG emissions according to an equity share boundary, to reporting on emissions according to operational control. This means our emissions are now reported on a 100% basis for operations where we have direct or joint operational control. This change addresses previous inconsistencies, and aligns this reporting with our other ESG

metrics (e.g., safety, health, and environmental and social data). The shift also better supports our efforts to assess and manage decarbonisation risks and opportunities and the impacts of climate change on overall company performance.

Work over the past two years has given us a thorough understanding of the resilience of our business to climate transition and physical risks. Given that we operate mainly in a country where electricity is generated by coal-fired power stations, with a national power grid facing serious constraints, there is a limit to our ability to reduce our carbon footprint through business-as-usual methods. Accordingly, we are installing solar photovoltaic (PV) plants with battery storage at our Black Rock and Khumani mines in the ferrous division. Our platinum division finalised an agreement post year end to generate around one-third of its power needs over three years through 100MW of solar PV energy.

Globally, water systems are under threat from rising consumption, pollution, weak governance, and climate change. 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 strain. We have made significant advances in measuring water impacts and water reporting over the last four years and are making progress towards reporting water data according to the revised ICMM water accounting framework guideline. Water reuse efficiency, a key indicator in monitoring and managing consumption and losses, improved to 79% in F2022.

Total water withdrawal decreased 13% to 17.4 million m³ in F2022. Our current water target was to maintain the reduction in withdrawals of potable water at 17% in F2022 relative to F2011, and I am pleased to report that we achieved a 19% reduction on this

basis in F2022. Context-based water targets or objectives were set for operations with material water-related risks, aligned with ICMM guidance.

Responsible tailings management is a priority for ARM, the mining industry and investors. In addition to the critical compliance requirements set in the guidelines of the DMRE and the South African National Standard on the management of mine residue (SANS 10286), ARM is implementing a tailings storage facilities (TSFs) management policy and standard that align with appropriate good-practice standards nationally and internationally, including the Global Industry Standard on Tailings Management (GISTM).

To transform our commitment into action, we have incorporated measurable climate change and water targets into the remuneration packages of relevant executives. We believe this is the most effective and sustainable way of aligning management and stakeholder interests.

Ethics and compliance

The code of conduct formalises ARM's values and commits us to the highest moral, ethical and legal compliance in dealing with our stakeholders. Directors and employees are required to maintain these standards to ensure the company's business is conducted honestly, fairly, legally, reasonably, in good faith and in the best interests of all stakeholders.

During the year, the committee received and considered reports on compliance with the code of conduct, including the online training programme. The company followed up on assessments to counteract risks of fraud, bribery and corruption. ARM has a whistleblower policy and the committee received reports on results of investigations into calls made to the independent whistleblower facility.

ARM regards legal compliance as the minimum requirement while we implement targeted improvement initiatives, including reducing water consumption and carbon emissions. Ongoing engagements with regulators ensure that the required licences and permit applications are approved and in place, and that we continue to comply with the conditions of these authorisations. Amendments to licences and permits are an ongoing process as operations expand and projects evolve, underpinned by internal and external compliance monitoring processes.

No major environmental incidents were reported at our operations in F2022.

Assurance

In line with its terms of reference, the committee had oversight of ARM's appointment of an independent external sustainability assurance provider for the 2022 ESG report, in line with the ICMM, and reported to ARM's audit and risk committee that the appointment was made. This assurance included selected ESG information included in the 2022 IAR and in this report.

Execution of responsibilities

Based on its activities, we believe the social and ethics committee has executed its duties and responsibilities during the financial year in line with the Companies Regulations and its terms of reference.

Acknowledgements

I thank my colleagues on the social and ethics committee and board for their diligent contribution during the year. On behalf of the board, I thank management and employees for their hard work during the year and for continuing to demonstrate our shared commitment to act with integrity, respect the environment and make a positive contribution to society as we work towards achieving our strategic goals.

We remain mindful that ARM's ability to create value depends on the value we create for others and thank all our stakeholders for their support and positive engagements.

Dr RV Simelane

Chairman of the social and ethics committee



Our approach

We are committed to contributing to global efforts to reduce carbon emissions and mitigating the physical impacts of climate change. We are equally committed to contributing to a water-secure future that is socially and culturally equitable, environmentally sustainable, and economically beneficial. To meet these commitments each year, we strive to take steps to better monitor and mitigate our environmental impacts, to improve our understanding of and response to risks, and to comply with reporting and regulatory requirements.

We house climate change and water together in this single report given that they are inextricably linked. For clarity's sake, we describe our climate change and water journeys separately, in this and subsequent sections. However, where relevant, we describe how the respective activities and analyses intersect.

Our climate-change journey to date

There is a 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.

We have taken many notable GHG target-setting steps since we first tracked and reported on GHG emission-reduction initiatives to the CDP in 2010. In F2020, we revised our carbon emission-reduction target based on a bottom-up assessment of opportunities to reduce GHG emissions at our operations, and a top-down assessment that included benchmarking against peer company targets and stakeholder expectations. In F2021, we set the long-term, company-level target of achieving net-zero GHG¹ emissions from mining by 2050 (figure 1). This year we focused on developing operation-

specific decarbonisation pathways that detail the short- and medium-term steps that need to be taken to achieve that long-term target. We recognise that decarbonisation cannot happen at all costs, particularly in the context of a developing country, and are working to identify contextually appropriate and just mitigation options for each operation.

As part of the pathway process, we have categorised mitigation options (eg energy efficiency, renewable energy, electrification, green fuels, green hydrogen and carbon offsets) into work streams with different levels of risk and certainty, and are exploring how to roll these out in effective, context-appropriate ways. We have already initiated diverse emission-reduction activities, including executive remuneration incentives; internal carbon pricing; energy efficiency projects and capital allocation; and explorations into low-carbon technologies and products. Some of our most advanced explorations have focused on different opportunities to invest in renewable energy technologies (eg solar PV in the Northern Cape) and to procure clean energy from renewable sources (eg wheel renewable energy to our platinum operations).

Our actual emissions have decreased over time due largely to Nkomati Mine moving to care and maintenance. Emission reductions have been offset by increases due to changing operating conditions (such as higher stripping ratios, or mining deeper and farther) reflected in the largely stable, sometimes increasing, emissions intensities per product. To assess performance, we consider a business-as-usual baseline that isolates the impacts associated with emission-reduction initiatives. Our performance has varied over the years. Between F2013 and F2018 our emissions

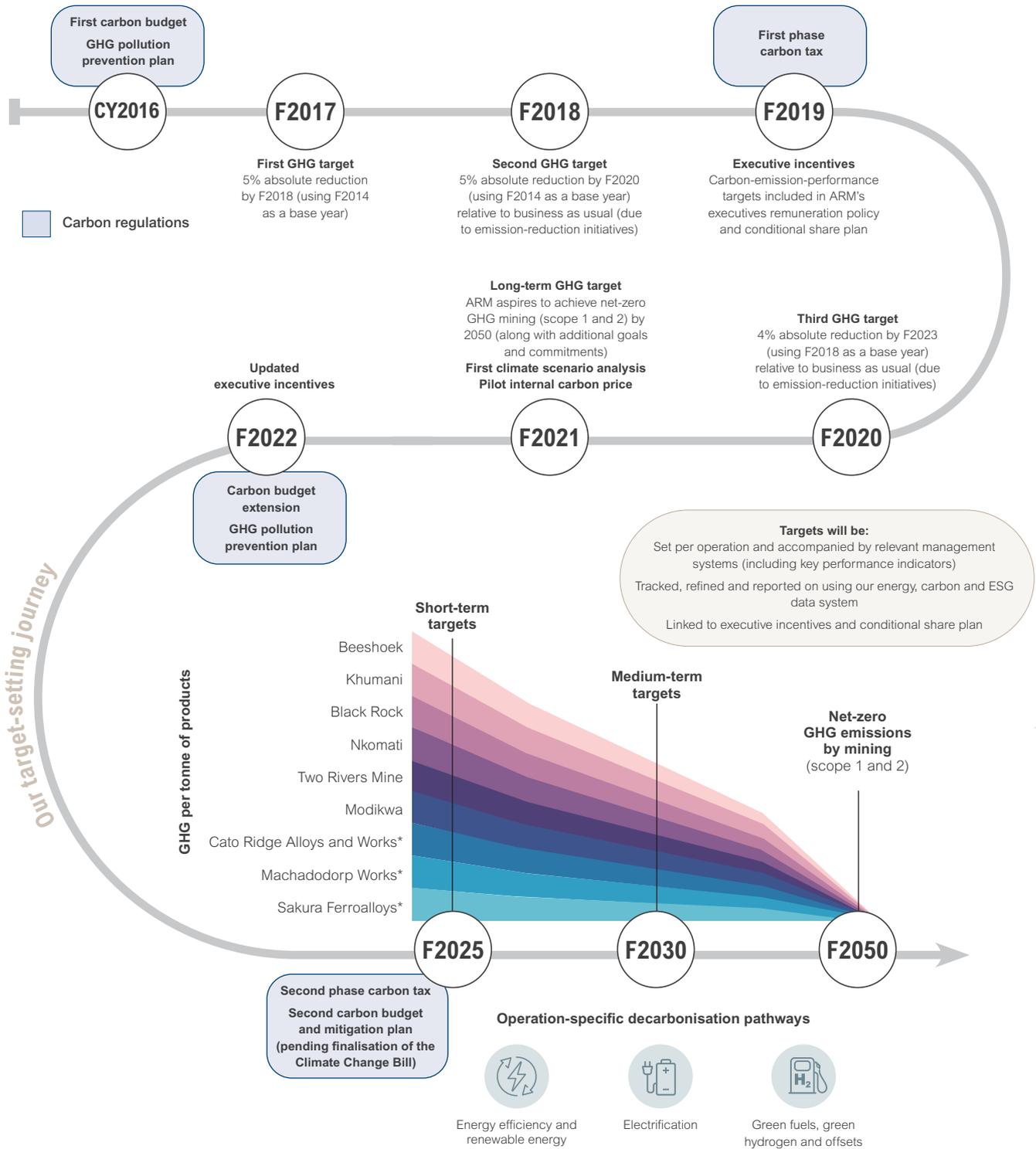
reduced steadily. These reductions slowed in F2019 due to challenging market conditions, limited viable options, the implementation of many 'quick-win' initiatives, and the financial and governance processes associated with capital investments. However, due to additional investments and improved measurement and reporting, we registered significant additional emission savings in F2020 and F2021. This year, we found a 1.6% absolute reduction of scope 1 and 2 emissions compared with a business-as-usual baseline.

We are using climate scenario analysis (first done in F2021) to better understand and plan for future business impacts and to better integrate climate change into our enterprise risk management (ERM) processes. Extreme weather events have already affected most of ARM's mining sites, and by assessing different climate futures we are gaining a stronger understanding of the physical climate risks to which some of our operations and suppliers will be exposed. The climate scenario analysis is also elucidating the risks and opportunities associated with the global transition to low-carbon energy and industry.

One of our primary focus areas involves improving our accounting and reporting processes, and this year we interrogated and adjusted our GHG reporting boundary. Previously, we calculated and reported on emissions according to ARM's equity share (attributable emissions) in the operations where we have operational or joint operational control. However, this year, following benchmarking of both our peers and joint venture partners, and in line with stakeholder expectations, we shifted our reporting to operational control boundaries. This change addresses previous

¹ This includes ARM's scope 1 and 2 emissions associated with operations under direct or joint direct operational control.

Figure 1: GHG targets and decarbonisation pathways



To support and complement our decarbonisation pathways and deliver on our long-term ambition, we commit to:

- Work collectively to ensure enabling policy environments
- Work collectively to secure financial and technical support, especially for mining and metals operations in developing countries
- Engage with suppliers to ensure the availability of feasible decarbonisation technologies relevant to our specific operations
- Collaborate across our value chains to determine the most appropriate role we can play in contributing to net-zero scope 3 emissions
- Engage with our joint venture partners to get buy-in and ensure alignment with their commitments, provided these are in line with our overall level of ambition.

* The smelters are not included in the current net-zero GHG by 2050 commitment, but they are included in the decarbonisation pathway development process.

Our approach continued

inconsistencies, and aligns this reporting with our ESG metrics (eg safety, health and environmental and social data). The shift also better supports our efforts to assess and manage decarbonisation risks and opportunities and the impacts of climate change on overall company performance.

Operations and investments outside of ARM's operational control are now included under the scope 3 emissions category. This includes emissions associated with coal investments (based on % equity in Goedgevonden (GGV), Participative Coal Business (PCB) and ARM Coal, Harmony and Sakura).

We have also continued to improve the accuracy and completeness of our scope 3 GHG inventory, and this year have included emissions associated with our investment in Sakura. We also continue to engage

in the ICMM Working Groups, driving improved reporting and appropriate measures for the industry to contribute to the decarbonisation of our value chain. We have also reviewed our industry associations' positions on climate change to ensure alignment of our direct and indirect climate-related lobbying with our long-term ambition (page 21).

We continue to comply with the South African carbon budget requirements. We submitted data as part of the phase 1 extension and were allocated an extended budget. We also submitted a GHG pollution prevention plan (PPP) that was approved by the Department of Forestry, Fisheries and Environment (DFFE). The second phase of the carbon budget has been hampered by delays in the promulgation of the Climate Change Bill. However, we have taken steps to proactively prepare for this legislated phase,

including the development of our operation-specific decarbonisation pathways, and by investing in appropriate management systems to ensure compliance.

We continue to investigate ways in which we can leverage our socio-economic development (SED) and corporate social investment (CSI) spending to enhance community resilience to climate change. During our climate scenario analysis process we identified transformation initiatives (specifically social and labour plan (SLP), environmentally sustainable development (ESD), SED and Community Trusts) as having the potential to contribute to improved resilience of vulnerable host communities to adapt to climate change. This year we initiated a process to identify where existing efforts contribute to this objective and can be scaled up, and where positive resilience outcomes can be driven by new transformation initiatives.



Our products are contributing to a low-carbon future

Saving energy, reducing emissions



- Higher-quality ores optimise production and generate lower emissions
- Our high-quality lumpy iron ore lowers transport emissions
- Our high-grade manganese uses less energy when processed.

Enabling the hydrogen economy



- Hydrogen fuel cells use platinum to generate energy from hydrogen and oxygen; water is the only emission
- Our platinum can be used to create hydrogen fuel cell electric vehicles, which offer a zero-emissions alternative to the internal combustion engine.

Storing energy efficiently



- Lithium-ion energy storage is supporting the growth of renewable energy and electromobility
- Our nickel and manganese are used in these batteries.

Our water journey to date

Water is essential to all mining and metals operations. Without access to water, ARM cannot function. We are increasingly exposed to water-related risks that could affect production, increase costs, constrain growth, disrupt our supply chains, and place our communities under strain.

Our proactive and holistic water management strategy facilitates how we sustainably manage our water resources. It is 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 uses, and minimising withdrawal of clean, potable, or municipal water. Our goal is to recycle 100% of water – excluding losses due to evaporation, seepage, and entrainment – and to have no reportable discharge incidents.

As an ICMM member, and in line with our water stewardship policy (page 55), we use water targets to better manage our water withdrawals, consumption, outputs and reuse efficiency. Our initial target was set at the ARM-level, and included a 10% reduction of potable water withdrawals

(surface and municipal sources) by F2020, relative to F2011 levels (figure 2). Over the next two years we increased the ambition of this target (to 15% by F2020, and 17% by F2021), exceeding the targets in both instances. However, without covering the multi-dimensional risks specific to each operational context (even mines in the same catchments face different water challenges), our operations did not find the targets useful for measuring and driving their water performance.

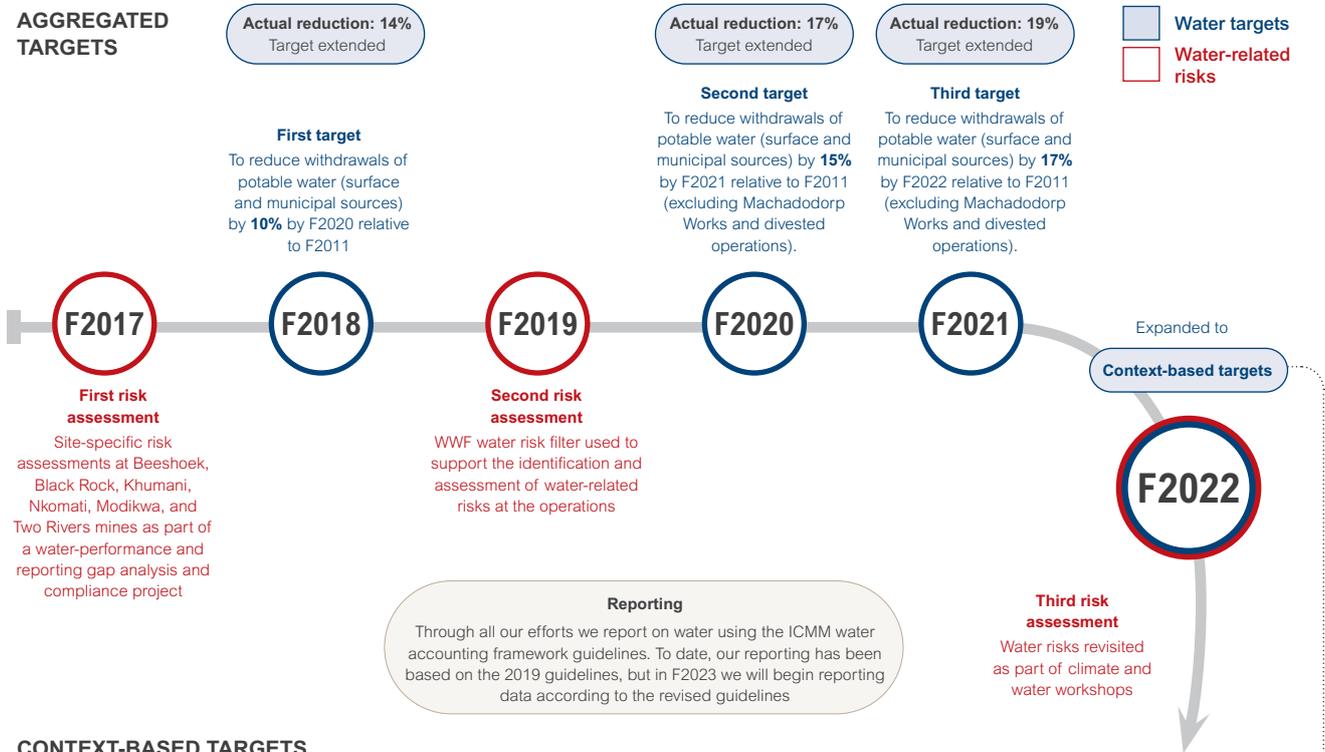
As a next step on our target journey we focused on setting context-based water targets for operations with material water-related risks. During F2021 and F2022, in line with ICMM guidance, we worked with operations and technical teams to develop process-oriented targets that include commitments for stakeholder engagement, and that detail collective action to address community access to water. By F2022 we had set context-based water targets for 75% of our operations. While we will work to achieve our new context-based targets from F2023, we will continue to drive efforts to reduce potable water consumption.

Another of our key activities focuses on water-related risks and opportunities, which we consider at company and asset levels. We used our first climate scenario analysis (F2021) to understand the impact of climate change on the resilience of our business, which included considerations of different water-related futures for each of our operations (page 32). Details of emerging or ongoing risks or opportunities, and our capacity to manage these, are discussed at our management risk and compliance committee meeting, and our social and ethics committee meetings. Meeting outputs and decisions feed directly into the strategy development process.

We are also increasingly looking beyond our operational borders to manage risks. This year, and moving into F2023, we are leveraging the preliminary results of our climate scenario analysis to reassess water-related risks in our supply chain. We are also using a catchment-level approach to manage some of the significant catchment-level water risks that some of our operations face which include poor existing infrastructure, lack of

Our approach continued

Figure 2: Water targets and risks



CONTEXT-BASED TARGETS

Commitments and quantitative targets		To achieve and maintain consumption levels of:			
Beeshoek	<ul style="list-style-type: none"> To not exceed the volumes as per the agreement to receive water from Kolomela via Sedibeng Water To maintain the good relationships and agreement with Kolomela. 	0.9 m ³ water/tonne run-of-mine fed to the crushing plants	0.6 m ³ make-up water/tonne run-of-mine	1.3 m ³ water/tonne product	1.0 m ³ make-up water/tonne of product
Khumani	<ul style="list-style-type: none"> To continue to support collective actions to help Sedibeng manage water supply more effectively. 	0.064 m ³ water/tonne mined (including waste/stockpiled material)	0.22 m ³ water/tonne run-of-mine fed to the crushing plants	0.319 m ³ water/tonne product	
Black Rock	<ul style="list-style-type: none"> To set a baseline in F2023 (following deployment of additional flow meters) To set a quantitative target in F2024 To not exceed groundwater dewatering and abstraction volumes as per the WUL (1 126 486m³/annum). 				
Nkomati	<ul style="list-style-type: none"> Monitor water quality over time to understand longer term impact of water in pits on salts Undertake progressive rehabilitation Explore alternative water management options Engage with the authority to determine the necessary long term water management strategy. 				
Two Rivers Mine	<ul style="list-style-type: none"> Set F2023 KPIs for the General Manager, linked to the target Educate the staff on the importance of saving water through meetings, posters, water conservation campaigns and community engagements Implement water management measures (prevent water leakages and unnecessary water use; water efficiency technology in change rooms, toilets and bathrooms, surface and stormwater management measures; rainwater harvesting/rainwater tanks; compaction aids such as bituminous emulsion, improving water quality within the mine, artificial intelligence; increase the water recycling opportunity by upgrading the existing Water Treatment Plant) by F2024 Implement improved water management, monitoring and reporting by F2024, with the aim to develop a plan to reduce water importation. 			0.5 m ³ water/tonne milled	
Modikwa	<ul style="list-style-type: none"> Undertake a water audit and gap analysis in F2023 Develop a new water management plan based on the gap analysis and audit by F2023 Revise the target and qualitative commitments including contributions to collective actions in the catchment by F2023 Set F2023 KPIs for the General Manager, linked to the targets. 			0.5 m ³ water/tonne milled	
Cato Ridge Alloys and Works	No context-based water target set as the site is not located in a water-stressed area				
Machadodorp Works	To be set				

funding and capacity to deliver new infrastructure, and the impacts of climate change on water supply. We regard water availability, consumption and pollution as key risks and include them in both our operational and corporate risk profiles. We partner with local and regional government structures, where appropriate, to mitigate water risks outside of our mine boundaries.

Investors and other stakeholders are increasingly calling for greater insight on 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 and to ensure the sustainability of water resources. These stakeholders include the Department of Water and Sanitation (DWS); local communities; authorities at local, provincial, and national levels; water fora; irrigation boards; catchment management agencies (CMA); and farmers and other industry users.

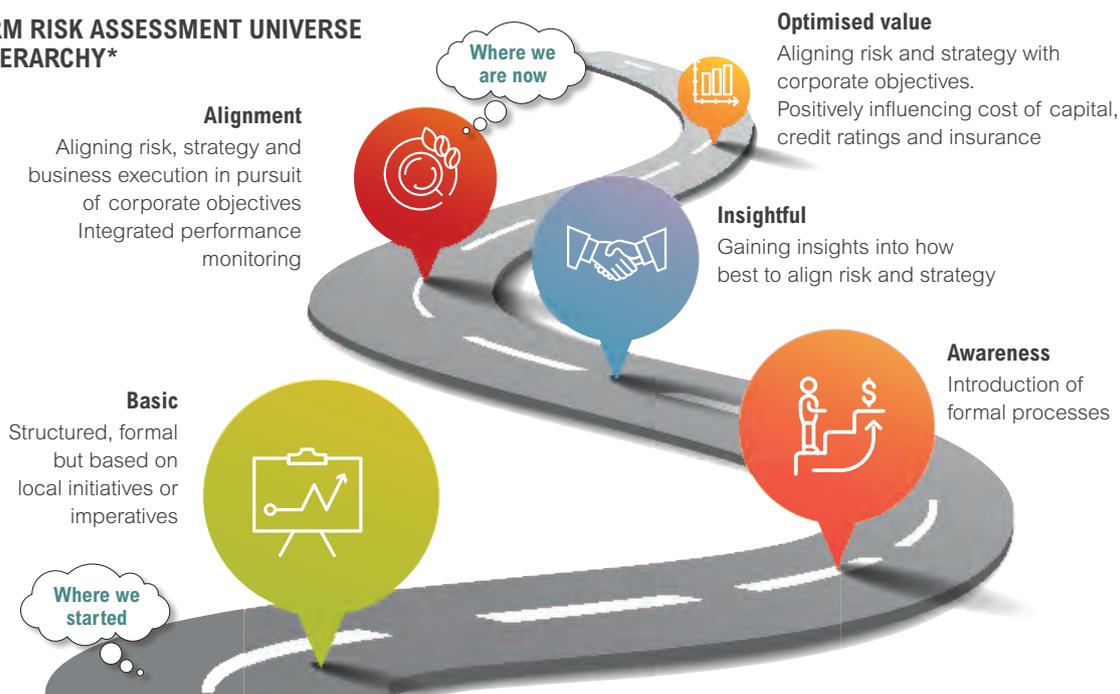
Engagements with communities help us understand and mitigate their concerns, identify how we can contribute to community water security, and increase transparency regarding our operations. Along with our joint venture partners, and through our operations, we invest in

local water infrastructure to improve community access to sufficient potable water and increase community resilience. The ARM Rural Upliftment Trusts also fund water-provision projects, including sinking and equipping boreholes for schools and communities in South Africa. Following our climate scenario analysis, we are also investigating opportunities to enhance community resilience to water-related impacts through our SED and CSI spend programmes. These actions provide us with the additional benefit of improving community relations and strengthening our social licence to operate.

Risk management

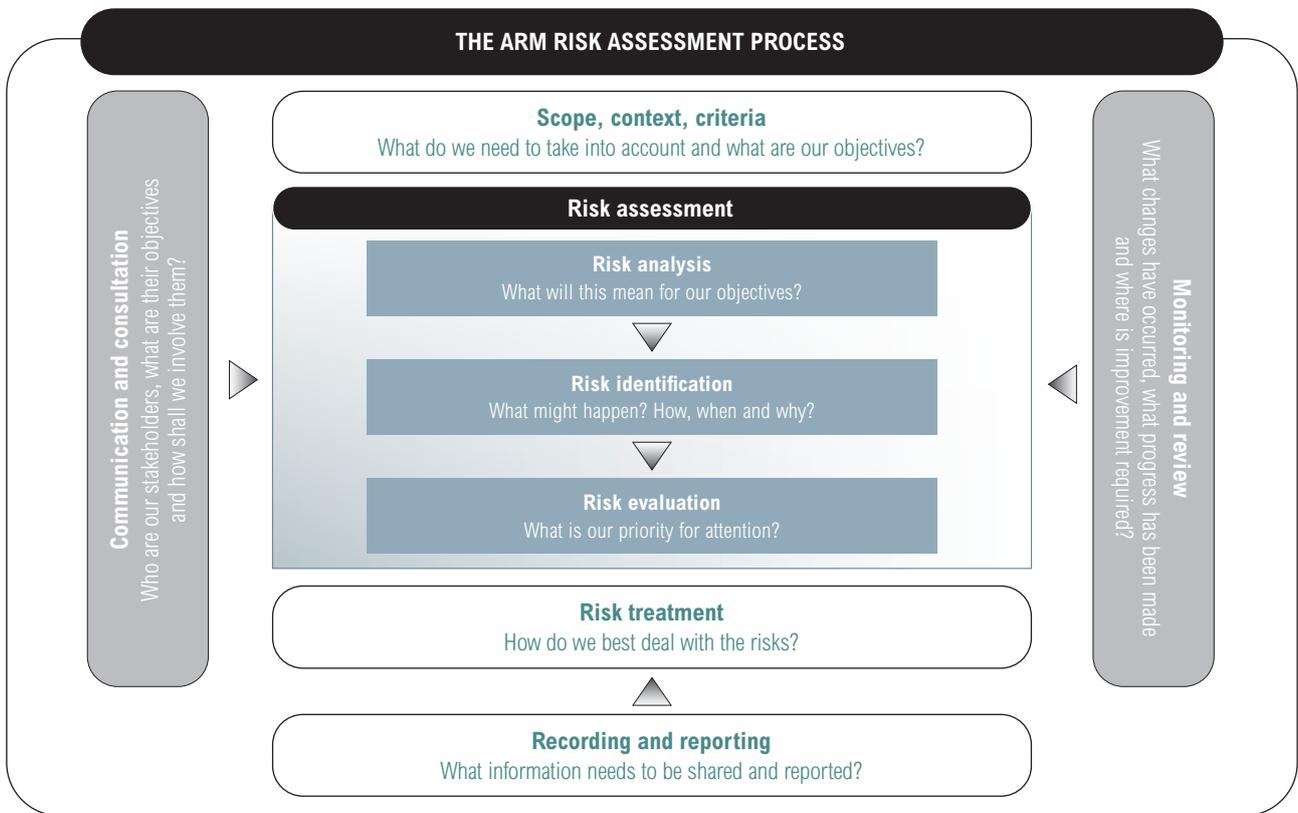
Our ERM process recognises risk as uncertainty that could affect one or more of our strategic objectives. We assess and manage these risks at various levels of the organisation. At the higher levels of the ARM risk universe we will continue to expand our risk context to consider various external ecosystems, including critical suppliers that may have a business-continuity impact on our operations, and other key stakeholders in the regions where we operate.

THE ARM RISK ASSESSMENT UNIVERSE AND HIERARCHY*



ESG * Further detail can be found in the ESG report pages 34 – 41.

Our approach continued



The growing importance of climate change has emphasised the need to explicitly integrate climate change into risk-management processes. We are doing this by repeating climate scenario analyses at regular intervals, and by integrating physical climate risks into ERM processes in an ongoing, structured, and evidenced-based manner. In addition, as our operations are exposed to context-based, water-related risks, this year we started to include and integrate identified water risks within the ERM process. This resulted in risks being redefined to fit within ARM’s risk assessment methodology, and included the re-rating of risks to an ARM-specific risk prioritisation methodology.

Climate and water compliance and reporting programme

In 2017, we launched a programme to comply with current and evolving regulations, reporting expectations, and non-negotiable but voluntary requirements related to climate change and water. The programme initially aimed to comply with the requirements to submit our GHG PPP and GHG emissions to the DFFE; identify gaps in climate and water risk assessment, management, and reporting; and comply with the ICMM member commitments on climate change and water. The programme has since evolved and phase 6, conducted in F2022, was informed by a variety of drivers affecting our business.

Specific programme objectives included:

- **Developing decarbonisation pathways** with revised short-, medium- and long-term targets, including piloting an internal price on carbon, implementing process steps, updating executive remuneration, and scoping the requirements for a decarbonisation technology department/forum
- **Improving GHG accounting and reporting**, including adjusting the reporting boundary, improving data systems, ensuring compliance with mandatory reporting, submitting our GHG PPP progress report, improving process emissions accounting at Cato Ridge Works, and scope 3 emissions accounting

- **Improving our carbon budget**, including complying with phase 1 extensions and compiling phase 2 data, assessing implications of DFFE methodology, assessing carbon-reduction options, and conducting lobbying
- **Improving compliance with the carbon tax and exploring carbon offsets**
- **Improving our carbon management and reporting system**, including incorporating financial metrics, to inform the prioritisation of decarbonisation measures and feed into developing our long-term decarbonisation pathways
- Further steps to formally **integrate climate change into our ERM processes**, including implementing a roadmap, continuing scenario analysis processes, and exploring a commodity portfolio
- **Reviewing industry associations' positions on climate change** to ensure alignment of our direct and indirect climate-related lobbying with our new long-term ambition
- Leveraging preliminary results of the climate scenarios analysis to inform a revised assessment of **water and climate-related risks in our supply chain**
- **Using SED, enterprise development (ED), the BEE Trusts and CSI spend to enhance community resilience to climate change**
- **Improving context-based water targets**
- **Improving water accounting** and ICMM water reporting
- **Raising awareness and conducting training**
- **Engaging** with internal divisions and operations as well as joint venture and investment partners, and then management, risk and compliance committee (MRCC), social and ethics committee (SEC), remuneration committee (REMCO), and board.

Annual climate change and water workshops

As part of our climate and water compliance and reporting programme, we conduct annual climate change and water workshops with each division and operation, facilitated by an external specialist consultant. Representation at these includes senior management, engineers, and environmental managers on-site, together with the executive: risk and sustainability and divisional safety, health, environment and quality managers.

In these workshops, we explore evolving climate change and water-related risks and opportunities. We specifically look at upstream risks in our supply chain that have the potential to impact our operations directly – eg through production stoppages or increased costs – or to affect our stakeholders. The latter explorations focus particularly on risks that impact the availability of water in our communities.

Due to the increased material importance of both climate change and water management, particularly the former, we have started to address these issues separately in our workshops. This is to ensure that focused attention is paid to each topic and all the necessary resources are made available.

In F2022 we held workshops at both corporate and operational levels, responding to the following objectives:

- **Building awareness:** feeding back on past performance and collectively shaping priorities and processes going forward
- **Developing decarbonisation pathways and preparing for the legislated carbon budget process (phase 2):** co-designing a process with operations, developing draft pathways, initiating additional assessments of GHG reduction options, exploring site-specific targets and additional implementation requirements (including budget, key performance indicators (KPIs) and other system elements)
- **Updating the environmental targets of ARM's Conditional Share Plan** (at corporate level)
- Discussing and agreeing on the process of **shifting from a tier 1 (default emission factors) to a tier 3 (mass balance) approach to submit data for Cato Ridge Works** to DFFE as part of the mandatory GHG emissions reporting (via the South African Greenhouse Gas Emissions Reporting System (SAGERS)). This included discussing the implications of shifting from tier 1 to tier 3 on carbon tax liability for Cato Ridge Works (CRW) and Cato Ridge Alloys (CRA)
- **Discussing and agreeing on the process for reporting CRW and CRA GHG product data to customers**
- **Finalising context-based water targets:** expanding on our F2021 efforts (page 12)
- **Implementing water accounting improvements and meeting the updated ICMM requirements.**



Governance

Our climate change and water strategies are supported by high standards of corporate governance. These are reviewed regularly to ensure robust reporting, strong relationships with our stakeholders, and to align our businesses with global good practice.



Oversight

The ARM board, through the social and ethics committee chaired by Dr Rejoice Simelane, has ultimate responsibility for climate change and water management. The responsibility for implementing this work rests with the chief executive officer (CEO), who delegates to the chief executives of each division and the executive: risk and sustainability. This executive is responsible for reviewing ARM's sustainable development policies, strategies and targets, including our revised GHG and water targets, and ensuring these are aligned with the board's commitment to zero tolerance for harm to employees, host communities and the environment. The ARM social and ethics committee provides oversight by monitoring and reporting on the manner and extent to which we protect, enhance and invest in the wellbeing of the economic, social and natural environments in which we operate.

Climate-related issues, through the reporting of the social and ethics committee, remuneration committee, and our divisions' operational reviews, form part of the agenda of quarterly board meetings. Recent meetings have tabled:

- Shifting our GHG reporting boundary from an equity share to an operational control approach
- Amendments to the remuneration policy, including updates to climate-change incentives linked to ARM's GHG reduction target
- Approving the annual ESG and climate change and water reports
- Receiving/monitoring quarterly reports on climate change and water performance and compliance.

The growth and strategic development committee evaluates growth opportunities and plans the content for a two-day strategy session with the board. ARM's

climate scenario analysis, which was conducted in F2021, explored climate-related impacts on demand for commodities, and its results will feed into this committee's strategic sessions in F2023. Chaired by the CEO, the committee meets regularly and provides feedback to the executive chairman.

The timing of our climate change risk management process is aligned with our assurance and corporate governance requirements. Climate risk management, however, is not an activity that takes place periodically, but continuously through all phases of our work and with every major change in our business and operations. All ARM-managed operations and divisions conduct quarterly risk reviews, which are supported by six-monthly corporate risk reviews and an annual group-level risk workshop. Climate-specific processes to augment these steps include annual climate and water risk assessments and management workshops with the divisions and operations, as well as climate scenario analyses to explore the long-term transition and physical risks associated with different climate futures. The management risk and compliance committee (a subcommittee of the audit and risk committee) coordinates and monitors our ERM process, which includes climate-change risks. Company-level risks, such as the evolving climate-change mitigation regulations (including the carbon tax and carbon budgets), are tracked by the chief risk officer.

The executive: risk and sustainability also reports to the management risk and compliance committee, a subcommittee of the audit and risk committee of the board, on matters and activities related to climate change and carbon emissions as a

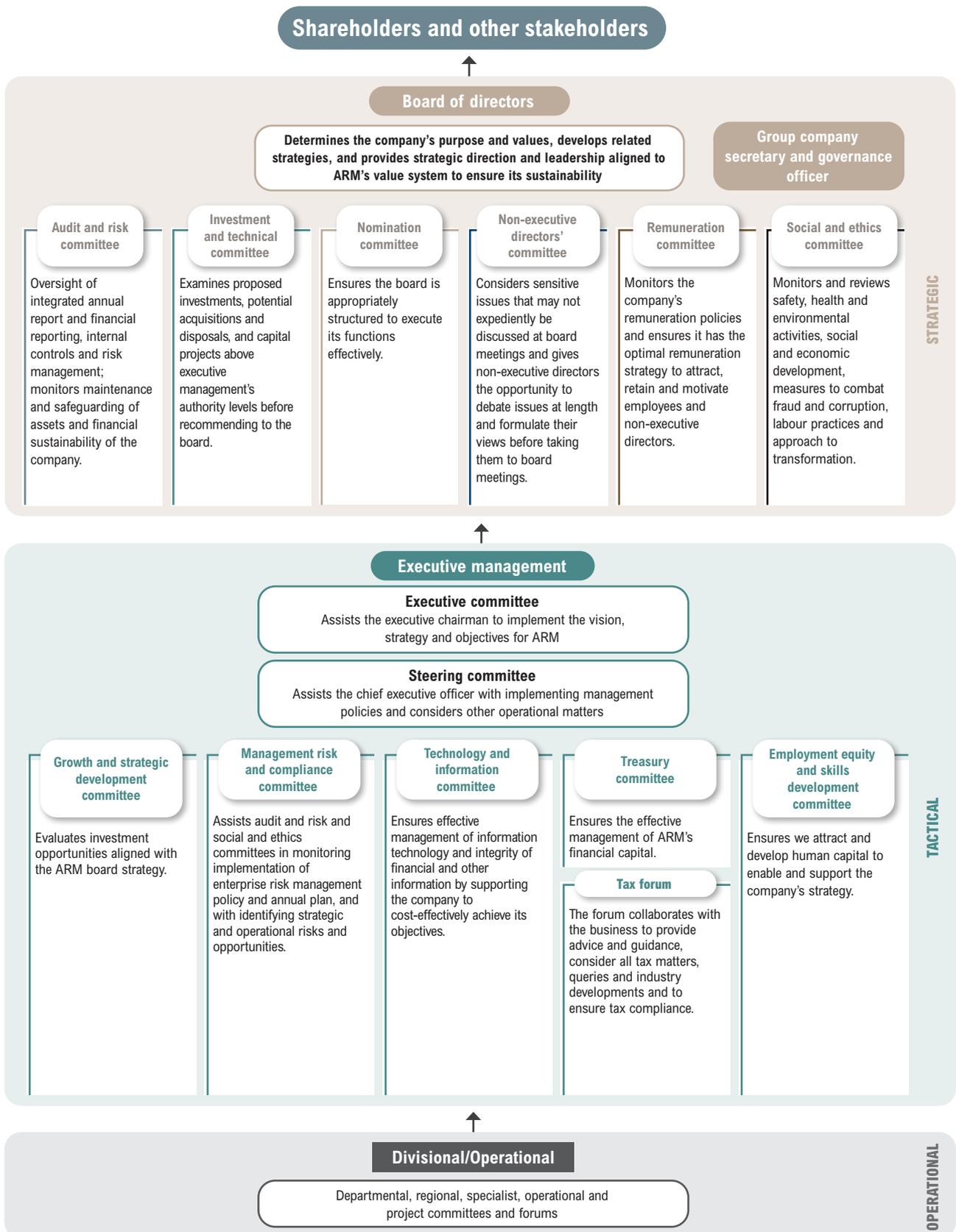
standard agenda item. This includes an update on carbon tax. An update on implementation of the GISTM is also provided by each division.

We continue to disclose our performance according to the TCFD framework, have completed an initial climate scenario analysis process, and have set a long-term GHG reduction target in line with the goals of the Paris Agreement. We plan to fully implement TCFD recommendations by F2024, subject to clarity on how the mining industry should integrate climate risks and opportunities into mainstream filings.

Our focused programme to comply with new climate-change regulations (page 14), as well as non-negotiable but voluntary requirements and reporting expectations for climate change and water, originated in 2017 and has continuously been reviewed and updated. Given that the regulatory and voluntary requirements are related, we have aimed to embed a methodical process for developing systems, reporting and building capacity to meet current and evolving requirements.

The second phase of implementing the ICMM's A Practical Guide to Consistent Water Reporting (2017), based on the water accounting framework (WAF) developed by the Minerals Council of Australia (MCA), was completed in F2019. We will begin the process of reporting on F2023 data according to the revised ICMM water accounting framework guideline. The executive: risk and sustainability is a member of the ICMM water working group, which considers emerging issues driven by new legislation or society, and uses these to develop corresponding good-practice, policy or position statements for collective industry.

Governance continued



Assmang, a joint venture between ARM and Assore Ltd, has established a social and ethics committee that monitors environmental performance in ARM Ferrous. It is chaired by the ARM executive director: investor relations and new business development and reports to the ARM social and ethics committee. In ARM Platinum, every operation has a sustainable development committee, which is chaired by the ARM executive: risk and sustainability, and reports to the executive committee or board of the respective joint ventures, as appropriate, as well as to the ARM social and ethics committee.

Executive remuneration

Carbon-emission-reduction targets have been included in ARM's remuneration policy and in the CSP for ARM executives, since F2019.

Up until now, the incentives have been based on actual savings (due to emission-reduction initiatives) over three years, with a stretch target of equal to/greater than 3% further reduction in scope 1 and 2 emission levels at the end of the three-year performance period against the baseline at the beginning of the period. The approach is based on the GHG protocol's policy and action standard, available at <https://ghgprotocol.org/policy-and-action-standard>.

During F2022, we have worked to better align future CSP targets to our updated GHG reduction targets and decarbonisation pathways, which themselves will be aligned with ARM's commitment to achieve net-zero GHG emissions from mining by 2050. Consideration is being given to linking future CSP targets to specific projects (eg the successful delivery of large project milestones such as the generation or

procurement of renewable power, or electric vehicles) and/or process steps (eg setting revised targets within a certain time period, piloting new technologies, formalising decarbonisation-focused partnerships across the value chain).

The shift in our reporting, from equity share to operational control boundaries (page 8), will have no bearing on the previous awards (for FY2019, FY2020, FY2021 and FY2022), which were based on 100% of emissions and 100% of savings for operations under joint operational or operational control. However, going forward, the awards will be structured in accordance with developments in our decarbonisation pathways.

The decarbonisation pathways will be completed in early F2023, with the revised GHG reduction targets developed and finalised by end F2023. During this development period, the F2022 award targets will be extended, based on the existing approach. Once the decarbonisation pathways and GHG reduction targets are finalised, CSP awards for future years will link to them.

Performance for the F2023 award will be measured from 1 July 2022 to 30 June 2025 and will continue to use the existing methodology linked to ARM's current GHG reduction target. Performance for the F2024 award will be measured from 1 July 2023 to 30 June 2026 and will align with the updated targets.

Engineers and production staff are incentivised on energy efficiency per tonne of ore milled, time of energy use and 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.

ARM does not currently have incentives for executive employees or board members related to water performance.

Refer to page 152 of the summarised remuneration report in the 2022 ESG report. 

Assurances

IBIS provided independent third-party assurance over selected performance information in our ESG report, in line with the AccountAbility AA1000AS guidelines (assurance type II, moderate). This includes a review of the reporting process and assessment of the report against AccountAbility's guiding principles of inclusivity, materiality, responsiveness and impact.

The climate-change related indicators that were assured in F2022 included scope 1 and 2 GHG emissions, electricity consumption, total diesel consumption, total energy used, total volume of water withdrawn and total volume of water discharged.

 IBIS's independent assurance statement is on page 190 of the 2022 ESG report, available on our website at www.arm.co.za.

The emission savings associated with our reduction initiatives have been subjected to third-party assurance. Our performance on our short-term GHG reduction target and the associated executive share incentive is based on actual (reported) emission reductions relative to a business-as-usual baseline. Carbon-reduction initiatives implemented over a particular period are included in the scope, but only if they are active at the end of the period.

Governance continued

The target is at a company level. This means there are no operational targets, but savings from our operations are aggregated to determine company-wide performance.

For the first time in F2022, we have subjected our scope 3 emissions to an independent internal assurance review.

Stakeholder engagement

Supply chain engagement

We have always worked closely with our key suppliers, not only to ensure that we collectively strive to mitigate climate risks in our supply chain, but to ensure we are aware of and make use of the best technology available. Relevant and new technology might help our operations to increase energy efficiency, reduce our GHG emissions, or increase our resilience to physical climate-change risks.

We are engaging with our suppliers to reduce diesel consumption at our mines, for example, and are looking into ways to reduce our transport-related emissions while accommodating increased production at Black Rock Mine.

In F2019, we assessed the emissions of each of our operations' top five suppliers according to spend to understand their climate-change related performance. We found that, while information was available on larger suppliers, limited public information could be obtained for smaller, more local suppliers. Our larger suppliers also did not provide information on emissions at a product level.

In F2021, we included a preliminary assessment of supply chain risk in our climate scenario analysis. In F2022, we have been working to better understand and manage climate change risks in our supply

chain, particularly regarding exposure to physical climate changes. We are currently using both bottom-up and top-down approaches to identify priority suppliers to focus on in our analyses. Once selected we will model impacts on the suppliers, assess their risk profiles and propose mitigation (or other) recommendations.

With the growing emphasis on scope 3, we are also investing in improving our inventory. In F2022 we drew on expenditure and leveraged relevant emission factors to achieve more complete assessments of scope 3 categories 1 (purchased goods and services) and 2 (capital goods). We plan to further refine these assessments to focus on specific purchased goods and services, and capital goods. We also included emissions associated with Sakura for scope 3 category 15 (page 46).

The security of electricity supply in South Africa is a material risk, specifically the reliability and cost of power from Eskom, our primary supplier of electricity, which has demonstrated and reported problems in its financial and operational management. Uncertainty on the utility's future, high level of debt, and lack of proven historical reduction in emissions, present significant risk to our GHG reduction target and long-term objectives. To mitigate this, quarterly liaison meetings are held with Eskom representatives.

Public/policy engagement

ARM supports the move to 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 use of carbon tax to support targeted mitigation actions, alignment with other mechanisms such as carbon budgets, and clarity on how these mechanisms will integrate.

ARM has engaged directly with the DFFE and has been supportive in disclosing information that 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, promotes benchmarking and sharing of good environmental practice. ARM participates in a number of initiatives, including the Minerals Council South Africa (MCSA) and its environmental policy committee), Business Unity South Africa (BUSA), National Business Initiative (NBI), FAPA and the ICMM.

Stakeholders and various reporting frameworks have highlighted the importance of ensuring consistency between our climate-change policy and positions taken by industry associations to which we belong. Involvement in these associations also serves as a sharing and learning opportunity in addition to being an advocacy mechanism for engaging with climate policy development processes.

As a member of ICMM, we commit to publicly disclosing where our position differs from that of the ICMM on climate change. We continue to engage as an active member of the ICMM through the climate change working group. We have provided feedback and comments on proposed additions to the climate-change position statement as part of the ICMM's enhanced collective leadership. Our policy and commitments are aligned with the ICMM, and we have further committed to updating our long-term target in line with pending updates to the ICMM climate-change position statement.

ARM is actively feeding into the MCSA position statement on climate change, and the member guidelines for the climate-change action plan. In F2022 we provided detailed comments as part of the development of this material, and we are currently supporting its review and finalisation.

In F2022, we reviewed the climate-change positions of the industry associations to which ARM belongs. We assessed the climate-change policies and positions of the five industry associations of which ARM is a member or where our joint ventures are members to see how these align with ARM's 12 climate-change commitments/statements. Our assessment involved a desktop review of available information (eg websites, reports, press releases, information about an association's climate lobbying via independent thinktank InfluenceMap), including public statements by senior members of an association (eg opinion pieces in the press).

<p>Key questions about each industry association</p>	<p>Does the association have a publicly available position on climate change?</p> <p>If yes, how does this align with ARM's position?</p> <p>Are there material differences between an association's position and that of ARM? If so, how might ARM respond?</p> <p>In the case where an association lacks a climate-change position, or has a significantly weaker position than ARM, how might ARM advocate for change?</p>
<p>Main findings</p>	<p>Two of the industry associations of which ARM is a direct member have climate change policies that are mostly congruent with ARM's 12 commitments/statements (ICMM and MCSA). Other associations of which ARM is not a member, including the NBI and BUSA, also have positions mostly congruent with ARM's position.</p> <p>The Energy Intensive Users Group (EIUG), of which Assmang is a member, lacks any publicised position on half of ARM's 12 commitments/statements, and has material differences for one of ARM's commitments/statements.</p> <p>Two of the industry associations of which Assmang is a member (FAPA and IMnL) have no publicly available climate change positions.</p> <p>Positions on carbon pricing are largely outdated or absent, while most South African industry associations reviewed oppose the design of the carbon tax or seek greater certainty.</p>

There is value for ARM in engaging with these associations to learn about climate-change policy developments for industry and to help shape the enabling environment, while showing climate-change leadership. This is relevant for the MCSA since it is still in the process of drafting its climate-change position statement.

The work by NBI and BUSA is of particular interest, since it aims to inform concrete actions on sector-specific decarbonisation pathways, including those for mining. We have used their findings and recommendations to identify how these apply to ARM's climate-change strategy and the development of our short-, medium-, and long-term decarbonisation pathways.

Engaging with our partners

We work with our joint venture partners to collectively assess and mitigate climate-change risks and capitalise on climate-related opportunities. This includes ongoing management interactions during the ordinary course of business, monthly executive management meetings, and quarterly board meetings, depending on the shareholder agreement.

Our joint venture partnership with Assore provides access to important industry initiatives such as the life-cycle assessment and life-cycle inventory studies, waste management initiatives and the energy-efficiency initiatives of the International Manganese Institute (IMnI).

In F2020, we disclosed the GHG emissions from our direct investment in coal and in ARM Coal operations, managed by Glencore, for the first time. In F2021, we expanded disclosure to cover our interest in Harmony Gold, and in F2022 expanded it further to cover our interest in Sakura.

We hold ourselves to the highest ethical and governance standards in dealings with all stakeholders, including our joint venture partners.

Climate change

Compared with other global crises, climate change is likely to affect more people, in more regions around the world, in as many ways over the short, medium, and long term. It is the crisis of our time and, without meaningful measures to address it, the crisis of future generations too.



Our position on climate change

At ARM, we are aware of the critical global challenges that climate change presents and the effects these challenges may have on our business, our stakeholders, and the world. As a result, we are committed to participating in the global response to reduce carbon emissions and mitigate the physical impacts caused by climate change.

We have implemented robust processes to measure and report on carbon emissions at our operations, and identify opportunities to reduce these emissions. We are actively developing technology and processes to enhance energy efficiency at our operations while improving fuel efficiency and reducing our carbon footprint through other targeted initiatives.

Together with other groups in the mining industry, we also continue to produce the metals that are critical to a low-carbon future.

Our climate-change policy 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 to support the goals of the Paris Agreement to limit the increase in the global average temperature to 2°C and pursue efforts to limit the increase to 1.5°C
- The critical role that the mining and metals sector plays in supporting 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 partners and key suppliers along our value chains

- The need to reduce emissions from the extraction and use of mining products and support collaborative market-based approaches to accelerate the use of low-emission technologies as part of a transition to a low-carbon energy mix
- The practical challenges that South Africa, as a developing country with domestic supplies of fossil fuels, will face in making that transition to a low-carbon economy
- That climate and energy policy should be technology neutral and rely on market-based approaches to enable least-cost abatement solutions
- The vital role that a broad-based, predictable, long-term carbon price can play, alongside other market mechanisms, to drive reduction of GHG emissions and incentivise innovation
- The importance of providing climate-related disclosure to measure and respond to climate change risks and opportunities. We welcome the transparency around climate-related risks brought by the TCFD and see value in its recommendations
- The prioritisation of emission-reduction initiatives and technologies, recognising the role for carbon offsets for hard-to-abate emissions
- The role of a circular economy in reducing emissions associated with the extraction and use of mining products by increasing resource efficiency in production and promoting their re-use and recycling.

We are committed to:

- Engaging with our peers, governments, and others to develop effective climate-change policies. We support the movement towards a low-carbon economy and are committed to constructive

engagement with government on measures aimed at achieving this. Important issues still under consideration and discussions with government include using carbon tax to support targeted mitigation actions, alignment with other mechanisms such as carbon budgets, and clarity on carbon tax allowances and offsets

- Implementing governance, engagement, and disclosure processes to ensure climate-change risks and opportunities are considered in business decision-making (page 36)
- Supporting carbon pricing and other market mechanisms that drive the reduction of GHG emissions and incentivise innovation. We support global efforts to address systemic challenges that inhibit this transition, such as: 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 and we will collaborate, to the extent appropriate, to drive the changes necessary to achieve a net-zero carbon industry (page 9)
- Demonstrating leadership by advancing operational-level adaptation and mitigation solutions through, for example, researching, developing, and piloting new technologies (page 43)
- Engaging with host communities on our shared climate-change risks and opportunities and helping host communities to adapt to the physical impacts of climate change (pages 9, 13, 23, 37, 51, 59 and 64)

Climate change continued

- Supporting initiatives 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 (pages 26 and 27)
- Disclosing scope 1 and 2 emissions annually and setting emission-reduction targets informed by the scientific requirements to achieve the 1.5°C by 2050 global temperature goal, and associated efforts towards a net-zero carbon industry (pages 39 and 41). In F2021, we set a long-term target in line with the scientific requirements and included commitments to various actions needed to achieve this target. We are developing decarbonisation pathways to inform short- and medium-term targets, based on operation-specific GHG reduction measures, to ensure that we meet our long-term commitment
- Engaging with stakeholders to determine a preferred approach to reporting scope 3 emissions and exploring our role in reducing those emissions (page 46). In F2022, we significantly improved our scope 3 emissions accounting, and our first scenario analysis process informed a range of commitments towards addressing our role in reducing GHG emissions across our value chain
- Supporting the global transition to a low-carbon economy by contributing to the sustainable production of commodities essential to the energy and mobility transition, and by working with the partners and key suppliers along our value chains (page 20).

Strategy

Scenario analysis

Our business strategy is to deliver competitive returns and sustainable value by:

- Operating our portfolio of assets safely, responsibly, and efficiently
- Applying disciplined capital allocation
- Focusing on value-enhancing and integrated growth.

To better integrate climate-change considerations into our business strategy, and in response to and in line with TCFD recommendations, in F2021 we assessed the resilience of our business to **climate transition risks** (risks related to actions in response to the threat of climate change) and **physical climate risks** (direct risks to operations and the supply chain, and indirect risks to value chains stemming from changing or extreme climate patterns) under five different scenarios (see opposite page).

For **climate transition risks** we considered all of ARM's operations, including Sakura and our investments in ARM Coal and Harmony Gold. Here we explored issues relevant to mining value chain decarbonisation, evolving commodity markets, and the role of critical minerals in the transition to net zero.

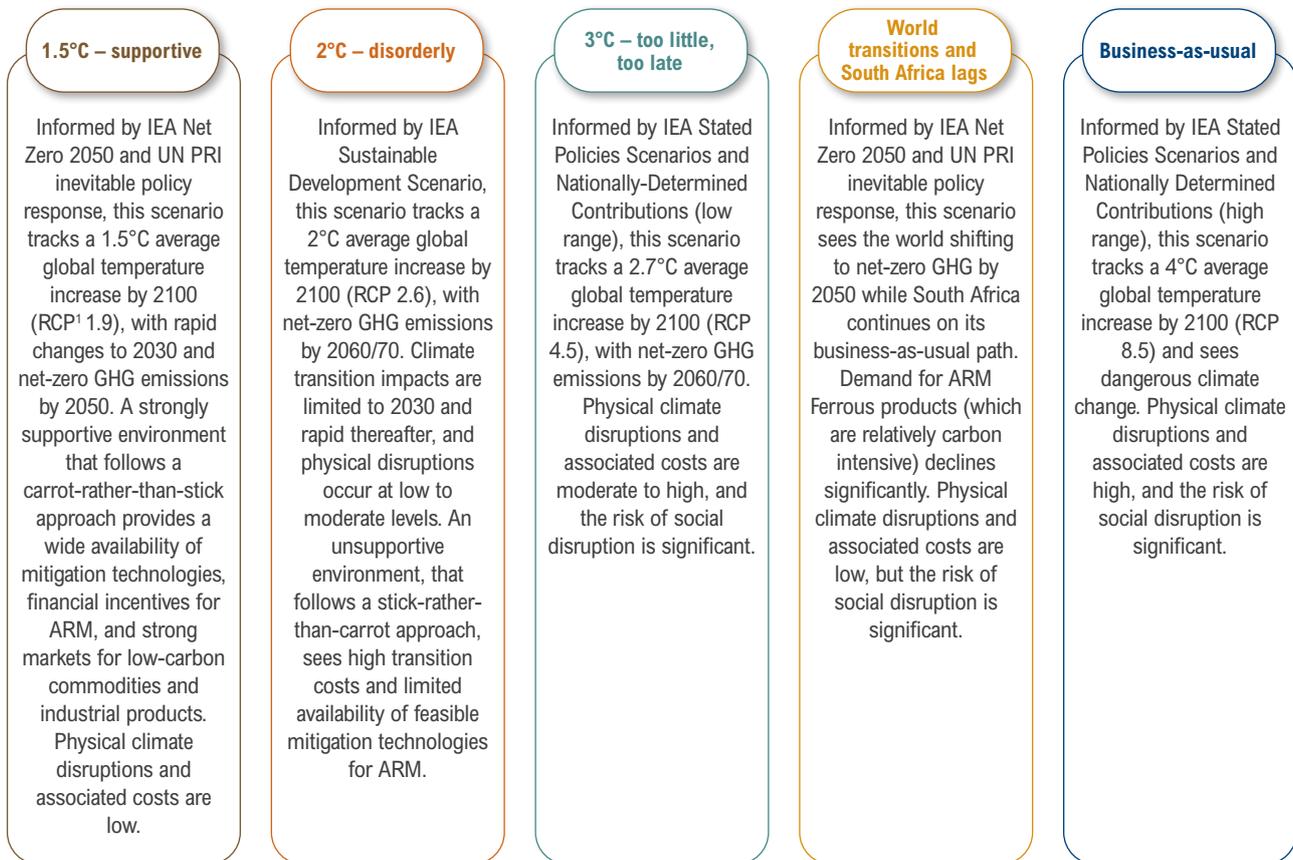
For **physical climate risks** we considered the operations over which we have operational or joint operational control (ie excluding ARM Coal and Sakura). Here we assessed the supply chain implications of our operations, and compiled and reviewed site-specific climate-change projections.

Our scenario analysis involved a series of workshops led by our CEO and attended by executives and operations representatives. Technical teams were established to explore transition risks and opportunities (more relevant at company level) and physical risks (more relevant at operational and division levels). Executive-level support and the involvement of key personnel were critical to the project's success.

The impact of climate risks on ARM will be difficult to determine without knowing the cost structures of different producers, and therefore which producers might drop off, for example. Our focus is to be below the 50th percentile of the global cost curve per commodity. We will use the results of our scenario analysis to inform strategic decision-making regarding our portfolio and to explore opportunities to invest in low-carbon technology minerals.

The scenario analysis process led to ARM committing to a long-term target to achieve net-zero GHG emissions from mining by 2050 (figure 1). It has also served as the foundation for a roadmap to integrate climate change into ARM's ERM processes, and for the development of short-, medium-, and long-term operation-specific decarbonisation pathways. Lastly, it has emphasised the need for ARM to participate in and drive efforts to ensure an enabling policy environment, and to ensure our ambition and commitments align with our joint venture partners.

ARM is a formal supporter of the TCFD (<https://www.fsb-tcfd.org/supporters/>)



¹ The analysis focused on the intergovernmental panel on climate change's representative concentration pathway (RCP), which assesses long-term changes in annual rainfall, rainfall intensity, the magnitude of flooding events, drought severity, annual dry days, and maximum and minimum temperatures. The median RCP 4.5 scenario was used as the most-likely climate scenario, with the 66th percentile upper and lower bounds used for the worst- and best-case scenarios.

Operation-specific decarbonisation pathways

This year we have focused on developing decarbonisation pathways that detail the short- and medium-term targets that will underpin ARM's net-zero GHG by 2050 target (page 9). In this process, we recognise that decarbonisation cannot happen at all costs, particularly in the context of a developing country. Consequently,

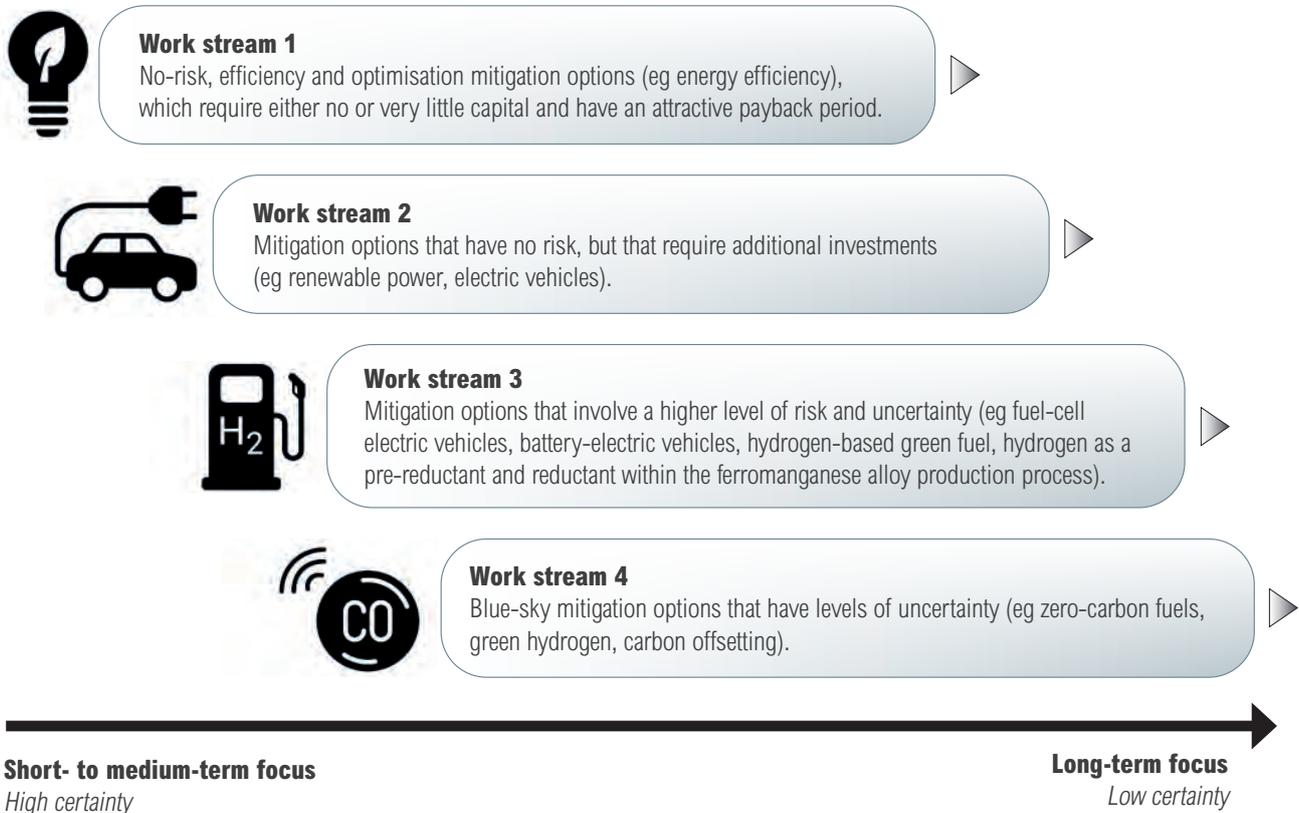
we are working to identify contextually appropriate and just mitigation options for each operation, and to explore their respective mitigation potential, costs to CAPEX and OPEX, and implementation requirements.

Through a consultative process within ARM and with our joint venture partners we developed a conceptual model for the decarbonisation

pathways that organises mitigation options with different levels of risk and certainty into four work streams (figure 3). In the short to medium term, we will focus on the work streams that contain more certain mitigation options, namely work streams 1 and 2. In the longer term we will focus more on the work streams that contain less certain mitigation options, namely work streams 3 and 4.

Climate change continued

Figure 3: Work streams for decarbonisation pathways



Long-term commitments and goals

To support and complement our decarbonisation pathways and to deliver on our long-term ambition, we commit to the following actions:

- Work collectively to ensure enabling policy environments
- Work collectively to secure financial and technical support, especially for mining and metals operations in developing countries
- Engage with suppliers to ensure the availability of feasible decarbonisation technologies relevant to our specific operations
- Collaborate across our value chains to determine the most appropriate role we can play in contributing to net-zero scope 3 emissions
- Engage with our joint venture partners to get buy-in and ensure alignment with their commitments, provided these are in line with our overall level of ambition.

Exploring renewable energy opportunities

We are continually exploring options to invest in renewable energy-generation technologies or to buy electricity from renewable sources. Our feasibility considerations include capital and operational costs, electricity generation relative to our operations' load requirements, GHG and environmental impacts, and the alignment of green investments with the remaining economic lives of our assets. The latter is particularly important as operations with a short life-of-mine are not suitable candidates.

ARM Platinum

In F2022 we explored specific options to wheel renewable power supply to ARM Platinum's mining operations. We found that over the course of 20 years wheeling 100MW of renewable energy would generate circa 4 900 000MWh of electricity and save

circa 4 800 000tCO₂. We are currently planning to use power purchase agreements to secure the renewable power supply and will split the 100MW between three mines, namely Two Rivers, Bokoni and Nkomati. We are negotiating contractual arrangements to secure the environmental attributes (carbon savings) as the initiative represents an important part of our efforts to decarbonise, and securing reliable cost-effective power at our operations.

Eskom is currently building a new transmission line to meet increased electricity requirements associated with the Two Rivers Merensky Project at the mine, and we are pushing Eskom to meet the mid-2023 completion deadline. This investment in network infrastructure would further contribute to the potential for wheeling renewable power to the mine.

ARM Ferrous

Eskom has indicated that the transmission network in the Northern Cape cannot support wheeling to our ferrous mines. Because of this limitation, we commissioned a study to explore the feasibility of installing solar PV plants with battery storage at our Black Rock and Khumani mines, which showed the following:

- For Black Rock, the installation will require CAPEX of approximately R1.21 billion for a solar PV generation capacity of 44MW and battery storage capacity of 33 546MWh, to generate 103 774MWh of electricity per annum (representing roughly 57% of Black Rock’s power demand)
- For Khumani, the installation will require CAPEX of R1.12 billion for a solar PV generation capacity of 44MW and battery storage capacity of 26 587MWh, to generate 103 774MWh of electricity (representing roughly 44% of Khumani’s power demand).

In F2022 Assmang agreed to move forward with the project. The environmental impact assessment and system designs for this installation will be completed by August 2023, and construction completed by the end of 2024. ARM will have outright ownership of the renewable energy plants, with limited possibility of wheeling, which is constrained by the grid unavailability in the Northern Cape.

A pre-feasibility study for the Beeshoek Mine was also completed, but the decision to proceed with the feasibility study has not yet been made.

Managing change

We manage rising operating costs associated with climate risks as part of our short-term strategy (F2021 to F2022). Our long-term strategy (beyond 2021 to 2050) is influenced by expected changes in regulations and market demands that pose both

risks and opportunities. For instance, regulation changes will affect the price and supply of energy and water. This is especially true for geographies where climate changes are expected to be severe, and where resulting regulatory changes will impact our ability to operate.

In terms of market demands, in recent years we’ve seen how making higher-grade ‘cleaner’ products that yield fewer emissions gives us a competitive advantage in the growing Asian market. As the global economy becomes more carbon constrained, we expect this demand will become increasingly material. For example, and as per our climate scenario analysis, demand for manganese is projected to increase due to its use in lithium-ion batteries for mobile and stationary electricity storage applications. Demand for platinum is expected to increase given its key role in the hydrogen economy, and given climate-related drivers in transport and industry. The supply and price of thermal coal is also likely to be materially

impacted going forward. We integrated all of these factors into our strategic and operational planning processes in F2022.

Carbon pricing

Carbon pricing is now universally accepted as critical for driving decarbonisation towards the global 1.5°C climate goal. Projections on the potential carbon price in different jurisdictions vary and there is considerable uncertainty on how governments will set prices over time. It is expected that, even under business-as-usual conditions, carbon prices will translate into increased operating costs for ARM.

Our F2021 scenario analysis explicitly considered how different potential carbon prices affect the costs of supplying our commodities to global markets, the potential impact of these costs on demand for our products, and the possibility of border-tariff adjustments to create level playing fields in these markets.

ARM range of assumed internal carbon prices (US\$) in F2021 climate scenario analysis

	2025	2030	2040	2050
South African carbon tax (business-as-usual scenario)	10	12	20	33
1.5°C – supportive	45	83	160	200

In the case of avoided power supplied by the Eskom grid, it is assumed that a carbon price could only be passed through the electricity price, but the timing of it is uncertain.

We modelled a range of carbon tax pass-through costs, assuming a grid emission factor based on South Africa’s integrated resource plan’s technology mix, and a range of effective tax costs that could be passed by Eskom. Avoided costs, based on the zero-carbon electricity generated and consumed by our operations, were considered over the life of the assets to determine a range of impacts on the project’s internal rate of return.

The actual carbon price in South Africa, reflected in the carbon tax, has been incorporated into our internal carbon price. In F2022 we used this internal carbon price to evaluate new projects and acquisitions, applying a range of carbon prices to our feasibility studies for solar power and battery-storage systems at our Black Rock and Khumani mines in the Northern Cape, for example.

Climate change continued

These evaluations provided some insight into the financial implications of a project that reduces carbon-tax liability, and generated lessons for integrating an internal price of carbon into ARM's new projects and acquisitions. Our internal carbon price assessments are parallel processes to the feasibility studies that demonstrate the internal rate of return when considering potential avoided carbon-tax costs.

We also identified a range of potential carbon prices relevant to developed country markets of up to US\$75 in 2025, US\$130 in 2030, US\$205 in 2040 and US\$250 in 2050. Further quantitative analyses will be undertaken to explore the implications on demand for our products as part of the next iteration of our climate scenario analysis. We will incorporate our range of carbon prices into subsequent renewable energy and other feasibility studies at our operations to consider the potential reduction in carbon liability and the contribution to our GHG

reduction ambitions on the overall feasibility of projects.

In F2022 we also reviewed our industry associations' positions on carbon pricing and found them to be largely outdated or absent, while most South African industry associations reviewed oppose the design of the carbon tax or seek greater certainty.

Risk management

ARM faces material risks and opportunities linked both to the climate transition and physical climate impacts. We've described these risks in the sections that follow, detailing their causal factors and residual risk ratings, our risk treatments, and how the risks affect ARM's strategic intent factors.

Climate transition risks and opportunities

The global transition to low-carbon energy and industry presents multiple risks for ARM, including changing

demands for PGMs and thermal coal; divestment from carbon-intensive activities; increased operating costs associated with carbon pricing; high costs and carbon intensities of key energy sources; limited availability and high cost of mitigation measures; and social unrest and disruptions. Yet, transition opportunities exist too, including increasing demand for commodities in our portfolio, including bulk and base metals; demand for zero- and low-carbon mining and metals products; and increasing access to low-cost capital for activities aligned with global climate objectives.

In figure 4 we describe how demand for our current portfolio of products is expected to change under different climate scenarios, and detail our responses to key climate transition risks and opportunities (in table 2).

Table 1: ARM's strategic intent factors

1		Focus on efficient allocation of capital	5		Improving operational efficiencies and containing unit cost increases by utilising innovation and technology
2		Aim for value-enhancing integrated growth	6		Partnering with and investing in the personal and professional wellbeing of our employees
3		Manage a robust financial position that enables us to be flexible and resilient	7		Improving relationships with our key stakeholders and driving positive impacts in the areas where we operate
4		Maintaining a safe and healthy working environment	8		Remain responsible stewards of our environmental resources

Figure 4: Demand for ARM’s products under different climate scenarios

Scenario	Palladium	Platinum	Iron ore	Manganese alloy and ore	Thermal coal	Low-carbon technology minerals	Implications for ARM
1.5°C – supportive							<ul style="list-style-type: none"> Positive outlook for ARM Platinum and ARM Ferrous. Focus on PGM assets with higher platinum ratios. A successful green steel industry in South Africa, if enabled by intentional industrial policy focused on green hydrogen production, boosts local demand for ARM products Very negative outlook for ARM Coal Significant opportunities to be explored in critical minerals for low-carbon transition An ambitious decarbonisation pathway is needed to compete in global markets.
	Significant drop in demand for autocatalysts	Significant growth of (green) hydrogen economy	Growth in demand due to cost-effective green steel, enabled by measures supporting green hydrogen economy	Significant growth in demand for high-quality ore for battery storage	No demand for thermal coal in 2050. Early closure of all coal-fired power stations in South Africa (before 2050)	Significant increase in demand for critical minerals for low-carbon transition, notably copper, lithium, cobalt, nickel and rare earth minerals	
2°C – disorderly							<ul style="list-style-type: none"> Positive outlook for ARM Platinum and ARM Ferrous. Focus on PGM assets with higher platinum ratios Sustained demand for coal in the short term but very negative outlook for ARM Coal towards 2050 Significant opportunities to be explored in critical minerals for low-carbon transition Decarbonisation efforts will need to ramp up significantly towards 2050.
	Significant drop in demand for autocatalysts	Significant growth of (green) hydrogen economy	Growth in demand due to cost-effective green steel, enabled by measures supporting green hydrogen economy	Moderate growth in demand for battery storage	Sustained short-term demand but significant decrease in demand for thermal coal in 2050	Significant increase in demand for critical minerals for low-carbon transition, notably copper, lithium, cobalt, nickel and rare earth minerals	
3°C – too little too late							<ul style="list-style-type: none"> Negative outlook for ARM Platinum due to deployment of electric vehicles but limited expansion of hydrogen economy Sustained demand for coal in the short to medium term.
	Moderate drop in demand for autocatalysts	Moderate growth of hydrogen economy	Limited impacts	Limited impacts	Sustained short-term demand but moderate to high decrease in demand for thermal coal in 2050. More investment in gas to close capacity gap left by renewables	Moderate increase in demand for critical minerals for low-carbon transition	
World transitions and South Africa lags							<ul style="list-style-type: none"> Positive outlook for ARM Platinum Negative outlook for carbon-intensive products supplied by ARM Ferrous, due to lack of local environment that enables decarbonisation. Engagement and lobbying required to mitigate this potential outcome Sustained demand for coal in South Africa but very negative outlook for export market Significant opportunities to be explored in critical minerals for low-carbon transition.
	Significant drop in demand for autocatalyst	Significant growth of (green) hydrogen economy	Decrease in demand for carbon-intensive iron ore produced in South Africa	Moderate growth in demand for battery storage, in spite of carbon-intensive South African products	No export market but sustained demand in South Africa	Significant increase in demand for critical minerals for low-carbon transition, notably copper, lithium, cobalt, nickel and rare earth minerals	
Business-as-usual							<ul style="list-style-type: none"> Negative outlook for carbon-intensive products supplied by ARM Ferrous, due to lack of local environment that enables decarbonisation. Engagement and lobbying required to mitigate this potential outcome Sustained demand for coal in South Africa but very negative outlook for export market Significant opportunities to be explored in critical minerals for low-carbon transition.
	Moderate drop in demand for autocatalysts	Limited growth of hydrogen economy	Decrease in demand due to physical impacts of climate change on country's GDP	Decrease in demand due to physical impacts of climate change on country's GDP	Sustained short-term demand but moderate decrease in demand for thermal coal in 2050. New coal additions in Asian markets but more investment in gas to close capacity gap left by renewables	Low to moderate increase in demand for critical minerals for low-carbon transition	

Climate change continued

Table 2: Responding to climate transition risks and opportunities

Category	Risk	Causal factors	Impacts
Policy and legal	Carbon tax: increase in carbon tax cost profile.	Exceeding energy generation threshold at various operations. Progressive expansion of carbon tax coverage into other areas (eg electricity price).	Financial: ARM paid just under R3 million indirect carbon tax (through Assmang, its joint venture with Assore) and no direct carbon tax for Two Rivers Mine for the 2021 calendar year.
Policy and legal	Uncertainty due to delays in the promulgation of South Africa's draft climate-change bill. Carbon budgets and associated mitigation plans).		Financial: exposure to greater carbon tax cost burden. Financial: Mismatch in budgets/benefits; financial outlay in preparation for mandatory phase of climate-change bill may not be realised in the anticipated period. Financial (upside): proactive investment may reap financial benefits for ARM. The benefits of participating in phase 1 of the carbon budget include a 5% tax-free allowance for the first phase of the carbon tax. Legal compliance and reputation: ARM has a mature GHG reporting system that will enable ongoing reporting that complies with regulations. Resource efficiency incentives.
Technology	Technology substitution (electric vehicles) could lead to increased demand for PGMs, particularly palladium and rhodium. Our 1.5°C – supportive scenario sees an 18 times increase in electric car sales by 2030 relative to 2020 (subject to availability of critical minerals). Even in our business-as-usual scenario, we see growth in electric vehicle deployment affecting demand for palladium and rhodium in autocatalysts.	Evolving and disrupting technologies are continually being evaluated to deal with decarbonisation objectives.	Financial: increase in revenue and return on investments (ROI). Growth: access to new markets (platinum). Despite existing barriers, energy companies continue to invest in green hydrogen as it is seen as critical for the climate transition and key for achieving our global climate goal.
Markets	Access to growing markets for high-quality iron and manganese ore.	Lumpy iron ore enables steel producers to reduce energy consumption and GHG emissions by about 10%. High-grade manganese ore enables smelters to use less energy. Established pool of global long-term contract iron-ore customers are already considered 'value-in use' customers as they derive additional value from our high-grade iron ore products. More Chinese steel mills are moving towards using high-grade iron ores to achieve lower carbon emissions. In China, local miners being prevented from mining low-grade manganese ore (as a result of air pollution, energy-efficiency and climate-change drivers) has led to an increase in imports of the type of high-grade ore that ARM produces.	Financial: increase in revenue and ROI.

▲ Medium ▲ Medium to high ▲ High

Category	Residual risk rating	Risk treatment	Affected strategic intent factors
Policy and legal	▲ Medium	<p>Development of decarbonisation pathways and operation-specific targets that are key for mitigating carbon-tax liability and mitigating risks associated with carbon budgets and GHG mitigation plans.</p> <p>Exploration of emission-reduction initiatives, setting remuneration incentives for staff, and exploration of opportunities to invest in renewable energy technologies (eg solar PV in the Northern Cape).</p> <p>Procurement of clean energy from renewable sources (eg wheeling renewable energy to ARM's platinum operations).</p> <p>Implementation of rigorous measurement and monitoring of process GHG emissions.</p>	
Policy and legal	▲ High	<p>Proactive measures: ARM has developed individual mass balances for CRW and CRA to improve measurement and reporting of process GHG emissions, and to comply with the requirement to shift from tier 1 emission calculations (default) to a higher tier. In F2023, CRW will report on calendar year 2022 emissions using a tier 3 approach.</p> <p>Participation in phase 1 of the carbon budget followed by allocation and management of operation-specific carbon budgets once ARM receives the legislated phase 2 carbon budget.</p>	
Technology	▲ High	<p>ARM would need to move towards more platinum production (eg at Two Rivers Mine). But Modikwa Mine is at risk as it produces a relatively high proportion of palladium and is labour intensive.</p> <p>Growth direction: any additional investments in PGMs will consider operations that produce relatively more platinum than palladium.</p>	
Markets	▲ Medium to high (opportunity)	<p>ARM is well positioned to meet the increasing demand for high-grade iron ores. The 65% lumpy iron ore (industry benchmark: 62%) and the 64% iron ore fines (industry benchmark: 62%) that ARM produces can reduce carbon emissions from the steel-making process by 17.5% and 6.25% respectively. 58% of ARM's total iron ore product is lumpy, and 42% of ARM's total iron ore product is fines. Lumpy ore attracts a lump premium of about 15–20% and an additional grade premium of about 4.8%, with the grade premium for iron ore fines 4% over the base price for 62% fines.</p> <p>Regular monitoring of developments in the platinum market as well as initiatives to stimulate and support the hydrogen economy.</p> <p>Use of the climate scenario analysis results to inform strategic decisions on PGMs and composition of ARM's future portfolio.</p>	

Climate change continued

Category	Risk	Causal factors	Impacts
Markets	Access to new markets (eg platinum and minerals critical minerals for the energy transition).	Platinum is expected to play a key role in the green hydrogen economy and the demand for it is expected to increase to support climate-related changes in the transport sector (rising demand for fuel cell electric vehicles) and in industry.	Financial: increase in revenue due to diversification. Sustainability: due to investment in commodities that feed 'future' technologies.
Reputation	Increased stakeholder concern or negative stakeholder feedback.	Not adequately responding to evolving, and increasing, climate-change related stakeholder expectations. In particular, we are facing growing pressure from investors to proactively manage climate-change risks and opportunities, which are increasingly seen as material to shareholder value.	Financial: diminishing share performance. Reputation: deterioration.
Reputation	Shifts in consumer preferences.	By affecting global demand for several major commodities, global climate action will have severe business impacts for mining groups.	Financial: diminishing share performance. Reputation: deterioration.

Physical climate risks and opportunities

Changing or extreme climate patterns pose direct and indirect risks to ARM, including damage to fixed assets and equipment; compromised operational performance of facilities with long life spans (eg TSF, water, and waste-rock storage facilities); output disruptions and damage; and disrupted supply chains. The impact of extreme weather events has already been felt across most of ARM's mining sites, and some of our operations will face increased risk exposure in future. Alongside we detail the projected physical impacts on our operations in 2035 (figure 5), and describe our responses to key physical climate risks (table 3).

Figure 5: Projected physical impacts on ARM operations in 2035

Two Rivers Mine (Platinum)

 Precipitation	▼	6.5%
Dry spells	▲	5.3%
Peak rainfall intensity	▲	3%
Overland flow	▲	26%
 Maximum temperature	▲	2.5–2.7°C
Extreme temperature days/year	▲	19
Evapotranspiration	▲	9.8%

Black Rock (Ferrous)

 Precipitation	▼	2%
Dry spells	▲	8–20%
Aridity	▲	Small
Peak rainfall intensity	▲	22%
Overland flow	▲	10–25%
 Maximum temperature	▲	2.0–4.5°C
Extreme temperature days/year	▲	45
Evapotranspiration	▲	12%

Khumani (Ferrous)

 Precipitation	▼	1%
Dry spells	▲	2–31%
Aridity	▲	Small
Peak rainfall intensity	▲	7%
Overland flow	▲	10–5%
 Maximum temperature	▲	2.2–4.5°C
Extreme temperature days/year	▲	43
Evapotranspiration	▲	13%

Modikwa (Platinum)

 Precipitation	▼	10%
Dry spells	▲	11%
Peak rainfall intensity	▲	8%
Overland flow	▲	35%
 Maximum temperature	▲	2.8–3.4°C
Extreme temperature days/year	▲	22
Evapotranspiration	▲	12%

▲ Medium ▲ Medium to high ▲ High

Category	Residual risk rating	Risk treatment	Affected strategic intent factors
Markets	▲ Medium to high (opportunity)	Same as above.	 
Reputation	▲ High	<p>Regularly engage with stakeholders.</p> <p>Production and dissemination of an annual ESG report.</p> <p>Integrated approach (systems, reporting, capacity building) to comply with evolving climate change regulations and meet reporting expectations on climate change and water.</p> <p>Communities receive additional benefits from the mines and smelters through our CSI and local economic development (LED) investment programmes.</p>	 
Reputation	▲ Medium to high	<p>Use of the climate scenario analysis results to inform strategic decisions on ARM's portfolio.</p> <p>Development of ambitious and operation-specific decarbonisation pathways to ensure that ARM's products can compete in global markets that are increasingly demanding zero- or low-carbon mining products.</p>	 

Machadodorp Works (Ferrous)

	Precipitation	▼	4%
	Dry spells	▲	2–30%
	Aridity	▲	Small
	Peak rainfall intensity	▲	3%
	Overland flow	▲	5–5%
	Maximum temperature	▲	2.3–4.4°C
	Extreme temperature days/year	▲	35
	Evapotranspiration	▲	14%

Nkomati (Platinum)

	Precipitation	▼	4%
	Dry spells	▲	10%
	Peak rainfall intensity	▲	9%
	Overland flow	▲	2%
	Maximum temperature	▲	2.2–2.4°C
	Extreme temperature days/year	▲	14
	Evapotranspiration	▲	8.9%

Cato Ridge Works* (Ferrous)

	Precipitation	▼	3%
	Dry spells	▲	23%
	Aridity	▲	Moderate
	Peak rainfall intensity	▲	4%
	Overland flow	▲	0–10%
	Maximum temperature	▲	1.8–3°C
	Extreme temperature days/year	▲	30
	Evapotranspiration	▲	7%

Beeshoek (Ferrous)

	Precipitation	▼	1%
	Dry spells	▲	8–29%
	Aridity	▲	Small
	Peak rainfall intensity	▲	14%
	Overland flow	▲	10–25%
	Maximum temperature	▲	2.0–4.6°C
	Extreme temperature days/year	▲	40
	Evapotranspiration	▲	13%

* Includes Cato Ridge Alloys.

Climate change continued

Table 3: Responding to physical climate risks

Category	Risk	Causal factors	Impacts
Acute	Increased severity of extreme weather events affecting water availability.	Long-term decrease in annual rainfall. Rainfall intensity and magnitude worsens.	More frequent and severe drought conditions and increased aridity. Greater risk of more frequent and severe flash floods. Compromised water availability, paired with regional water infrastructure problems. Disruptions to production. Safety risks. Limited operational expansion. Impact on supplies. Greater investment in risk-reduction measures.
Acute	Increased severity of extreme weather events increasing the risk of discharges.	Floods with higher peaks and shorter lag times that occur fast and with little warning.	Operational interruptions. Uncontrolled discharge of excess water into the environment. Controlled discharge and associated non-compliance with the waste management and water use licences. Legal non-compliance. Reputational and financial consequences. Investments in dewatering processes, the construction of water-related infrastructure with large retention capacity, and the improved treatment of discharge water.
Acute	Increased severity of extreme weather events affecting electricity costs and supply.	Supply of coal and other products used in generating power are interrupted. Damage to infrastructure.	Exacerbated existing power-supply risks. Operational interruptions. Reputational and financial consequences.
Chronic	Changing rainfall patterns in the Vaal catchment.	Northern Cape operations are fed by Sedibeng Water which sources water from the Vaal River. Drying is expected in the northern and western parts of the catchment, but increased rainfall is expected in the southern and eastern parts.	Shifted hydrogeological balances in the catchment which lead to stress on these water resources. Threatened long-term security of water supply. Impacts on production. Limiting operational expansion. Impact on supplies. Investment in risk-reduction measures.

▲ Medium ▲ Medium to high ▲ High

Category	Residual risk rating	Risk treatment	Affected strategic intent factors
Acute	▲ High	<p>Investment in bulk water infrastructure as part of industry/government collaboration.</p> <p>Mine leadership forum established to engage collaboratively and proactively on the Vaal Gamagara Water Supply Scheme (VGGWSS) design and cost with Sedibeng Water (utility service provider).</p> <p>Participation in the Lebelelo Water User Association (LWUA) to supply bulk raw water.</p> <p>Khumani Mine is exploring the potential to access approximately 2.1 million m³ of water per annum from the neighbouring Sishen mine.</p> <p>Paste technology used at Khumani for TSF (recovering up to 85% of water), and long-term investment for on-site water storage.</p> <p>Beeshoek Mine has invested in pumping capacity and revised road designs to improve water drainage during heavy rainfall.</p> <p>Black Rock Mine is investing in a combined sewage treatment plant that will provide potable water for the village and reduce the quantity of potable water withdrawals from Sedibeng Water. Grey water will be diverted to the village for irrigation, and stormwater will be captured for reuse.</p> <p>Two Rivers Mine is conducting more active cleaning of the pollution control, buffer, and settling dams to build capacity.</p> <p>Modikwa Mine has maintained its focus on removing alien vegetation to improve the availability of water to users in the catchment.</p>	 
Acute	▲ Medium to high	<p>Proactive water use management in line with licences and regulatory commitments.</p> <p>All operations run closed-water circuits and have developed management tools to optimise use and management of water.</p> <p>Discharges only take place in line with permits in times of extreme precipitation or in emergency situations, and are reported to authorities.</p> <p>Nkomati is exploring all options to mitigate discharge of water during the care and maintenance phase and as it moves towards closure.</p> <p>Machadodorp Works has established a water management project team and constructed cut-off trenches to capture and redirect any dirty run-off water to the sump first, and to stormwater dams thereafter.</p>	 
Acute	▲ Medium	<p>Monitoring extreme weather events.</p> <p>Emergency plans in place to respond.</p> <p>Mitigating unplanned electricity supply interruptions through the use of diesel generators and ring-feeder power supplies.</p> <p>Exploring on-site renewable power options.</p> <p>Quarterly meetings with Eskom to communicate with the group electrical engineer about power outages that may affect the various operations.</p>	 
Chronic	▲ High	<p>Along with VGGWSS, exploring the extent to which the relevant authorities have explored the projected impacts of changing rainfall on future supply from the Vaal.</p> <p>Determining the role ARM can play in ensuring appropriate response measures are put in place.</p> <p>Khumani Mine is undertaking studies to explore whether projects are needed to manage higher rainfall levels.</p>	 

Climate change continued

Category	Risk	Causal factors	Impacts
Chronic	Rising mean temperatures affecting our workforce.	Temperatures are expected to increase by 2.5–5°C by 2100 along with increases in the occurrence, duration and magnitude of heatwaves.	Halting or downscaling operations to prevent heat stress during extreme high temperatures. Requirement for investment in under- and above-ground cooling solutions. Operational and workforce efficiency issues. Low employee morale and wellness.
Chronic	Increasing social unrest related to climate change.	Impact on livelihoods and wellbeing of vulnerable communities through, for example, reduced food security, health impacts, and increasing costs of living.	High levels of social unrest and destruction of assets and infrastructure. Compromised ability to source local workforces and secure mining rights. Exacerbated employee relations issues. Industrial action and production losses.
Chronic	Changes in rainfall patterns and extreme weather variability affecting ARM's suppliers.	Droughts and extreme rainfall events.	Impacts to our value chain, operation logistics, and product sales. Interruptions to supplies and shipment of materials.

Integration of climate change risk into ARM's ERM processes

During the scenario analysis process, it became clear that climate risks have real financial implications for our business, both through the potential capital investments we may require to continue operating, as well as operational interruptions. It was apparent that identifying, evaluating, and managing these risks required detailed quantified information. We also realised that a well-developed risk severity scale, able to incorporate climate risk impacts, was necessary to communicate physical climate risks at operational and corporate levels. Although current scales in use largely meet these requirements, we will continue to review and refine them to ensure that they are fit for purpose and accommodate climate change-related causes and impacts.

Climate risks will be assessed in all aspects of ARM where climate risk and climate resilience are relevant, including existing processes, practices, standards, and guidelines, from planning to operations to closure. Ultimately, these climate change risks and opportunities will also be

integrated into mainstream filings, including income statements, cash flow statements, and balance sheets.

A roadmap to integrate climate change fully into our ERM process was finalised in August 2021. This roadmap includes improving data on climate impacts, and refining risk rating scales to accommodate climate-specific impacts. It also includes assessments of climate-impact thresholds at operations and mitigation measures necessary for negating risks.

Implementation of the roadmap commenced in F2022. Efforts to date have focused on refining the physical risk outputs of the scenario analysis. These have fed into the development of a climate knowledge base which is being used to meet the climate-related requirements of the GISTM. In F2023, we plan to conduct workshops to explore the operation-specific impacts associated with the projected physical climate changes, develop appropriate response measures, and develop systems to ensure more structured, ongoing assessments of climate risks.

The impact of risks and opportunities on business and financial planning

During F2022, our operations, suppliers and communities experienced a number of disruptions related to climate change.

Two Rivers, Black Rock, Nkomati, Machadodorp Works and Beeshoek mines experienced unusually heavy rainfall and/or high winds which led to production losses, dam overflows and discharge events.

Flooding in KwaZulu-Natal caused delays in the delivery of spare parts (particularly associated with Caterpillar and Toyota machinery) at various ARM operations. Although these delays generated challenges, for most mines they did not result in any production stoppages or other material impacts. Cato Ridge Works, however, was particularly heavily impacted by the flooding and inclement weather. Its stormwater management systems were pressurised, furnace batch plants were overwhelmed, feed chutes were blocked, cables failed, and material feeding into the furnace had high

▲ Medium ▲ Medium to high ▲ High

Category	Residual risk rating	Risk treatment	Affected strategic intent factors
Chronic	▲ Medium	Weather data monitored continually and action taken should temperatures exceed a threshold to prevent heat stress. Results of the climate scenario analysis used to inform more robust climate-impact assessments.	
Chronic	▲ High	Employee relations policies. Engagement with communities, government and other stakeholders. Investments in line with our social and labour plans. BBBEE compliance. Leveraging SED and CSI spending. Broader contribution to South Africa's economic development. Identifying where existing efforts to improve community resilience can be scaled up, and where new transformation initiatives are needed.	
Chronic	▲ High	Prioritising suppliers/supply chains for analysis. Modelling impacts, assessing risk profiles, and developing mitigation measures/other recommendations.	

moisture contents. These challenges significantly reduced efficiencies (including the need to adjust to lower quality ores and lower quality sinter), and led to an estimated production loss of R42 million, and repair costs of R2.5 million.

Loadshedding in F2021 and F2022 required greater use of backup generators that support critical functions, such as ventilation fans, which increased diesel consumption and emissions.

Social unrest and strikes have impacted the resilience of our operations and of the communities in which we operate. The Lebalelo pipeline was damaged in 2015 by local communities that had social funding expectations beyond the prescripts of mines' social and labour plans. Incidents continue sporadically, though less significantly.

On the positive side, market trends driven by climate change, among other issues, have seen an increase in demand for certain commodities. We continue to invest in PGMs and anticipate an increase in demand for platinum associated with hydrogen

to reduce GHG emissions in the transport and hard-to-abate industrial sectors.

Assmang has also recorded higher demand for better-quality iron and manganese ores as steel producers – most notably those in China – are driven to improve efficiencies, reduce emissions and curb air pollution.

Climate-change risks and opportunities have also contributed to the impetus to invest in innovation. We are investigating and testing technology that may reduce energy requirements in the smelting process.

Considering climate-change risks in ARM's investments

ARM Coal

ARM Coal has a 20% share in PCB and a 51% share in GGV. Glencore Operations South Africa (GOSA) owns the remaining stakes. ARM Coal is in turn jointly owned by ARM (51%) and GOSA (49%).

GGV is an open-pit mine producing around 7Mt of saleable thermal coal per year, with a life-of-mine of 20 years. PCB includes Impunzi

(open-pit operation), and Tweefontein (open-pit operation following the discontinuation of underground operations in F2022). PCB produces some 15.3Mt of saleable thermal coal per year and has a LOM of 13 years. Export coal is marketed and sold by Glencore International to various markets, mainly in India.

Information on coal resources and reserves appears on page 13 of the ESG report.

GGV is governed by a management committee controlled by ARM Coal, with ARM and GOSA representatives. Operational management is contracted to GOSA. PCB is governed by a supervisory committee with representatives from both ARM and GOSA, and is operated by GOSA.

Climate-change risks are assessed and tabled as appropriate at quarterly steering committee meetings. GHG emissions associated with the operations are measured and then consolidated by GOSA during its mandatory reporting for all its South African operations. ARM has reported on GHG emissions proportional to its coal investments (page 41). 

Climate change continued

Glencore has committed to deliver a 40% reduction in total emissions by 2035 (using 2019 levels as a baseline) and, within a supportive policy environment, to be a net-zero total emissions company by 2050. It has also undertaken a climate scenario analysis and formulated a new climate strategy in partnership with key stakeholders. Glencore has also made the strategic decision to continue to operate its coal mines until they reach the end of their lives. It continues to invest in efforts to decarbonise its operations, including PCB and GGv. This includes collaborating with supply chains, supporting uptake and integration of abatement, using technologies to improve resource efficiency, and being transparent in reporting on progress and performance.

ARM recognises that global emission-reduction initiatives and the move to cleaner mobility and energy are expected to put pressure on demand for PGMs and thermal coal. But they also create opportunities for other commodities in our portfolio, including bulk and base metals.

Harmony

ARM owns 12.12% of Harmony's issued share capital. Harmony is run by its own management team who are responsible for its mineral resources and reserves, which it reports on in its annual report. As part of engaging with Harmony to report on our scope 3 emissions attributable to this investment, we explored Harmony's approach to identifying and managing climate-related risks.

Currently, Harmony monitors and reduces energy use and GHG emissions. In line with its short- and medium-term business strategy for

the next five years to move towards an alternative energy supply mix (page 49), it is actively reducing its grid-electricity consumption and GHG emissions with both year-on-year and multi-year targets. The company has also undertaken a climate scenario analysis and determined that water is the primary medium through which it will feel the physical effects of climate change. Second to that is the increase in temperatures, which could affect underground ambient temperatures, particularly in its deeper-level operations. It has also identified climate-transition risks that could increase business costs and undermine the long-term viability of operating deep-level mines. Harmony continues to undertake robust business planning that considers these risks.

In F2021, Harmony published its second report on climate change in line with TCFD requirements.

ARM's risk processes do not include African Rainbow Capital and African Rainbow Energy and Power. They are separate companies with their own processes for assessing and managing climate-change related risks and opportunities.

Targets and performance

GHG emissions

Interrogating our GHG accounting organisational boundary

In previous years, we calculated and reported on emissions according to ARM's equity share (attributable emissions) in the operations where we have operational or joint operational control. However, this year, we have shifted our reporting to operational control boundaries (page 6). This means our emissions

are now reported on a 100% basis for operations where we have direct or joint operational control, namely:

- **ARM Ferrous:** Khumani, Beeshoek and Blackrock mines together with the Cato Ridge Works and Machadodorp Works operations
- **ARM Platinum:** Two Rivers, Modikwa, and Nkomati mines.

Scope 1 and 2 emissions

Our GHG calculations are based on the GHG protocol, which was first published by the World Resources Institute and World Business Council for Sustainable Development in March 2004. Our data-collection process also complies with the data quality requirements set out in ISO 14044, as well as GRI Standards. Our scope 1 and 2 GHG emissions are externally assured each year.

ARM's existing base year is F2018. Our target base year excludes Nkomati, which has moved to care and maintenance.

The emissions attributable to our operations primarily come from the consumption of electricity produced by coal-fired power stations and the combustion of fossil fuels during our mining, load-and-haul, materials handling and processing activities. We monitor and report on our emissions data internally every quarter, discuss them at operational sustainability meetings, and assess them as part of our quarterly risk management workshops.

Scope 1 emissions mainly relate to diesel consumption for load-and-haul activities and reductants, such as at Cato Ridge Works. Electricity consumption (scope 2 emissions) comprises 78% of our total carbon footprint.

CASE STUDY

Improved emissions accounting at CRW and CRA

The carbon tax requires that CRW and CRA, as separate legal entities, disclose emissions and pay carbon tax separately. Furthermore, mandatory GHG reporting regulations require that we adopt a tier 3, or mass balance approach to account for the emission sources.

While we have historically applied a tier 3 approach to calculate process emissions for CRW as a whole, we were previously unable to split CRW and CRA using this approach and therefore instead applied a tier 1, or default emissions approach for the two entities.

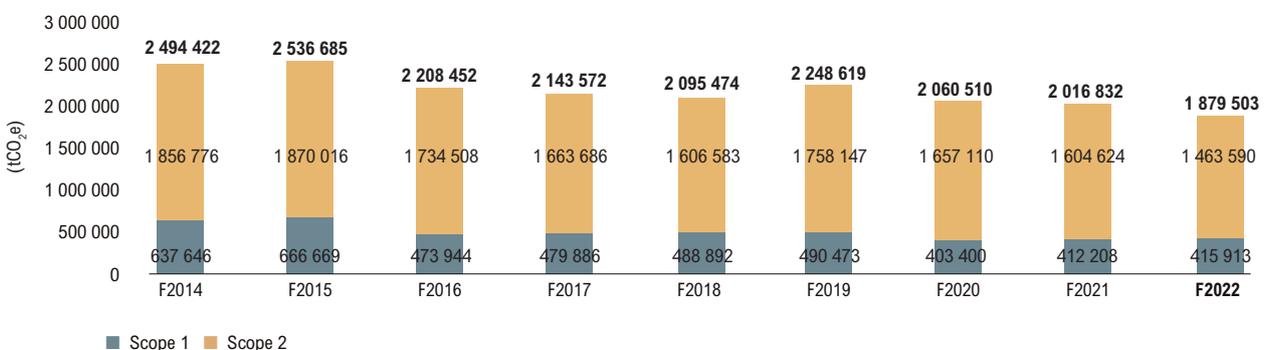
In F2021 we implemented measures to apply a tier 3 approach, with the net effect being that carbon tax liability increased significantly for CRW and decreased significantly for CRA. This is because, in a tier 1 approach the emissions associated with producing molten metal are included in the Medium Carbon Ferromanganese default emission factor, while in a tier 3 approach the only input into the CRA mass balance calculation is molten metal (High Carbon Ferromanganese), and the only outputs are dust and slag (MCFeMn). The embodied emissions in the molten metal (ie the process emissions used to produce that molten metal) are included in the CRW account.

In F2022 we have continued to refine the tier 3 approach, and have engaged with the DFFE on the process for submitting and obtaining approval. We have also continued to improve the emissions accounting at CRW where ARM’s process emissions represent 50% of our scope 1 emissions and 11% of our scope 1 and 2 emissions on an operational control basis. Additional improvements include more accurate estimations of carbon content of dust and slag associated with production.

GHG emissions changes over time

Overall, ARM’s F2022 absolute scope 1 and 2 emissions have decreased by 6.8% from the previous year. However, this decrease is largely due to Nkomati Mine moving to care and maintenance, and therefore cannot be considered as performance-related.

Carbon footprint (scope 1 and 2 – 100% basis)



Climate change continued

The estimated carbon footprint (scope 1 and 2 attributable emissions) decreased 7.3%, from 1.00 million equivalent tonnes of CO₂ (mtCO₂e) in F2021, to 0.92 million mtCO₂e in F2022.

On a 100% basis (the new operational control boundary), emissions decreased by 6.8%, from 2.02mtCO₂e in F2021, to 1.88mtCO₂e in F2022. This represents a 9.5% decrease compared to our F2018 baseline and a 25% decrease on the previous baseline in F2014.

Scope 1 emissions increased 1% year on year while scope 2 emissions decreased 9% year on year. The Eskom grid emission factor decreased by 2%. The carbon intensity of South Africa's grid remains a concern and, together with cost and security of supply drivers, we continue to explore lower-carbon power alternatives. Our electricity consumption in MWh decreased by 11%.

Year-on-year changes in emissions are primarily due to:

- **Reduced furnace efficiencies at Cato Ridge Works:** In December 2019, ARM invested in a brix plant at Cato Ridge Works to enable optimal reduction conditions. The process at the plant includes bonding 'bricks' that contain nine streams, including metal fines, in

optimal ratios. The bricks enable consistent sizing, which optimises air flow for the reduction of manganese. This has improved furnace efficiencies, and contributed to a reduction of 25 643tCO₂e in F2020 relative to F2018. The decision to process lower-quality ores in F2021 reduced some of the efficiency benefits associated with the brix plant, resulting in relative reductions of 21 615tCO₂e for that year. Efficiencies were further reduced in F2022 as the operation had to adjust to lower-quality sinter, as well as to lower-quality ores, but also higher moisture contents in materials due to flooding (page 68). The net effect was an active saving of 12 277tCO₂e. The new sinter plant, expected to be operational in F2023, will improve sinter quality and contribute to addressing some of these efficiency challenges



- **Changes in production output:** Emissions from Nkomati decreased significantly as it is on care and maintenance, with the mine having ceased production at the end of March 2021. Production changes at various operations contributed to other changes over time. These include a 3.1% increase in production at Khumani Mine (total production of iron ore from Khumani and Beeshoek mines increased by 2%), a 2.1% increase in production at Black Rock Mine, a 5.3% increase at Two Rivers Mine, and a 19% increase at Modikwa Mine

- **Electricity supply disruptions:** Loadshedding in F2022 necessitated the use of generator sets, particularly at Black Rock Mine, which has a 14MW-capacity diesel generator
- **GHG emission-reduction initiatives:** Initiatives implemented since F2018 are still actively contributing to savings, with 30 256tCO₂e saved in F2022. This contributed a 1.6% reduction to the change in our scope 1 and 2 emissions compared to what they would have been had the initiatives not been implemented
- **Modernisation and expansion:** At Black Rock Mine ore-tipping faces were moved closer to loading areas. This has reduced haul distances significantly, saved costs, and reduced energy consumption and associated GHG emissions. Black Rock's investment in private rail facilities has also resulted in a shift from road to rail product transport.

In F2022, Cato Ridge Works contributed 35% of the group's total scope 1 and 2 emissions. Modikwa Mine contributed 18%, Khumani Mine 17% and Two Rivers Mine 14%, mainly as a result of diesel consumption during mining, and load-and-haul activities (on a 100% basis).

GHG emissions per operation based on equity share and operational boundaries

Equity share boundary (attributable basis)

	F2022			F2021		
	Scope 1 (tCO ₂ e)	Scope 2 (tCO ₂ e)	Scope 1 and 2 (tCO ₂ e)	Scope 1 (tCO ₂ e)	Scope 2 (tCO ₂ e)	Scope 1 and 2 (tCO ₂ e)
ARM Ferrous						
Beeshoek Mine	19 756	19 478	39 235	19 871	20 261	40 132
Khumani Mine	55 597	106 423	162 021	54 101	100 997	155 098
Black Rock Mine	12 513	76 783	89 296	11 191	70 851	82 042
Cato Ridge Works	100 958	223 250	324 208	89 031	215 471	304 502
Machadodorp Works*	1 184	12 643	13 827	976	13 728	14 703
Total	190 008	438 578	628 586	175 170	421 307	596 477
ARM Platinum						
Nkomati Mine	167	3 955	4 122	13 573	124 942	138 515
Modikwa Mine	4 974	137 054	142 028	4 824	116 851	121 675
Two Rivers Mine	9 384	138 319	147 703	9 448	129 215	138 663
Total	14 525	279 328	293 853	27 845	371 008	398 853
ARM corporate office	12	396	408	2	455	458
ARM total	204 545	718 302	922 847	203 017	792 771	995 788

* 100% basis as Machadodorp Works is wholly owned by ARM.

Operational control boundary (100% basis)

	F2022			F2021		
	Scope 1 (tCO ₂ e)	Scope 2 (tCO ₂ e)	Scope 1 and 2 (tCO ₂ e)	Scope 1 (tCO ₂ e)	Scope 2 (tCO ₂ e)	Scope 1 and 2 (tCO ₂ e)
ARM Ferrous						
Beeshoek Mine	39 513	38 957	78 469	39 741	40 523	80 264
Khumani Mine	111 195	212 847	324 042	108 202	201 994	310 196
Black Rock Mine	25 026	153 565	178 592	22 382	141 701	164 084
Cato Ridge Works	209 603	455 532	665 135	184 956	439 834	624 790
Machadodorp Works*	1 184	12 643	13 827	976	13 728	14 703
Total	386 520	873 544	1 260 064	356 257	837 779	1 194 037
ARM Platinum						
Nkomati Mine	334	7 911	8 245	27 146	249 884	277 031
Modikwa Mine	11 986	330 250	342 236	11 624	281 570	293 193
Two Rivers Mine	17 062	251 488	268 550	17 179	234 936	252 114
Total	29 381	589 649	619 030	55 949	766 389	822 338
ARM corporate office	12	396	408	2	455	458
ARM total	415 913	1 463 590	1 879 503	412 208	1 604 624	2 016 832

Going forward, we anticipate additional savings from energy and carbon audits, the assessment of mitigation options, the development of our decarbonisation pathways, and investments in renewable energy. Some reduction opportunities involve capital investment and a budgeting process over more than one financial year. While many of these activities will only begin to deliver significant savings from F2024, they will be key to achieving our targets.

Climate change continued

GHG emissions intensity

Scope 1 and 2 emissions per tonne of ferromanganese increased from 3.6–3.8tCO₂e/tonne of product. This was due to Cato Ridge Works having to process lower-quality ores and sinter, as well as challenges associated with adjusting to high moisture contents in the materials caused by floods during the year.

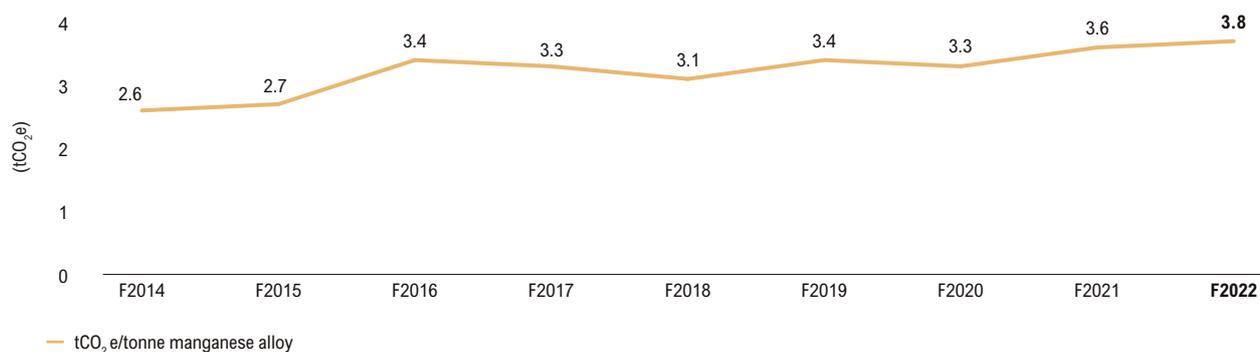
Scope 1 and 2 emissions per tonne of iron ore produced are 0.025tCO₂e/tonne (F2021: 0.025tCO₂e/tonne). Scope 1 and 2 emissions per tonne of manganese ore produced increased to 0.043tCO₂e/tonne from 0.041tCO₂e/tonne in F2021.

Carbon emissions per tonne of PGM ore milled at our two primary platinum mines, Modikwa and Two Rivers, increased to 0.106tCO₂e/tonne (F2021: 0.101tCO₂e/tonne).

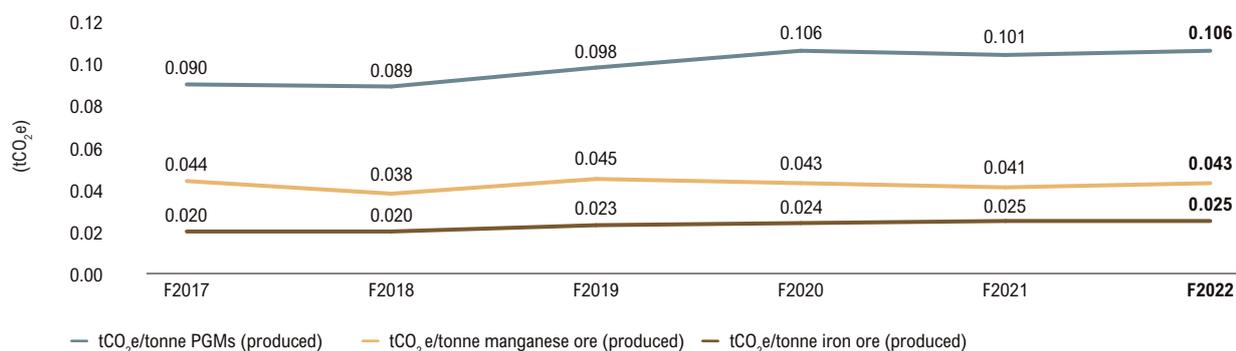
Scope 1 and 2 emissions per full-time employee (FTE) decreased 1.8% to 95.99tCO₂e (F2021: 97.7tCO₂e).

Scope 1 and 2 emissions per man-hour worked increased to 48.72kg CO₂e (F2021: 48.22kg CO₂e).

Scope 1 and 2 carbon emissions per tonne produced – smelters (100% basis)



Scope 1 and 2 carbon emissions per tonne produced – mines (100% basis)



GHG targets and emission-reduction initiatives

Our strategic focus on cost efficiencies and operational cost-reduction projects supports our efforts to reduce energy consumption and emissions. Our energy and climate-change strategy aims to identify and develop opportunities for long-term achievable emission reductions. It does this by investigating energy-efficiency initiatives, alternative energy sources, new technologies, and considering our diversification into less energy-intensive products. Our decarbonisation pathway development process is ramping up these efforts, in recognition that we need urgent, more ambitious reductions, if we are to achieve our net-zero commitment.

This process spans multiple financial years and involves feasibility or product comparisons, budgeting, and capital allocation, and finally procurement or construction depending on the nature of the project.

We drive investment in emission-reduction activities in the following ways:

- **Remuneration incentives:** Our 2018 CSP connects corporate executive share incentives to our GHG emission-reduction target. The plan has been updated to include yearly executive incentive targets aligned with pathways to achieving our target. At our operations, remuneration and incentive packages for engineers and production staff are linked to energy efficiency and GHG emission reductions
- **Internal carbon price:** We have taken initial steps to establish an internal carbon price for evaluating new projects and acquisitions. The pilot exercise provided some insight into the financial implications of a project that reduces carbon tax liability, and generated lessons for integrating an internal carbon price into our new projects and acquisitions
- **Climate scenario analysis:** This analysis demonstrated the importance of identifying an appropriate decarbonisation pathway in line with the global 1.5°C climate goal
- **Dedicated budget:** We have a capital allowance for energy-efficiency projects at our operations. We are exploring additional budget requirements associated with the more ambitious reductions being explored as part of our decarbonisation pathway development process
- **Energy-efficiency plans:** As part of our decarbonisation pathway development process we are exploring operation-specific mitigation priorities, with energy-efficiency being a primary short-term mitigation focus
- **Engagement workshops:** Annual climate and water workshops at our operations focus on identifying and implementing GHG emission-reduction initiatives. In F2022, these workshops helped to improve reporting systems in preparation for our revised carbon budget, updated the CSP incentives, and initiated the decarbonisation pathway development process
- **Leveraging incentives and innovative models:** We have benefitted from the section 12L energy-efficiency incentives offered by the South African government, and we continue to explore direct support opportunities and engage with third parties on innovative models for procuring renewable energy
- **Research and development (R&D) and supply chain engagement:** We are exploring, internally and with our partners, innovative technologies that deliver low-carbon products or help our

operations by indirectly reducing their energy consumption and environmental impacts

- **Energy and carbon management system:** We have been refining the system to serve a more proactive function to enable planning, assign clear roles and responsibilities for implementation, track progress and performance, and facilitate reporting.

GHG emissions performance

Long-term target: net-zero GHG¹ emissions from mining by 2050.

Short-term target: 4% absolute reduction of scope 1 and 2 emissions by F2023 against F2018 baseline through emission-reduction initiatives implemented from F2019 onwards (provided they are still delivering active savings; excluding Nkomati Mine which is under care and maintenance).

¹ This includes ARM's scope 1 and 2 emissions associated with operations under direct or joint direct operational control.

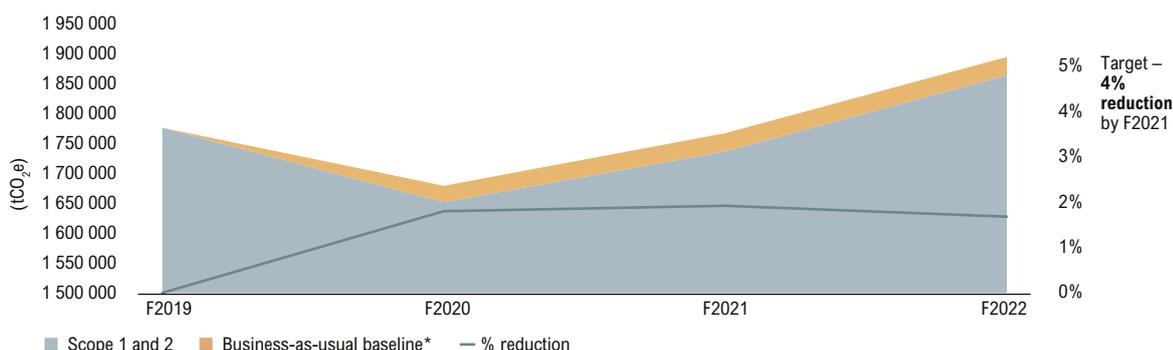


To illustrate our performance relative to our emission targets, we calculated the percentage of emission reductions that could be attributed to our emission-reduction initiatives, and found a 1.6% absolute reduction of scope 1 and 2 emissions compared with a 2018 business-as-usual baseline. Our calculations for this metric excluded Nkomati Mine. New initiatives implemented in F2022 are described on page 44. These reductions are not in line with our short-term target of achieving 4% absolute reduction of scope 1 and 2 emissions by F2023. However, our current focus on establishing decarbonisation pathways will help us improve these short-term emission reductions while simultaneously paving the way for net-zero emissions by 2050.

Climate change continued

The increase in the business-as-usual baseline emissions (excluding the impact associated with Nkomati Mine moving to care and maintenance) is largely due to increased production associated with expansion activities at Black Rock, Two Rivers and Modikwa mines, increased stripping rations and haulage distances at Khumani Mine, and reduced furnace efficiencies at Cato Ridge Works.

GHG emissions performance



* The business-as-usual 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).

GHG savings from new initiatives

Various saving and carbon emission-reduction initiatives were implemented in F2022, some of which have a payback period of less than three years.

New initiatives implemented in F2022	Additional savings per year (tCO ₂ e)
Backfilling at Beeshoek reduced the need to drive up the waste stockpile and resulted in a diesel usage reduction year on year compared with the same period.	1 650
Installation of variable speed drives as part of the Furnace 5 baghouse upgrade at Cato Ridge Works. This project is benefitting from section 12L tax incentives.	823
Leaving haulage vehicles underground at Modikwa Mine, which required investing in service and refuelling bays underground.	608
At Modikwa Mine, keeping the rigs and bolters underground instead of driving them up to the surface after each shift. This reduces the number of trips to the surface (8km each way).	338
Developing and implementing a generator management system to control the stopping and starting of individual generators on demand, and to run individual generators at optimum loading. This ensures the most fuel-efficient operation and reduces the total running hours and diesel consumption per MWh generated.	289
More efficient air conditioners at Two Rivers Mine.	36

Additional projects being developed include:

- Investigating the feasibility of renewable energy solutions in the Northern Cape and for our Platinum operations (page 26 and 27)
- Piloting electric vehicles with multiple benefits (see ARM's F2020 supplementary report on climate and water)
- Reducing vehicle numbers. Beeshoek Mine will replace trucks to reduce the size of the fleet while handling the necessary tonnages
- Energy efficiency: At Black Rock Mine, we are moving fans closer to working places, installing motion detectors for existing LED lights, investing in additional LED lighting, automatically stopping conveyors when not in use, and installing vent fans with variable speed drives. The development of the Merensky Project at Two Rivers Mine includes investing in energy efficient equipment and best-practice design
- Optimisation: We are looking into surface fan relocation, right-sizing hauling vehicles (eg improved road conditions, reducing idling time, using batteries to support

air-conditioning systems and lighter bowls to reduce diesel consumption at Khumani Mine), replacing haul roads with underground conveyor belts (such as at Modikwa Mine), and moving fans closer to working places (at Two Rivers Mine)

- Reducing energy requirements for haulage: Khumani Mine is investing in a discard spreader system that will replace haul trucks with conveyors. This will reduce diesel consumption, increase electricity consumption and result in a net savings in GHG emissions. The project began in F2022 but we experienced challenges in implementation. Savings are expected from F2023. Black Rock is exploring leaving vehicles underground by investing in underground workshops
- In F2021, Cato Ridge Works commissioned a study to explore the potential of using biomass as a reductant in the ferromanganese smelting process to help reduce scope 1 process emissions. Initial results are positive but there is a challenge around fitting the husks into the furnace. The operation is exploring using husk-based carbon brix to supply around 500 tonnes per month. This could potentially reduce coke use by 800 tonnes per month as the husks have been found to be more reactive. The business case looks positive, but some technical questions still need to be answered
- Reducing emissions in our value chain (scope 3 – transportation).

Energy and carbon audits

For our platinum division mines we undertook energy and carbon audits to identify and quantify mitigation options at Two Rivers Mine and Modikwa. These audits will not be

done for Nkomati as the mine is on care and maintenance. For ARM Ferrous, we have contracted an external service provider to conduct energy and carbon audits at our Northern Cape mines, CRW and CRA (South Africa), and Sakura (Malaysia).

These audits will yield long lists of mitigation options, each with marginal abatement cost curves (which consider the net-present value of costs over the net-present value of emission reductions over the life of the initiative) to aid decision-making. Our next steps are to determine operation-specific mitigation priorities, convert them into operation-specific mitigation plans that have the budgets, systems and target-specific KPIs needed to ensure the mitigation options can be effectively implemented, tracked, and reported on. Targets will likely be expressed on an intensity basis, based on the 'bottom up' decarbonisation pathways and with reference to pathways required by science.

Improving our energy and carbon management system

In F2020, we started to develop a formal energy and carbon management system that identifies, prioritises, implements and reports on measures that save energy and GHG emissions. The system was initially developed reactively, in response to a variety of regulatory and voluntary drivers related to decarbonisation and energy management, and with the objective of gathering historical information for the sake of reporting. For example, the carbon budget requires a PPP that outlines planned measures and reports on implementation performance, while carbon tax requires an indication of efforts to reduce taxed emissions and mitigate costs.

However, over time, as the focus on climate change has grown, we have been refining the system to serve a more proactive function to enable planning, assign clear roles and responsibilities for implementation, track progress and performance, and facilitate reporting. As part of our voluntary decarbonisation objectives, we also knew that we needed to develop decarbonisation pathways to achieve our long-term GHG reduction target, and to inform the short-term milestones of our executive share incentive.

In F022 we began exploring data solutions that could improve the functionality of our energy and carbon management system, and that would ultimately enable us to integrate ESG-relevant metrics and related management activities into it. The system will be key to managing the implementation of our decarbonisation pathways and their associated management plans, as well as achieving our new targets once they're set.

In addition to this system, across our operations we are conducting energy and carbon audits to identify areas where energy efficiency can be improved, and carbon emissions reduced. Based on the outcomes of these audits, and the resultant decarbonisation pathways, will be a clear set of projects to be implemented by different operations that detail mitigation potential as well as CAPEX and OPEX costs. These will help ARM to evaluate GHG reductions from a financial perspective, and to identify future opportunities for cost-effective emissions reductions.

Climate change continued

Scope 3 emissions

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. It explicitly recommends that organisations disclose scope 3 emissions, which refer to indirect emissions not included in scope 2 that occur in the upstream and downstream value chains.

We calculate scope 3 emissions according to the GHG protocol – corporate value chain (scope 3) accounting and reporting standard. The latest UK Department for Business, Energy and Industrial Strategy’s emission conversion factors are used, and other emission factors are sourced from organisations such as the World Steel Association and IMnI.

Source data is either gathered directly or estimated, depending on its availability or the materiality of the scope 3 category. Our approach to addressing scope 3 emissions is evolving and includes initiatives to improve the completeness and accuracy of data gathering and reporting. These developments can make it difficult to compare emissions value directly on a year-on-year basis (see table alongside). We also intend to focus on material sources in recognition of our promise to collaborate with stakeholders to reduce emissions.

Improved scope 3 accounting

In response to the growing emphasis on and importance of scope 3 emissions, we continually work to improve our scope 3 inventory.

In F2021 we focused on the completeness and accuracy of our most material scope 3 categories: emissions associated with the use

and processing of products (notably iron ore, manganese ore and ferromanganese), and emissions associated with our investments (notably our investments in thermal coal with Glencore and our investments in gold with Harmony Gold). We also included emissions associated with transmission and distribution losses (fuel and energy-related activities), and restated F2020 and F2019 to include these sources.

In F2022 we continued this work, drawing on expenditure and leveraging relevant emission factors to achieve more complete assessments of scope 3 categories 1 (purchased goods and services) and 2 (capital goods). We plan to further refine these assessments to focus on specific

purchased goods and services, and capital goods. We also included emissions associated with Sakura for scope 3 category 15 (investments), resulting in an increase compared with F2021.

This year, we have reported all scope 3 emissions on an operational control basis, requiring a restatement of F2021 and F2020 numbers reported last year (previously reported on an equity share basis). Emissions associated with category 15 (investments) are, however, reported based on ARM’s proportional share of investments in those operations¹ and companies, as per the GHG Protocol’s Corporate Value Chain (scope 3) Standard.

Scope 3 emissions

Category	Scope 3 (100%)** (tCO ₂ e)		
	F2022	F2021	F2020
1 Purchased goods and services	679 289	52 305	53 645
2 Capital goods	652 462		
3 Fuel and energy-related activities	220 413	211 774	216 426
4 Upstream transport and distribution	985 728	962 031	859 903
5 Waste generated in operations	1 371	1 432	1 130
6 Business travel	1 584	1 724	2 765
7 Employee commuting	13 613	14 637	14 255
8 Upstream leased assets*	–	–	–
9 Transport and distribution of sold products	314 149	323 836	367 364
10 Processing of sold products	55 105 803	63 232 082	20 795 435
11 Use of sold products*	–	–	–
12 End-of-life treatment of sold products*	–	–	–
13 Downstream leased assets*	–	–	–
14 Franchises*	–	–	–
15 Investments	939 823	759 895	161 076

* Not relevant or not material. ARM makes limited use of leased assets and associated emissions are estimated to be immaterial (category 8). ARM’s products feed into various end uses, many are recycled and we have limited influence over the end-use (categories 11 and 12). ARM has no leased assets (category 13). ARM does not have any franchises (category 14).

** Except for investments which are reported on a proportional basis.

¹ This includes scope 1 and 2 emissions for ARM Coal and Sakura, and scope 1, 2 and 3 emissions for Harmony.

Assessing emissions associated with Sakura

Sakura Ferroalloys smelter in Sarawak, Malaysia, is managed by Assmang. ARM owns 27% of Sakura (Assmang, of which ARM is a 50% joint venture partner, owns 54%). As part of ongoing efforts to improve the accuracy and completeness of our scope 3 emissions reporting, ARM has included Sakura in our scope 3 inventory (included in category 15: investments). Emissions are reported proportional to ARM’s 27% investment in the operation.

	F2022 (tCO ₂ e – proportional basis)
Direct (scope 1)	71 592
Indirect – purchased electricity (scope 2)	32 510
Total	104 102

The operation includes two closed submerged arc furnaces producing high carbon ferromanganese. Sources of emissions include process emissions (calculated using a tier 3 approach), mobile diesel combustion, acetylene used in workshops, and electricity sourced from the Sarawak Energy Company. The plant is highly mechanised and requires limited use of vehicles. Power from the Sarawak Energy Company is largely generated by hydro (with an emission factor of 0.203tCO₂e per MWh). Some of the carbon monoxide gas from the furnaces is used to cure ladles and has in the past been used to dry raw materials when needed.

To feed into efforts to develop an operation-specific decarbonisation pathway, Assmang is also collating material categories of Sakura’s scope 3 emissions, and historical and projected scope 1, 2 and 3 emissions. In addition, a service provider has been contracted for F2023 to assess and prioritise short, medium and long-term mitigation options, costs, and implementation requirements.



Climate change continued

Reporting on ARM's attributable GHG emissions associated with investments in coal

Scope 3 category 15 (investments) includes emissions associated with our direct investment in coal, and our investment in ARM Coal.

For the third year, we are reporting GHG emissions associated with our effective 20.2% investment in PCB and our effective 26.01% investment in GGV. PCB includes Impunzi and Tweefontein. Glencore has operational control and reports its GHG emissions to the DFFE as part of reporting on all its operations in South Africa.

Following engagement with Glencore, we have received GHG emissions-related data for the operations relevant to ARM. Data are associated with Glencore's financial year (1 January to 31 December 2021) but are included in ARM's financial year reporting (1 July to 30 June).

Operation	F2022 direct (tCO ₂ e attributable)	F2022 indirect (tCO ₂ e attributable)	F2022 total (tCO ₂ e attributable)	F2021 total (tCO ₂ e attributable)
PCB	41 513	44 214	85 727	91 445
GGV	24 993	16 385	41 378	46 064
Total	66 506	60 599	127 105	137 509

Emissions include the following sources for each operation:

- **Direct emissions (scope 1 for the operations):** Fugitive methane – production (underground) using an emission factor of 0.77m³ CH₄ per tonne; fugitive methane – post-mining (underground) using an emission factor of 0.18m³ CH₄ per tonne; and diesel (mobile) using an emission factor of 0.00315tCO₂e/litre for mobile combustion and 0.00268tCO₂e/litre for stationary combustion
- **Indirect emissions (scope 2 for the operations):** Purchased electricity using a grid emission factor of 932g CO₂/kWh.

Fugitive emissions at the opencast operations are no longer reported by Glencore, in line with the South African legislative requirement (these were included in F2021). Liquefied petroleum gas (LPG), petrol and explosives are not included as Glencore deems them as immaterial to the footprint. However, from next year Glencore will report emissions associated with explosives.

Emissions have been apportioned to ARM, based on our effective shareholding in each operation.



Reporting on emissions associated with ARM's investment in Harmony

We have a 12.12% investment in Harmony Gold. Emissions attributable to ARM have been calculated based on this shareholding and are included in our scope 3 inventory (under category 15: investments).

	F2022 (tCO ₂ e – proportional basis)	F2021 (tCO ₂ e – proportional basis)
Direct (Harmony scope 1)	21 819	16 499
Indirect – purchased electricity (Harmony scope 2)	557 566	515 228
Indirect – value chain (Harmony scope 3)	129 230	90 660
Total	708 616	622 386

Harmony's scope 1 emissions include emissions associated with diesel, petrol, explosives, and fuel/heating oil, calculated using DEFRA 2021 emission factors.

Harmony's scope 2 emissions include emissions associated with purchased electricity in South Africa (calculated based on 1.08kg CO₂/kWh) and in Papua New Guinea (PNG; calculated based on 0.68kg CO₂/kWh).

Harmony's scope 3 emissions include emissions associated with a range of purchased goods and services (embodied emissions in explosives, cement, timber/lumber, cyanide, caustic soda and lime), fuel and energy-related activities (transmission and distribution losses in South Africa and PNG), and business travel (rental vehicles, and domestic, international, commercial and charter air travel).

Scope 2 emissions account for the bulk (79%) of Harmony's emissions. This is aligned with energy consumption in South Africa, where energy is sourced from the state power utility, Eskom.

Harmony has a long-term target of net-zero GHG emissions by 2045. To meet this target, it has developed a decarbonisation strategy with science-based targets that has been approved by the board and submitted to the Science Based Targets initiative (SBTi) for verification.

Currently, Harmony monitors and reduces energy use and GHG emissions. In line with its short- and medium-term business strategy for the next five years to move towards an alternative energy supply mix, it is actively reducing its grid-electricity consumption and GHG emissions with both year-on-year and multi-year targets. As part of the transition to renewable energy Harmony is constructing three 10MW (30MW in total) solar plants in the Free State, with plans in place for an additional 105MW of renewable energy by F2023, 480MW by F2024, and 195MW by F2025. It has additional pipelines of renewable and alternative energy projects in various stages of development, including using wind wheeling to generate 350MW by F2024, and using LNG to generate 585MW by F2025. It has implemented over 200 energy-saving initiatives that have yielded estimated savings of R1 billion since 2016 and reduced energy consumption by around 1.3TW hours or 1.2 million tonnes of carbon dioxide.

Harmony also works to ensure that companies in its supply chain observe laws and regulations governing water and air quality, and use all reasonable measures to avoid polluting and degrading the environment. It has also engaged with its top 20 suppliers on their carbon and water footprints with the intention of improving processes and reducing their impact of climate change.

Climate change continued

Energy

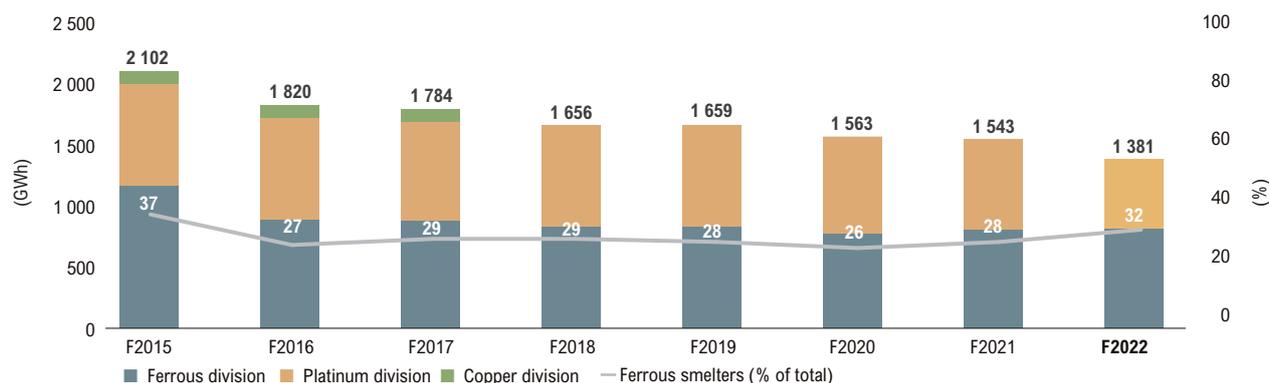
The primary sources of energy consumed in our value chain are electricity and diesel. Electricity is used in mining activities to power ventilation fans, pumps for processing and dewatering, conveyor belt motors and machines that crush and mill ore. Diesel is used to power mobile equipment (trackless machines and vehicles used for mining, loading, hauling and logistics) and standby electricity generators. The energy used for heating is one of the biggest cost inputs in the smelting process at Cato Ridge Works.

Total energy consumed in F2022 was 7 577 456GJ (including diesel, electricity, LPG, petrol, acetylene and paraffin).

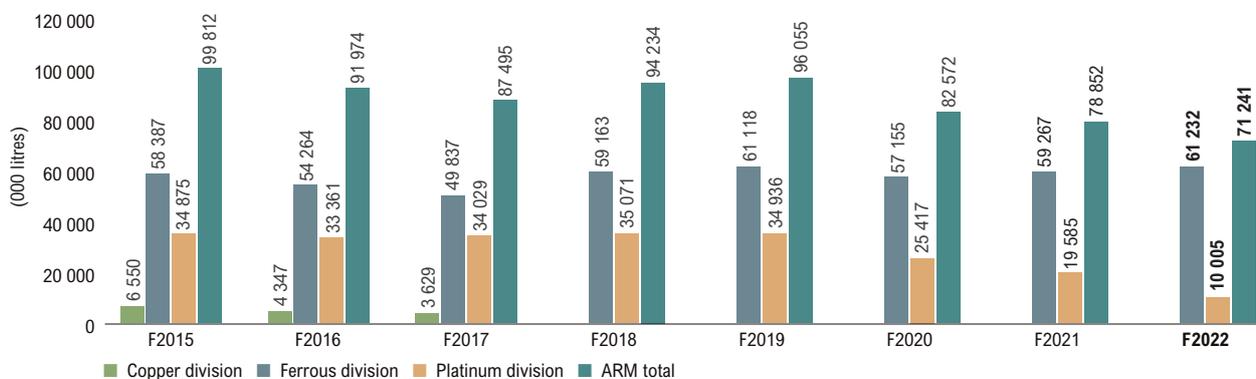
Total electricity consumed by the operations was 1 381GWh (100% basis), a decrease of 11% compared with F2021 (15 463GWh). The ARM Platinum division contributed 40% to total group electricity consumption, the three ARM Ferrous mines contributed 28%, Cato Ridge Works contributed 31%, and Machadodorp Works contributed 1%. Modikwa Mine accounted for 23% of total electricity consumption, Two Rivers Mine 17%, and Nkomati 1%.

Diesel consumption contributed 47% to total scope 1 carbon emissions in F2022 (100% basis). Total group diesel consumption decreased 10% to 71.2 million litres in F2022 (F2021: 78.9 million litres). Khumani (54% of total group diesel use), Beeshoek (19%) and Nkomati (0%) – now on care and maintenance – are large open-pit mines that use diesel mainly to haul run-of-mine material to the concentrator plants. Black Rock contributed 12%.

Electricity consumption (100% basis)



Diesel consumption by division (100% basis)



Energy consumption intensity (100% basis)

Energy consumption for each product type during F2022

Type	Energy	Metric
Iron ore	0.17	GJ/tonne iron ore
Manganese ore	0.20	GJ/tonne manganese ore
Manganese alloy	9.35	GJ/tonne FeMn (HC, MC and recovered metal)
PGMs	18.16	GJ/tonne PGM concentrate

Energy consumption is expected to increase at many of ARM's operations. Khumani and Beeshoek are mining at deeper levels and mining lower-quality ore, which increases stripping rates.

Two Rivers Mine has invested in a new mill, which increases energy demand by 3.5MW; more ancillary equipment; and a new TSF, which has increased electricity for pumping requirements by 1.7MW. The decision to mine the Merensky Reef will result in a significant increase in energy consumption (from 35MVA to 64MVA by 2024). Two Rivers' Mine electricity demand is set to increase from 35MVA to 40MVA with the completion of the new 132/11kV substation in March 2023. Diesel generators are currently installed in the plant to supply the shortfall between the available 35MVA and the required 40MVA. The new Merensky Mine and concentrator will result in a significant increase in energy consumption from 40MVA to 64MVA by CY2024. This amount will increase incrementally to 70MVA as the mine builds up to full production towards CY2027.

Future climate-change focus areas

Areas of focus in F2023 and F2024 include:

- Finalising our operation-specific long-term decarbonisation pathways, setting revised GHG reduction targets aligned with our long-term commitment, and putting measures in place to achieve those targets (including budget allocation, setting KPIs, and implementing energy and carbon management systems)
- Preparing for the South African carbon budget legislated phase 2 requirements
- Concluding plans to secure large-scale renewable energy sources and setting renewable energy consumption targets
- Continuing to collaborate to refine our scope 3 approach and better understand our role in reducing those emissions
- Continuing to investigate ways of leveraging our SED and CSI spending to enhance community resilience to climate change, and then implementing these
- Continuing to assess climate-related risks in our supply chain and to implement the roadmap to fully integrate climate change into our ERM process
- Investing in a new ESG management information data system that will allow the improved management of ESG risks and opportunities. The initial priority of this data system will be on climate change and carbon management and reporting, but the intention is to ultimately include the ESG-relevant metrics and related management activities that enable ARM to proactively drive improved performance
- Further incorporating financial metrics into our energy and carbon management system
- Updating our executive remuneration incentives to blend short-term targets into our medium and longer-term climate goals.

Climate change continued

TCFD index

The table below provides references for our disclosures in terms of the TCFD recommendations.

TCFD recommendation	Reference to disclosure	Page
GOVERNANCE – Disclose the organisation’s governance on climate-related risks and opportunities		
(a) Describe the board’s oversight of climate-related risks and opportunities.	Governance	17
(b) Describe management’s role in assessing and managing climate-related risks and opportunities.	Governance	17
STRATEGY – Disclose the actual and potential impacts of climate-related risks and opportunities on the organisation’s business, strategy and financial planning where such information is material		
(a) Describe the climate-related risks and opportunities the organisation has identified over the short, medium and long term.	Climate transition risks and opportunities	28
	Physical climate risks and opportunities	32
(b) Describe the impact of climate-related risks and opportunities on the organisation’s business, strategy and financial planning.	Integration of climate-change risk into ARM’s ERM processes	36
	The impact of risks and opportunities on business and financial planning	36
(c) Describe the resilience of the organisation’s strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.	Strategy	24
	Scenario analysis	24
RISK MANAGEMENT – Disclose how the organisation identifies, assesses and manages climate-related risks		
(a) Describe the organisation’s processes for identifying and assessing climate-related risks.	Climate transition risks and opportunities	28
	Physical climate risks and opportunities	32
(b) Describe the organisation’s processes for managing climate-related risks.	Integration of climate change risk into ARM’s ERM processes	36
(c) Describe how processes for identifying, assessing and managing climate-related risks are integrated into the organisation’s overall risk management.	Scenario analysis	24
	Operation-specific decarbonisation pathways	25
	Managing change	27
	Carbon pricing	27
	Integration of climate-change risk into ARM’s ERM processes	36
METRICS AND TARGETS – Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material		
(a) Disclose the metrics used by the organisation to assess climate-related risks and opportunities in line with its strategy and risk management process.	Targets and performance	38
	GHG emissions	38
	Energy	50
(b) Disclose scope 1, scope 2 and, if appropriate, scope 3 GHG emission and the related risks.	Scope 1 and 2 emissions	38
	Scope 3 emissions	45
(c) Describe the targets used by the organisation to manage climate-related risks and opportunities and performance against targets.	Scope 1 and 2 emissions	38
	GHG targets and emission-reduction initiatives	43
	Scope 3 emissions	45
	Energy consumption intensity	51



Water

The global pressure on life's most important resource cannot be overemphasised. All over the world, water systems are under threat from rising consumption, pollution, weak governance, and climate change. We are seeing shifting weather patterns, changes to water supplies, and an increase in extreme weather events such as floods and droughts.



Water stewardship policy

Our water stewardship policy recognises that:

- Water is a precious shared resource with high social, cultural, environmental, and economic value. Access to water is recognised as a human right that is integral to the wellbeing and livelihoods, as well as 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. It is 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. 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. 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 United Nations' 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 by 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 water users in the wider catchment
- ARM plays an important role in the sustainable management of water resources where we operate. Proactive and holistic water-management strategies will create substantial competitive advantage by reducing water-related risks, identifying opportunities, attracting investment, and building trust through improved transparency.

We also commit to:

- Applying strong and transparent corporate water governance by:
 - Publicly disclosing our approach to water stewardship through this report, as well as through our ESG and IAR reports
 - Allocating clear responsibilities and accountabilities for water – from the board to our operations (page 17)
 - Integrating water considerations in business planning – including ARM's strategy, life-of-asset and investment planning (page 60)
 - Publicly reporting our water performance, material risks, opportunities, and management response using consistent industry metrics and recognised approaches (page 60 and 64 – 67)
- Managing 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 (page 56 and 72 – 74)

- Setting context-based water targets or objectives for operations with material water-related risks (page 58)
- Proactively managing water quantity and quality to reduce potential socio-environmental impacts and realise opportunities. ARM began reporting publicly on water quality in F2019 (page 12)
- Ensuring all our employees have access to clean drinking water, gender-appropriate sanitation facilities, and hygiene at their workplaces. WASH facilities are in place for all our employees
- Collaborating to achieve responsible and sustainable water use by:
 - Identifying, evaluating, and responding to catchment-level water-related risks and opportunities (page 59)
 - Identifying and engaging proactively and inclusively with stakeholders who may influence or be affected by our operations' water use and discharge (page 58)
- 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 (page 58 and 59)
- Supporting water-stewardship initiatives that promote better water use, effective catchment management and by contributing to improved water security and sanitation (page 63).

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

Water continued

How we use and manage water

At ARM's operations, water is used in milling, beneficiation, cooling and for dust suppression during blasting, on haul roads, and at ore-transfer points. Our employees need access to water for drinking and WASH purposes, and it is a critical component in our supply chain commodities, including electricity, chemicals and explosives.

Operations withdraw water from a range of sources defined in the terms of their water use licences (WUL), which include rivers, boreholes and municipal supplies. Water is also essential for users in our wider catchments.

Water uses at our operations have not changed significantly over time, except at Machadodorp Works, where no smelting operations have

been conducted since F2016, and Nkomati Mine, which has moved to care and maintenance. Evaporation is high at Cato Ridge Works which requires water to cool its furnaces. However, only three of the six furnaces at Cato Ridge Works are currently operating. Our ARM Ferrous Northern Cape mines record high evaporation rates and a number of these operations supply water to third parties, such as villages and farms.

Main 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"> • Dewatering • Dust suppression • Ore processing • TSF management
Khumani Mine (iron ore)	Vaal WMA	<ul style="list-style-type: none"> • Dust suppression • Ore processing • TSF management
Black Rock Mine (manganese ore)	Vaal WMA	<ul style="list-style-type: none"> • Dewatering • Dust suppression • Mining, screening, and washing • TSF management • Domestic use (village and irrigation)
Cato Ridge Works (ferroalloys)	Pongola-Uzimkulu WMA	<ul style="list-style-type: none"> • Cooling • Dust suppression • Scrubbing (air-quality requirement) • Jigging (in metals recovery plant)
Machadodorp Works	Inkomati-Usuthu WMA	<ul style="list-style-type: none"> • Jigging (in ferrochrome metals recovery plant) • Dust suppression
Nkomati Mine (nickel, PGMs and chrome) On care and maintenance	Inkomati-Usuthu WMA	<ul style="list-style-type: none"> • Dewatering • Ore processing (stopped in the last quarter of F2021) • Dust suppression (ad hoc, under care and maintenance) • TSF management
Modikwa Mine (PGMs)	Olifants WMA	<ul style="list-style-type: none"> • Dewatering • Water in underground processes (drilling) • Dust suppression • Ore processing • TSF management • Domestic use in mine villages and farms/third parties
Two Rivers Mine (PGMs)	Olifants WMA	<ul style="list-style-type: none"> • Dust suppression • Ore processing • TSF management

* Operations under joint control or operational control.

ARM water balance summary

Metric	Source/destination/type	Volume of water by quality			Volume of water by quality		
		F2022			F2021		
		High (m³)	Low (m³)	Total (m³)	High (m³)	Low (m³)	Total (m³)
Withdrawal	Surface water	6 086 000	925 299	7 011 299	4 998 050	3 025 314	8 023 364
	Groundwater	7 078 477	3 304 020	10 382 487	7 725 369	4 285 871	12 011 240
	Total withdrawal	13 164 477	4 229 319	17 393 796	12 723 419	7 311 185	20 034 604
Output	Surface water	31 879	163 686	195 565	16 305	779 974	796 279
	Groundwater	0	31 155	31 155	–	33 151	33 151
	Supply to third party	0	16 116	16 116	33 281	3 840	37 121
	Total output	31 879	210 957	242 836	49 586	816 966	866 552
Consumption	Evaporation	311 768	4 840 493	5 152 261	274 419	5 496 504	5 770 923
	Entrainment	–	4 123 231	4 123 231	–	4 273 007	4 273 007
	Other	–	132 903	132 903	–	108 840	108 840
	Total consumption	311 768	9 096 627	9 408 395	274 419	9 878 351	10 152 770
Reuse efficiency	Total of all flows to tasks (m³/a)	9 608 208	69 068 045	78 676 252	14 529 040	74 907 494	89 436 534
	Total worked water flows to tasks (m³/a)	n/a	62 506 658	62 506 658	n/a	69 359 203	69 359 203
	Reuse efficiency	n/a	n/a	79%	n/a	n/a	78%
Diversions	Water diverted to neighbouring communities, farms and other users	590 117	–	590 117	359 953	293 723	653 676

* Reported according to ICMM water reporting metrics.

Report terminology*

Withdrawal: includes water extracted from surface water and groundwater sources.

Output: includes flows to surface water and groundwater, and supply to third parties (volume of water removed from the operational facility after it has been through a task, treated, or stored for use).

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

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

Diversions: includes water supplied to neighbouring communities, farms and other users.

Discharge: refers to unauthorised flows into the natural environment, as defined by operation WULs.

* Based on the ICMM's Water Reporting: Good Practice Guide (2nd Edition).

Water continued

Strategy

Context-based water targets

This year we set context-based water targets for 75% of our operations. We excluded Cato Ridge Works from this exercise as the site is not in a water-stressed area. We will develop and set a water target for Machadodorp Works in the near future. ARM Ferrous targets were signed off by the Assmang operations senior management teams and Assmang executives, and ARM Platinum targets were signed off by the operations' joint venture sustainable development committees.

Water stewardship

At ARM, water stewardship is integral to our business strategy. Our revised approach to water stewardship is more catchment-based and aims to be more collaborative in delivering on our strategic objectives. For example, at Khumani Mine, we engage in project management and engineering and maintenance issues for the provision of water, which supports our growth objectives. For operations where water availability is constrained, relevant KPIs have been introduced at operational levels. Operations invest in technology to reduce their water requirements, and consider these as part of new or expansion projects to reduce our water dependency and competition with other water users. Khumani Mine was designed with severely restricted water availability as a material consideration. As a result, and as compared to conventional TSF disposal facilities, its TSF paste-disposal facility was designed to minimise water use and discharge, ensure maximum recycling, and significantly reduce evaporation losses.

We also believe that water-related challenges should be owned collectively. These issues are shared and, in order to be properly resolved,

they require collaboration by governments, civil society, the private sector and local communities. We therefore continue to manage water impacts at our operations, while regularly engaging with our partners and other stakeholders on water stewardship and holistic-risk mitigation at the catchment level.

To this end, our operations participate in fora that discuss issues on sustainable water supply in their regions, including the ways that the availability and cost of water could potentially be influenced by climate change and shifts in regulation.

Water-related fora in which ARM operations participate or interact include:

- Gladdespruit Forum
- Inkomati-Usuthu CMA
- LWUA
- Kgalagadi Catchment Management Forum
- Manganese Leadership Forum (engaging on the appropriate design of the VGGWSS)
- Northern Cape Mines Leadership Forum
- Olifants River Water Resources Development Project
- Tshiping Water User Association (WUA)
- Tubatse Environmental Forum
- Vaal-Orange CMA.

Our operations also engage with catchment-level fora that estimate current and future catchment balances. The Inkomati-Usuthu CMA where Nkomati Mine operates is effective in facilitating this. The proposed Vaal-Orange CMA will take on this responsibility for the catchment where our Northern Cape operations are situated. Tshiping WUA and the relatively new

Kgalagadi Catchment Management Forum in the Northern Cape contribute to this function reasonably well. The latter is still developing relationships with mines. Other fora or CMAs are less effective and catchment-level water availability and quality are not as well understood.

At the Black Rock and Khumani mines, there are concerns about the security of water supply. Sedibeng Water is unable to supply the operations with contracted volumes due to the condition and capacity of infrastructure, as well as managerial challenges of the pipeline. This is impacting Khumani's ability to meet business objectives. Assmang, under the leadership of ARM Ferrous, and other stakeholders are engaging with Sedibeng Water and the DWS for a plausible and sustainable solution. Mines also make direct investments in improving water supply. For example, in F2022 Khumani invested over R200 000 and provided other non-financial resources to support Sedibeng Water in fixing valves, fixing leaks, and improving their data systems. Several new mines have been developed near Black Rock with a limited impact on water supply to the mine to date, but catchment level management will be critical to ensure security of supply as these operations ramp up.

Khumani has had some engagements with Kumba Iron Ore to use some of its excess water for dust suppression. This would require amendments to licences for both parties. Beeshoek also regularly engages with Kolomela Mine to ensure that any challenges at that mine with the potential to disrupt water supply to Beeshoek Mine can be addressed as early as possible. Black Rock has engaged with Kumba Iron Ore to be better

equipped when they face challenges that affect the mine. For example, during the year there were two instances where Kumba Iron Ore had issues with pump stations that affected Black Rock's water supply, and that resulted in potable water restrictions at the village.

Modikwa engages through a quarterly environmental forum established to help the local municipality with service-delivery issues. Along with other actors in the area, Modikwa also responds to the municipality's requests where possible.

Community water

In F2022, we invested in 41 new community boreholes at a cost of R9.5 million, facilitated by the ARM Rural Upliftment Trusts. To provide water to 5 500 households in Kuruman and the surrounding areas, Khumani Mine, in partnership with the Ga-Segonyana local municipality, Anglo American Kumba and Black Rock Mine, constructed a 13.5km pipeline with a diameter range of 300–500mm. Khumani contributed R34 million of the total project cost of R110 million.

Risk management

ARM's water risks

All of our operations are exposed to context-based, water-related risks. Operations can be impacted by too much water in a short period of time (flooding), not enough water over an extended period of time (droughts), and the respective impacts of these natural hazards on ground and surface water. Consequently, our strategic objectives at the group and operational levels include various water considerations including availability, protection and management of water sources, and the use of appropriate technologies and other mitigating factors to address water needs or manage water impacts.

Direct water risks and mitigation measures

At our operations, water balances manage and optimise water use and, where appropriate, KPIs are in place to incentivise improvements to water efficiency.

To the extent possible, all operations run closed-circuit water systems to maximise reuse and minimise

discharge into the environment. Dirty and clean water are separated, and operations implement a hierarchy of use to ensure that dirty or process water is recycled and reused 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 our mine closure plans. Surface and groundwater quality are monitored to measure compliance with WUL conditions, assess our impact on the receiving environment, and flag the need for mitigation actions. Biomonitoring of aquatic and riverine environments is performed as per the conditions of each operation's WUL.

Various measures are in place to reduce water consumption, increase storage and mitigate production downtime, including the use of dust-suppression surfactants to reduce evaporation.

CASE STUDY

Viabile public-private partnership helps meet catchment needs

ARM is represented on the LWUA by both Two Rivers and Modikwa mines. Through this representation we are interested in securing adequate water supply for our mines and for other users in the catchment while ensuring that costs are appropriately apportioned. Involvement in the LWUA is also important from a strategic expansion perspective, as it provides the potential flexibility to enable our growth in the area.

The combined demand for potable water at ARM's Modikwa and Two Rivers mines is expected to increase by almost 6% per year, primarily due to production associated with the Two Rivers Merensky Project. These mines need bulk raw water at a transparent, predictable and cost-effective tariff in order to maintain and expand their operations, and in F2022 it was confirmed that the LWUA would supply this water.

In F2021, in an effort to improve the resilience of local communities in areas of the Limpopo province to climate change and water risks, LWUA prepared a socio-economic development solution that proposed mechanisms for accelerating the local potable water supply, creating jobs and developing local businesses. LWUA is in discussions with the DWS to generate and sign an MOU.

Water continued

Main water measures at ARM's operations

Operation	Measures
Beeshoek Mine	<ul style="list-style-type: none"> • At Beeshoek Mine, business-case investment considerations during strategic life-of-mine planning delayed the start of the water-recovery feasibility study that is currently underway. The Assmang executive advised that the Beeshoek feasibility study should be based on the same industry-leading, paste-thickening clarification and process-water recovery technology currently in operation at Khumani Mine. At the Khumani and Black Rock mines, water harvesting is also improved through optimised stormwater (brown water) recovery systems, and the recovery and reuse of sewage water. Similar processes will be considered for Beeshoek Mine too. The Beeshoek feasibility study will be concluded by October 2022, and the business case finalised by end 2022. The project is expected to be initiated in mid-2023 and completed by mid-2024. Although these optimal water-recovery systems and the associated densification of deposited TSF requires significant capital investment, Assmang remains committed to its water-consumption targets • To provide greater flexibility as areas are mined out, Beeshoek Mine is applying for an amendment to its WUL to allow for additional dams and new boreholes. These measures would help reduce reliance on water from Kolomela via Sedibeng Water. The new stormwater dam, commissioned in F2020, enabled the mine to better separate clean and dirty water during flooding events in F2021. In F2022, additional investments were made in pumping capacity and road designs were revised to improve water drainage. A feasibility study has been initiated for a new paste facility. Previously, the mine has also invested in mobile pumps and software to optimise dust suppression using water trucks.
Khumani Mine	<ul style="list-style-type: none"> • In addition to a design that uses paste technology for TSF 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. These initiatives reduce safety risks during extreme weather and limit production downtime • Khumani is exploring the potential to access water from neighbouring Sishen mine. Both parties have started the process of obtaining the necessary approvals. Pipeline infrastructure will be ready in early F2023, with water supply to begin once licences are in place. This water will feed the plant via the paste facility, and in providing around 2.1 million m³ per annum, is expected to offset about 50% of the current supply from Sedibeng Water. The mine also upgraded the return water line at Parsons to speed up returns and reduce losses. Khumani plans to: upgrade the return water line between King and Parsons; improve stormwater management and Bruce and King; upgrade filling points to reduce losses (spillages); upgrade the load out and pollution control dam (PCD) pump at Parsons (to speed up pumping and reduce seepage losses); and upgrade the paste disposal facility's pumping systems (to increase recovery of interstitial water).

Operation	Measures
Black Rock Mine	<ul style="list-style-type: none"> • ARM Ferrous invested in and successfully commissioned two high-density thickening units at the Black Rock Mines (Nchwaning and Gloria). The Assmang project team completed the Nchwaning thickening unit in early 2020, and the Gloria thickening unit in 2021. Both units are currently in operation and form an integral part of optimal process-water clarification and recovery at these mines • Black Rock Mine has invested in a RO plant and filters and reuses process water for gland services. The mine has replaced potable water with process water at Nchwaning and will invest in pipelines to do the same for Gloria. Further efforts to separate dirty water to feed to the plants at Nchwaning and Gloria will be completed in F2023. A new lined TSF is being commissioned and expected to be in operation in early F2023. Once functional, the TSF will improve water performance by reducing water loss through seepage. The mine has allocated significant capital expenditure to water metering, with an additional 56 flow meters approved and rollout is almost complete • Black Rock is also investing in a combined sewage treatment plant that, subject to authorisation (currently delayed), will treat effluent using the RO plant to provide potable water for the village and reduce the quantity of potable water withdrawals from Sedibeng Water. Investment in a system to divert grey water to the village for irrigation will further reduce the mines' withdrawals from Sedibeng Water. Following a discharge after an extreme rainfall event in F2021, the mine also developed a new stormwater management plan to encourage better clean and dirty water separation and to reuse captured water in the process. A project, in feasibility and design stage, aims to centralise the mine's wastewater treatment plant and to use treated sewage water for irrigation at the village. This will reduce potable water currently being used for this purpose.
Machadodorp Works	<ul style="list-style-type: none"> • 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 an RO plant to mitigate the risk of discharges to the environment.
Nkomati Mine	<ul style="list-style-type: none"> • Nkomati Mine has desilted existing trenches to minimise exposure of water to mining activities, and introduced drifts to control water flows through the operation. Numerous studies have been commissioned to address water challenges associated with the mine being under care and maintenance and, ultimately, closure.
Modikwa Mine	<ul style="list-style-type: none"> • In F2022, Modikwa drilled scavenger boreholes to intercept potential pollution plumes as part of efforts to rehabilitate mine-affected water. This water will be reused in the process, pending approvals. It is also continually removing alien vegetation to improve water availability for other catchment users.
Two Rivers Mine	<ul style="list-style-type: none"> • Two Rivers Mine has lined the new TSF to reduce water seepage. The mine started using the new TSF in March 2022. The PCDs are now all lined. With the development of the Merensky Project, the mine is looking to better integrate across shafts by upgrading the pumping systems. Other initiatives undertaken during the year include: treating sewage water so that it can be used as service water; installing more water-efficient equipment in the change houses; removing salt from the settling dams; and more active cleaning of the PCDs, buffer and settling dams so as to build the capacity for the more-frequent big rainfall events.

Water continued

Water and TSF

We have 12 TSFs at our operations: four at Nkomati Mine, three at Black Rock Mine, two at Two Rivers Mine, and one each at our Beeshoek, Khumani and Modikwa mines. Black Rock Mine is in process of commissioning a fourth facility.

Responsible TSF management is a priority for ARM, the mining industry and investors. External review and dam-breach analysis were completed at our TSFs to ensure a comprehensive understanding of the potential impact on stakeholders, including communities, the environment and infrastructure, and to inform enhanced emergency response planning. Action plans are being implemented in response to the outcomes.

We developed a TSF management policy and standard that aligns with appropriate good-practice standards nationally and internationally, including the GISTM. ARM-managed operations have developed TSF implementation plans to comply with

the ARM TSF standard/GISTM as well as reporting dashboards on critical compliance elements.

As an initial step towards complying with the GISTM requirements to undertake Climate Change Resilience Assessments for each TSF, this year ARM developed a climate knowledge base, building on the outputs of the climate scenario analysis undertaken in F2021. For ARM Ferrous, this analysis provides sufficient information for the development of initial change-resilience plans that will comply with the GISTM requirements; the plans will be refined at a later stage. For ARM Platinum, a service provider was contracted to build on the climate scenario analysis by producing social, environmental and local economic impact assessments for the Modikwa, Nkomati, Two Rivers and Bokoni mines. The assessments will include a long-term climate baseline report for the region and the site-specific operations, a climate-change risk assessment, and a climate-change resilience plan for each TSF.

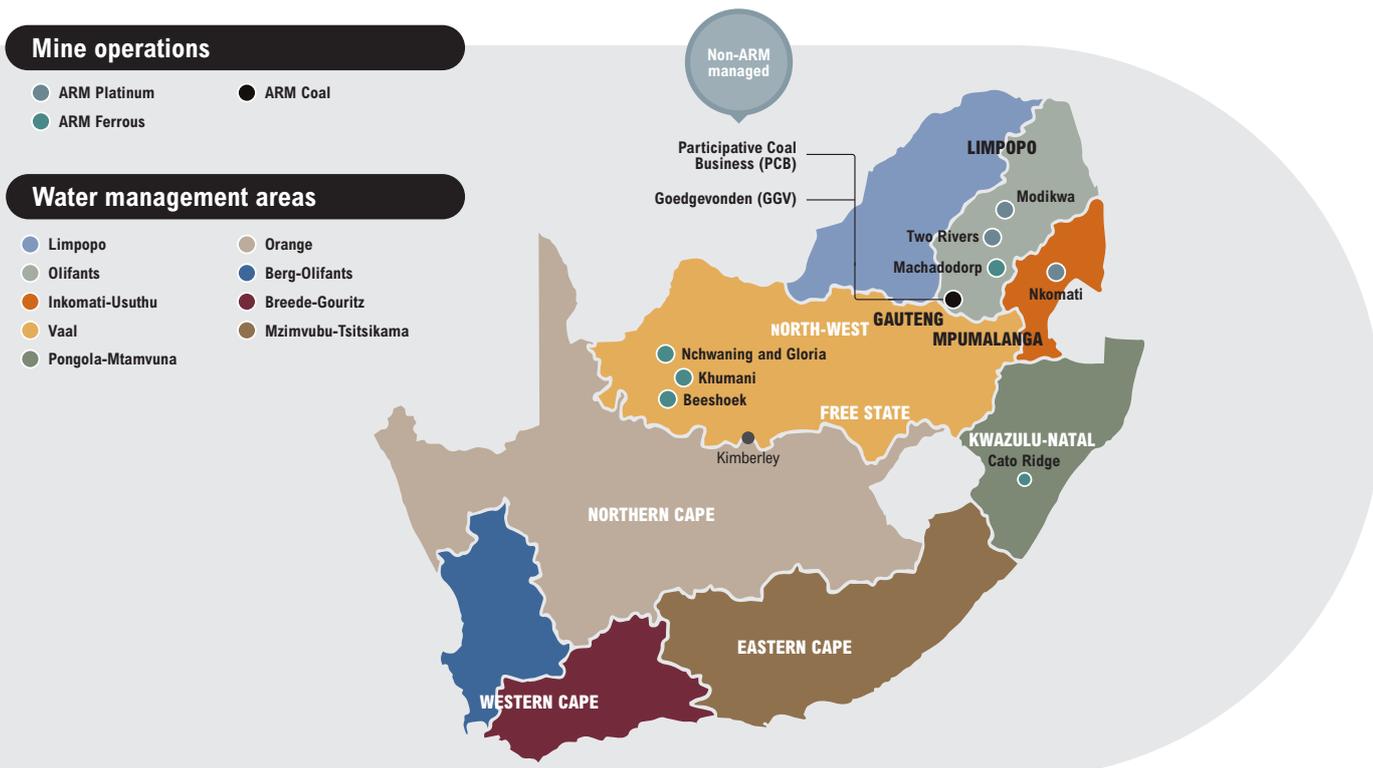
Further information on TSF management appears on page 72 of the 2022 ESG report.

ESG

Indirect water risks and mitigation measures

In F2019, to better understand the water risks associated with our supply chain, we assessed the risks faced by each operation's top five suppliers (by spend). Our F2021 scenario analysis then considered projected physical impacts of climate change on water supply, and identified critical areas that require additional investigation and collective efforts. These areas include the projected impacts of climate change on the Vaal River that feeds supply to our Northern Cape mines, as well as on the other areas depicted in figure 6. This year we started to use the preliminary results of the climate scenario analysis to reassess the water-related risks in our supply chain. This work will continue in F2023.

Figure 6: South African water management areas as they relate to our areas of operation



Catchment-level risks

Water is a material matter across the group, although for different reasons at different operations. Some of the key risks to our business value and performance relate to: potential non-compliance with WULs, especially where mines have a positive water balance and risk discharge events; adequate water supply; and climate and water-related disruptions that may result in production stoppages.

Our primary concerns are the availability of water, uncertainty in the existing policy environment, the state

of existing water infrastructure, and the socio-economic impacts of these risks. On the residual risk dashboard, the unreliability of the water supply in the Northern Cape is classified as one of our top ten risks (impact: critical; likelihood: almost certain).

We anticipate that the likelihood and impact of our water-related risks will increase over time as climate change results in more extreme weather events (particularly floods and droughts). We continue to take steps to mitigate these risks.

Corporate

In the Northern Cape, we have played a leading role in securing long-term bulk-water supplies (see case study). This is in addition to our operations’ investment in water purification and storage, and the various efficiency measures implemented. In Limpopo, an ARM executive participates in the LWUA, a section 12 entity set up by mining companies to supply bulk raw water to member mines and other clients.

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 presents a material risk to our operations in the area. We have been leading a process to proactively mitigate this risk.

The VGGWSS refurbishment project was started in 2016 to ensure adequate water supply to communities and mines in the area. In F2017, Assmang was instrumental in setting up the Northern Cape Mines Leadership Forum (NCMLF) as a platform for engagement among the mines, the MCSA and Sedibeng Water. Funds were raised through the NCMLF to support ongoing technical, legal and financial engagements with Sedibeng Water. Later, the DWS was also engaged together with the Northern Cape provincial government.

Phase 1, implemented by Sedibeng Water, with funding from the DWS, was completed in March 2022, and provided additional volumes of water north of Kathu. Phase 2, which is being expedited between the NCMLF and DWS, requires an estimated R10.7 billion of funding. Mines have proposed to cover 56% of the cost (R5.6 billion), with their investment being conditional on the maintenance of technical oversight and the implementation of industry-accepted financial and governance control standards. Assmang has committed R2 billion over five years to this project in total.

Assmang has also provided additional maintenance support to ensure ongoing water supply, given the deterioration of Sedibeng Water. To further mitigate supply disruptions, Assmang mines are maximising stockpiling on-site and at the port. Khumani Mine, for example, in collaboration with other mines in the vicinity, has taken steps to reduce the dependence on the VGGWSS by securing an additional source of water. However, in the long term, the security of bulk-water supplies is dependent on all parties sustaining funding and moving forward with the VGGWSS project.



Water continued

Operations

Seven of the eight operations under our direct or joint control are in water-stressed areas, namely: Beeshoek, Khumani and Black Rock (in the Vaal WMA); Two Rivers Mine and Modikwa (in the Olifants WMA); and Nkomati Mine (under care and maintenance) and Machadodorp Works (in the Inkomati-Usuthu WMA).

The risk profiles below indicate the water-related risks and/or opportunities for each of these mines. No risk profile is provided for Cato Ridge Works (which is in the

Pongola-Uzimkulu WMA) as it is not in a water-stressed area.

In the risk profiles we provide an ARM risk rating (based on the ERM methodology) for the respective WMA, and indicate catchment stress and operational risks. We used the WWF Water Risk Filter¹ to determine ratings and indices for catchment stress, and ratings for operational risks. For catchment stress we provide an overview of potential risks at the WMA scale. For operational risks we detail the primary and secondary risks associated with each operation.

In future risk reviews, we will consider including additional sources (eg the Council for Scientific and Industrial Research greenbook risk tool that considers climate-change adaptation at a municipal or settlement level), and increasing consideration of climate aspects such as floods, droughts, and supply of surface water and groundwater.

Risk profile for the Olifants WMA

▲ Medium ▲ Medium to high ▲ High

Operation	ARM risk rating	Catchment stress			Operational risk		
		Rating	Description	Index	Rating	Description	Index
Modikwa	▲ Medium	Moderate	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 the capacity constraints of the regulator.	3.33	▲ High	Primary risk <i>Physical:</i> water shortage (driven more by socio-economic dynamics in access to water and services rather than drought); indirect risks related to water and its impacts on TSF stability. Secondary risk <i>Physical:</i> underground flooding due to positive water balance underground. <i>Regulatory:</i> lack of established CMA. <i>Reputational:</i> vandalism of pipeline.	4.0
Two Rivers Mine	▲ Medium				▲ High	Primary risk <i>Physical:</i> water scarcity; extreme weather events, including increased spillages. Secondary risk <i>Regulatory:</i> lack of established CMA, poor catchment management (the mine tried to develop a sub-catchment balance but other users were reluctant to contribute).	4.06

Water availability is at risk at Modikwa Mine for socio-economic reasons rather than drought. Community unrest and vandalism could impact water supply to the mine. 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 been unsuccessful. In F2020, water in the Dwarsrivier River, the mine's main source of water supply, fell to very

low levels, and a pipeline was installed to secure an alternative water supply. The new Two Rivers Merensky Project requires additional water and the mine has entered into an agreement to be supplied 5ML per day from the Lebalelo pipeline.

¹ 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 to 5 and considers physical, regulatory and reputational water risks. Aggregated risk scores for catchment stress are computed by applying industry-specific weightings. Operational risks scores are calculated based on operation-specific responses to the WWF Water Risk Filter questionnaire.

Risk profile for the Inkomati-Usuthu WMA

▲ Medium ▲ Medium to high ▲ High

Operation	ARM risk rating	Catchment stress			Operational risk		
		Rating	Description	Index	Rating	Description	Index
Nkomati	▲ High	Moderate	The catchment has one of the few effective CMAs in the country, which helps mitigate overall catchment risk.	3.00	▲ High	Primary risk <i>Physical:</i> surface-water contamination (too much water, inadequate storage/space). <i>Regulatory:</i> challenge in obtaining an amended WUL as the mine has moved into care and maintenance. Secondary risk <i>Reputational:</i> managing stakeholder concerns on care and maintenance and ultimately closure.	3.96
Machadodorp Works	▲ Medium				▲ High	Primary risk <i>Physical:</i> surface-water contamination (limited production activities to manage high rainfall events).	3.8

Nkomati Mine has a net-positive water balance, and now that the mine is on care and maintenance, it is accumulating excess water. This water will ultimately need to be discharged, and the mine is

exploring the most efficient, effective and sustainable ways to do so.

At Machadodorp Works, reduced production activities linked to economic and market conditions

have put pressure on the system. Reuse and consumption have been reduced and any rainwater therefore runs the risk of controlled discharge and associated non-compliance with waste management and the WUL.



Water continued

Risk profile for the Vaal WMA

▲ Medium ▲ Medium to high ▲ High

Operation	ARM risk rating	Catchment stress			Operational risk		
		Rating	Description	Index	Rating	Description	Index
Black Rock	▲ High	Moderate	<p>ARM's company-specific risk assessment rates the basin risk higher, as the Sedibeng Water pipeline infrastructure requires investment and the source catchment faces water stress.</p> <p>There is limited catchment management as there is no CMA. Improvements are expected with the proposed establishment of the Vaal-Orange CMA.</p>	3.13	▲ High	<p>Primary risk <i>Physical:</i> water shortage [including future depletion of underground sources – particularly in shallow aquifers (boreholes)]; discharge events due to heavy rainfall events (resulting in directives from the DWS).</p> <p>Secondary risk <i>Regulatory:</i> limited catchment management, pending WUL amendments; heavy rainfall events leading to surface-water contamination affecting neighbouring farmers; flooding affecting bulk-water infrastructure.</p>	4.04
Khumani	▲ High				<p>▲ High</p> <p>Primary risk <i>Physical:</i> water shortage (need for long-term supply and storage).</p> <p>Secondary risk <i>Regulatory:</i> limited catchment management.</p>	4.01	
Beeshoek	▲ High				<p>▲ High</p> <p>Primary risk <i>Physical:</i> water shortage (need for long-term supply and storage).</p> <p><i>Regulatory:</i> reliance on an agreement that neighbouring Kolomela Mine, which has reduced Beeshoek Mine's groundwater supply by dewatering, provides water to the mine via Sedibeng Water (this agreement is not included formally in each mine's WUL but Kumba Iron Ore reconfirmed their commitment to this agreement in F2022).</p> <p>Secondary risk <i>Physical:</i> flooding (resulting in production disruptions) and other extreme weather events and periodic excess of supply.</p>	4.18	

At our Beeshoek, Black Rock and Khumani mines in the Northern Cape, issues with water scarcity have the potential to affect current operations and future expansion or growth plans. There is also the relatively minor risk of flooding during extreme weather events. Water is a core concern for our local communities and employees.

Beeshoek has an agreement that secures water from neighbouring Kolomela Mine. If Kolomela experiences challenges, then the supply of water to Beeshoek Mine

via Sedibeng Water can be affected, as happened in F2021. Good relationships and communication with Kolomela Mine, together with work to formalise this agreement in each mine's WUL, are aimed at mitigating this risk.

Water-supply restrictions at Khumani have affected the mine's ability to pursue capacity expansion. As a result, Assmang has offered to contribute a portion of the capital required for the Sedibeng infrastructure upgrade (page 63). Due to this capital infrastructure

cost, our Northern Cape mines are trying to reuse water as much as possible. Black Rock Mine is focused on getting the villages, which currently consume around 50% of the potable water supplied by Sedibeng Water, to use water that has been treated by the mine's RO plant. This must be approved as part of our WUL by the DWS. A revised application will be submitted in F2023.

In F2022, Black Rock Mine had to institute water restrictions in the villages. Extreme rainfall events have, over the past two years, resulted in

contaminated surface water flowing into a neighbouring farm and caused the overflow of sewage treatment plants. The mine is applying to erect a new central sewage plant to address the latter.

There is limited catchment management in the area. However, in May 2022, the Minister of Water and Sanitation signed the gazette proposing the establishment of the Vaal-Orange CMA through the extension of the boundaries and operational area of the Vaal River CMA. While the Tshiping WUA and the Kgalagadi Catchment Management Forum mitigate this risk, there is not a good understanding of the catchment-level water balance. This is evidenced by instances where Sedibeng Water is unable to supply water to meet mine allocations (in addition to instances caused by infrastructure and management challenges). There are concerns that future supply from the Vaal River is not well understood.

Joint ventures and investments

ARM has an effective 20.2% share in PCB and an effective 26.01% share in GGV. Glencore Operations South Africa owns the remaining stakes. Where appropriate, water risks are considered and reported on during PCB and GGV’s quarterly steering committee meetings.

Mainstreaming water risk into ARM’s ERM processes

In F2017 and F2018, we completed 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, we used the WWF water risk filter to support the identification and assessment of water-related risks at the operations. Water risks were discussed again as part of climate and water workshops in F2022. This

year, we started to include and integrate identified water risks within the ERM process, resulting in risks being redefined to fit within ARM risk assessment methodology. This included the re-rating of risks to an ARM-specific risk prioritisation methodology.

At the corporate level, we have embarked on a process to identify risks associated with critical suppliers that may have a business-continuity impact on our operations. Our initial investigations reveal that, other than the direct supply of water, our supply chain does not present significant water-related risks to our organisation.

ARM’s water opportunities

As part of improving our operational efficiencies, we focus on identifying opportunities to reduce water use. Some of these opportunities are cost effective. For example, by decreasing water consumption we minimise the need for costly investments in bulk-water schemes (which have the potential to increase costs between four and fivefold). We also recognise that our catchment-based approach provides an opportunity to improve community relations and strengthen our social licence to operate.

In the first half of F2020, a capital user charge on water of R6/t became effective when the Vaal Gamagara water system was upgraded. This contributed to above-inflation increases in on-mine unit production costs at Khumani Mine. Assmang, as part of the NCMLF, is proposing the establishment of a section 21/special purpose vehicle. By acting as the forum’s funding vehicle, and ensuring that financial and commercial governance standards are maintained, this special purpose vehicle provides an opportunity to drive catchment-level risk management.

Detrimental water-related impacts

ARM recorded the following detrimental water-related impacts in F2022:

- At Khumani Mine in the Northern Cape, breakdowns at the neighbouring Kolomela mine impacted supply via Sedibeng Water, resulting in production stoppages (425 lost hours) between 1–8 July 2021. In addition, Black Rock Mine had to impose water restrictions on the village and on third parties supplied with water by the mine. Extended breakdowns affecting supply is a risk but our operations do engage with Kumba Iron Ore to be better informed of these impacts
- Heavy rainfall in March 2022 resulted in lost production and a discharge incident (page 71) at Black Rock, though the mine was able to catch up production. Heavy rains resulted in over 40 shifts being lost at Beeshoek but the mine was able to catch up. Higher rainfall (2.5 times the normal annual average) occurred over the past two years, causing direct business disruptions, impacting local vegetation, and increasing fire risk
- High winds and heavy rains in May 2022 resulted in a lost shift at Black Rock. The mine was able to catch up production but at additional cost
- The flooding in KwaZulu-Natal in April 2022 caused delays in the delivery of spare parts (particularly associated with Caterpillar and Toyota machinery) at various ARM operations. These delays generated challenges but did not result in any production stoppages or other material impacts
- There was a slurry discharge at Two Rivers Mine in April 2022 but production was not impacted. Excessive rains caused spillages out of the PCD (which had been kept relatively full in response to previous droughts).



CASE STUDY

Impacts of flooding on Cato Ridge Works

In early April, 2022 heavy rain began to fall in KwaZulu-Natal, and over the days that followed the South African Weather Service issued increasingly serious rainfall warnings. Within 48 hours some areas had recorded more than 450mm of rain. Within 10 days, 400 people had died, 12 000 homes were destroyed, access to basic services was compromised, roads and infrastructure were damaged, and massive economic costs were incurred across the province. The destruction was so severe that the South African president declared a national disaster.

Cato Ridge Works was heavily impacted by this flooding and inclement weather. Its stormwater management systems were pressurised, furnace batch plants were overwhelmed, feed chutes were blocked, cables failed, and material feeding into the furnace had high moisture contents. These challenges significantly reduced efficiencies (in addition to the need to adjust to lower quality ores and lower quality sinter), and led to an estimated production loss of R42 million, and repair costs of R2.5 million.

Flooding events like this one typically occur once every 40 years. But climate change has made them twice as likely, as well as more severe. Because these climate risks have real implications for ARM, we are placing a strong focus on mainstreaming climate-change risk into our ERM processes.

Targets and performance

Current target: To reduce withdrawals of potable water (surface and municipal sources) 17% by F2022 relative to F2011 (excluding Machadodorp Works and divested operations).



Progress towards ARM's water target

As for previous years, we exceeded our F2022 target, achieving a reduction of 19% relative to the F2011 base year (figure 2, page 12).



The main contributors to achieving the target include:

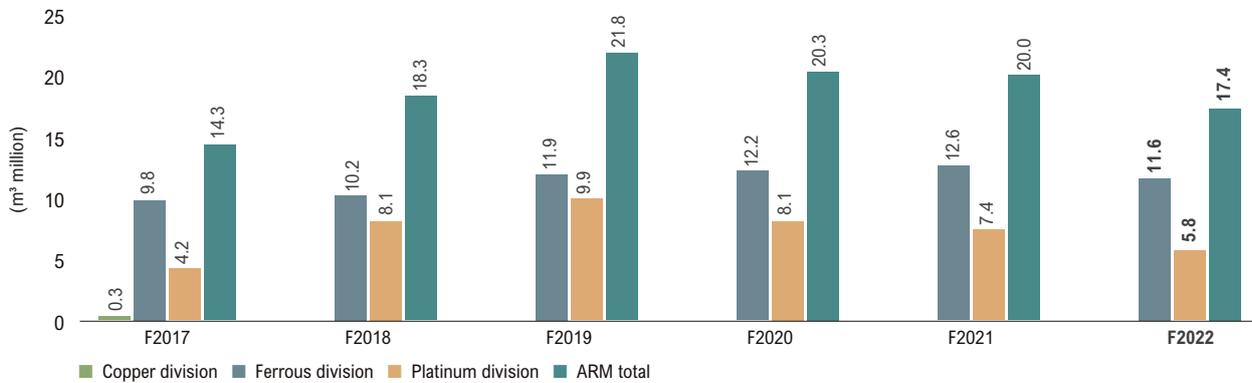
- Nkomati Mine decreased withdrawals from the Gladdespruit River after scaling down activities in preparation for care and maintenance. It ceased production at the end of March 2021
- Cato Ridge Works recorded a 32% decrease in municipal water withdrawals due to fewer furnaces in operation in F2022 compared with F2011
- Beeshoek Mine recorded a 32% decrease in water withdrawals

from Sedibeng Water since F2011 due to implementing an optimised water-management system, increased stormwater use, and a shift from monthly to daily monitoring that enabled faults to be resolved faster

- Modikwa Mine recorded a 14% decrease in water withdrawals from Lebalelo since F2011 due to higher groundwater withdrawals and increased water reuse as a result of various interventions.



Water withdrawal by division (100% basis)



Withdrawals at Black Rock and Two Rivers mines have increased as a result of expansions and associated increases in mining activity.

Water withdrawals

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

In F2022, water withdrawal decreased by 13% to 17.4 million m³ (F2021: 20 million m³) due to reduced activity in the last quarter of F2021 after mining stopped at Nkomati.

Further improvements in the implementation of the Water Accounting Framework (WAF), together with greater efforts to reuse water, resulted in an overall water-reuse efficiency of 79% (up from 78% in F2021, and 72% in F2020), and is a KPI in monitoring and managing consumption and losses. This increase reflects improved performance as well as improved measurement, particularly after installing additional water meters at Black Rock Mine.

The most material year-on-year differences include:

- Reduced surface withdrawals due to Nkomati being under care and maintenance, and less water required from Sedibeng Water because of increased intake from pit dewatering associated with increased rainfall at Beeshoek. This was partially offset by water-use increases at Modikwa due to the commissioning of the new chrome plant and the Merensky Shaft
- Reduced groundwater withdrawals due to Nkomati being under care and maintenance and reduced borehole intake at Beeshoek. This was partially offset by increases at Modikwa due to additional mining activity leading to more interceptions of fissure water
- Reduced surface water outputs due to Nkomati being under care and maintenance
- Reduced consumption at Beeshoek due to surplus water associated with high rainfall events
- Reduced water diverted to third parties at Black Rock due to water supply shortages and the need to impose water restrictions.

Beeshoek Mine accounted for 28% of total group water withdrawal, Khumani Mine 27%, and Modikwa Mine 24%. Water withdrawal by the ferrous division decreased 8% to 11.6 million m³ (F2021: 12.6 million m³) due to efficiency measures and supply challenges, and decreased 22% in the platinum division to 5.8 million m³ (F2020: 7.4 million m³) due to Nkomati Mine being on care and maintenance.

Water discharge Incidents

While all operations run closed-water circuits to maximise recycling and reuse, discharges are unavoidable in certain instances, such as during heavy rainfall. ARM categorises these discharges using level 1 to level 5 classifications of environmental incidents which are based on the size/scale of the impact, the sensitivity of the receiving environment, and remediation/clean-up requirements. Levels 1–3 incidents (insignificant to moderate impact) are reported internally at operations. Level 4 (high impact) and level 5 (major impact) incidents are reportable to relevant authorities.

In F2022 we had 13 level 4 water discharges which were all reported to the authorities. No level 5 discharges occurred.

Water continued

Water discharge incidences in F2022

Operation	Measures
Two Rivers Mine	<p>On 11 August 2021, slurry spilled outside the bund area and lined dam following cable theft at the booster pump station. Remedial action included cleaning up and rehabilitating the area with fertilised soil. On 11 August 2021 theft of pump cables at the booster pump station caused six out of 10 pumps to stop operating and led to approximately 10m³ of slurry spilling outside the bund area and lined dam into the natural environment. The silt from the slurry spill was cleaned up, and fertilised soil was added to the area to promote rehabilitation.</p> <p>On 26 August 2021 a breakdown in the TSF thickener led to voluminous discharge (25m³) into the PCD which overflowed into the natural environment. TSF rake arms were immediately replaced. Remedial action included the daily inspection and regular maintenance of pumps.</p> <p>On 23 February 2022 a power failure caused water from the plant to spill into the PCD. Approximately 50m³ overflowed into the natural environment and spillages (slurry/silt spills) occurred around the plant. The slurry was cleaned up immediately and the plant's silt traps and channels were all cleaned. Remedial action included installing an automated float switch system to monitor the level of water in the dam and to ensure the pump starts running once the water level rises.</p> <p>On 24 February 2022 an electrical trip caused the tailings booster area to overflow and led to slurry spilling outside the bund area and HDPE lined dam. An estimated 45m³ slurry spilled into the natural environment. Remedial action included ensuring that the pump's feedback mechanisms notify the control room when a spill occurs.</p> <p>On 28 February 2022 approximately 10m³ of water from the PCD overflowed into the natural environment due to excessive underground water and inadequate storage capacity. Remedial action included installing level detectors with alarm systems that indicate when the dam has reached 80% capacity.</p> <p>On 16 March 2022 a leaking return-water pipe caused approximately 25m³ of water from the PCD to overflow into the natural environment. The water was pumped back into the plant and to the TSF return-water dams, and silt was removed from the PCD. Remedial action included conducting pipe inspections to detect loose joints.</p> <p>On 17 March 2022 heavy rain caused approximately 108m³ of water from the PCD to overflow into the natural environment. Excess water was pumped to the TSF dam.</p> <p>On 28 March 2022 a leaking valve pinch led to slurry spillage at the booster station. The slurry spilled to the natural environment (non-perennial stream and Dwarsrivier). The area was cleaned, and a draft action plan was put in place with the DWS.</p> <p>On 19 April 2022 an estimated 8 400m³ of slurry spilled into the natural environment (non-perennial stream and Dwarsrivier), extending outside of the mine premises. The area was cleaned, and a draft action plan was put in place with DWS.</p>

Operation	Measures
Black Rock Mine	On 15 January 2022 dirty water from Nchwaning II shaft – one of Assmang; Black Rock Mine Operations (BRMO) – flowed from the mine premises onto the adjacent farm. The flow was caused by a combination of factors, including: a high rate of precipitation (65 mm on the day of the incident); unavailability of stormwater infrastructure; low evaporation and seepage rates; and saturated and compacted grounds. BRMO experienced a similar incident on 27 January 2021. No immediate remedial actions were taken, however BRMO acknowledges the inability of the current stormwater infrastructure to deal with the rainfall changes, and intends to update the infrastructure for the entire operation to comply with GN 704. BRMO will also investigate the possibility of extending the berms along the fence to contain the water, determine the effectiveness of the proposed berms, and explore the possibility of creating a containment facility (eg PCDs, sump).
Nkomati Mine	A high volume of rainfall (75mm) on 13 December 2021 resulted in an excessive accumulation of water in Nkomati's storm water dam. The excess water ultimately overflowed into the tributary of the Gladdespruit. To determine the impact on the receiving environment, surface water samples were taken from the storm water dam and from a downstream point and sent to the external laboratory for chemical analysis. The results indicated that the downstream point had a higher pH (8.22) and electro conductivity (50.8mS/m) than the dam (pH: 7.86; mS/m: 36.7). To free up storage capacity at the storm water dam and prevent further overflow, excess water was pumped to the high sulphide return water dam.
Modikwa Mine	On 29 July 2021 an expansion joint of a TSF deposition line at Modikwa began leaking slurry. Pipeline replacement was initiated immediately, and the slurry spillage was removed from the affected area. Water samples were taken and sent off for analysis. The cause of the leak was wear and tear. The incident was considered minor, as most of the spillage occurred on tar road and very little ended up in the nearby stream (which was not flowing during the time of the incident). To avoid a repeat of this kind of incident all pipelines will be inspected regularly and replaced timeously, and all expansion joints will be replaced within four months.
Machadodorp Works	In the first week of December 2021, the onsite weather station at Machadodorp Works recorded 113.8mm of rain, a substantial increase in expected volumes. To maintain dam levels and the integrity of the dam wall, a controlled release was initiated, during which water from dam 3 was pumped to dam 1, before water from dam 1 was released into the environment up-gradient of the Leeuwspruit. Within the week that followed all impacted storm water channels were cleaned. To avoid siltation of the down-gradient water management system all erosion gullies running into dam 1 were cleaned, and all siltation from in and around dams 1 and 3 was cleared. Several water samples were collected immediately after the incident and taken to an accredited laboratory for analysis in accordance with the WUL specifications. To prevent similar incidents from occurring in future, over the next 1–3 years an RO plant will be constructed and silt traps up-gradient of dam 1 will be upgraded.

Water continued

Water balance summaries

ARM's aggregated water reuse efficiency for sites in water-stressed areas is 79%, a slight improvement from 78% in F2021 (72% in F2020).

Water balance summary for ARM operations in the Vaal WMA*

Metric	Source/destination/type	Volume of water by quality			Volume of water by quality		
		F2022			F2021		
		High (m ³)	Low (m ³)	Total (m ³)	High (m ³)	Low (m ³)	Total (m ³)
Withdrawal	Surface water	2 724 288	893 453	3 617 741	2 951 752	1 085 407	4 037 159
	Groundwater	6 329 529	1 351 379	7 680 908	6 787 934	1 481 289	8 269 223
	Total withdrawal	9 053 817	2 244 832	11 298 649	9 739 686	2 566 696	12 306 382
Output	Surface water	–	163 623	163 623	–	134 566	134 566
	Groundwater	–	31 155	31 155	–	33 151	33 151
	Supply to third party	–	16 116	16 116	–	3 840	3 840
	Total output	–	210 894	210 894	–	171 557	171 557
Consumption	Evaporation	117 200	2 057 937	2 175 137	84 181	2 161 602	2 245 783
	Entrainment	0	781 997	781 997	–	1 621 164	1 621 164
	Other	0	132 903	132 903	–	108 840	108 840
	Total consumption	117 200	2 972 837	3 090 036	84 181	3 891 606	3 975 787
Reuse efficiency	Total of all flows to tasks (m ³ /a)	6 519 483	56 847 157	63 366 640	12 544 020	53 874 770	66 418 790
	Total worked water flows to tasks (m ³ /a)	n/a	53 164 880	53 164 880	n/a	55 533 806	55 533 806
	Reuse efficiency	n/a	n/a	84%	n/a	n/a	84%
Diversions	Water diverted to neighbouring communities, farms and other users	590 117	–	590 117	359 953	–	359 953

* Includes Beeshoek, Khumani and Black Rock mines.



Water balance summary for ARM operations in the Pongola-Uzimkulu WMA* total

Metric	Source/destination/type	Volume of water by quality			Volume of water by quality		
		F2022			F2021		
		High (m³)	Low (m³)	Total (m³)	High (m³)	Low (m³)	Total (m³)
Withdrawal	Surface water	255 162	–	255 162	252 768	–	252 768
	Groundwater	–	–	–	–	–	–
	Total withdrawal	255 162	–	255 162	252 768	–	252 768
Output	Surface water	31 878	–	31 878	16 305	–	16 305
	Groundwater	–	–	–	–	–	–
	Supply to third party	–	–	–	–	–	–
	Total output	31 878	–	31 878	16 305	–	16 305
Consumption	Evaporation	194 568	59 853	254 421	190 238	59 781	250 019
	Entrainment	–	–	–	–	–	–
	Other	–	–	–	–	–	–
	Total consumption	194 568	59 853	254 421	190 238	59 781	250 019
Reuse efficiency	Total of all flows to tasks (m³/a)	255 162	59 853	315 015	252 768	59 791	312 559
	Total worked water flows to tasks (m³/a)	n/a	59 853	59 853	n/a	59 791	59 791
	Reuse efficiency	n/a	n/a	19%	n/a	n/a	19%
Diversions	Water diverted to neighbouring communities, farms and other users	–	–	–	–	–	–

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

Water balance summary for ARM operations in the Inkomati-Usuthi WMA* total

Metric	Source/destination/type	Volume of water by quality			Volume of water by quality		
		F2022			F2021		
		High (m³)	Low (m³)	Total (m³)	High (m³)	Low (m³)	Total (m³)
Withdrawal	Surface water	–	31 846	31 846	15 105	592 397	607 502
	Groundwater	43 526	160 047	203 573	729 955	742 822	1 472 777
	Total withdrawal	43 526	191 893	235 419	745 060	1 335 219	2 080 279
Output	Surface water	–	–	–	–	644 773	644 773
	Groundwater	–	–	–	–	–	–
	Supply to third party	–	–	–	–	–	–
	Total output	–	–	–	–	644 773	644 773
Consumption	Evaporation	–	77 940	77 940	–	651 506	651 506
	Entrainment	–	44 715	44 715	–	46 181	46 181
	Other	–	–	–	–	–	–
	Total consumption	–	122 655	122 655	–	697 687	697 687
Reuse efficiency	Total of all flows to tasks (m³/a)	43 526	96 594	140 120	500 443	7 596 528	8 096 971
	Total worked water flows to tasks (m³/a)	n/a	32 632	32 632	n/a	4 333 923	4 333 923
	Reuse efficiency	n/a	n/a	23%	n/a	n/a	54%
Diversions	Water diverted to neighbouring communities, farms and other users	–	–	–	–	293 723	293 723

* Includes Machadodorp Works and Nkomati Mine.

Water continued

Water balance summary for ARM operations in the Olifants WMA* total

Metric	Source/destination/type	Volume of water by quality			Volume of water by quality		
		F2022			F2021		
		High (m³)	Low (m³)	Total (m³)	High (m³)	Low (m³)	Total (m³)
Withdrawal	Surface water	3 106 550	–	3 106 550	1 778 425	1 347 510	3 125 935
	Groundwater	705 422	1 792 594	2 498 016	207 480	2 061 760	2 269 240
	Total withdrawal	3 811 972	1 792 594	5 604 566	1 985 905	3 409 270	5 395 175
Output	Surface water	1	63	64	–	635	635
	Groundwater	–	–	–	–	–	–
	Supply to third party	–	–	–	33 281	–	33 281
	Total output	1	63	64	33 281	635	33 917
Consumption	Evaporation	–	2 644 763	2 644 763	–	2 623 615	2 623 615
	Entrainment	–	3 296 520	3 296 520	–	2 605 663	2 605 663
	Other	–	–	–	–	–	–
	Total consumption	–	5 941 283	5 941 283	–	5 229 278	5 229 278
Reuse efficiency	Total of all flows to tasks (m³/a)	2 790 036	12 064 435	14 854 472	1 231 809	13 376 405	14 608 214
	Total worked water flows to tasks (m³/a)	n/a	9 249 294	9 249 294	n/a	9 431 683	9 431 683
	Reuse efficiency	n/a	n/a	62%	n/a	n/a	65%
Diversions	Water diverted to neighbouring communities, farms and other users	–	–	–	–	–	–

* Includes Modikwa and Two Rivers mines.

Future water focus areas

Areas of focus in F2023 and F2024 include:



- Reporting our F2023 water data according to the revised ICMM water accounting framework guideline
- Further investigating and then implementing ways in which we can leverage our SED and CSI spending to enhance community resilience to climate change and associated impacts on water
- Continuing the processes initiated in F2022 of leveraging the preliminary results of the climate scenario analysis to inform a revised assessment of water and climate-related risks in our supply chain, and to implement the roadmap to fully integrate climate change into our ERM process.



List of acronyms

BUSA	Business Unity South Africa
CCS	Consequence classification of structures
CEO	Chief executive officer
CRA	Cato Ridge Alloys
CRW	Cato Ridge Works
CMA	Catchment management agency
CSI	Corporate social investment
CSP	Conditional share plan
DFFE	Department of Forestry, Fisheries and Environment
DTIC	Department of Trade, Industry and Competition
DWS	Department of Water and Sanitation
EIUG	Energy Intensive Users Group
ERM	Enterprise risk management
FAPA	Ferroalloy Producers' Association
GGV	Goedgevonden
GHG	Greenhouse gas
GISTM	Global Industry Standard on Tailings Management
HDP	Historically disadvantaged persons
ICDA	International Chrome Development Association
ICMM	International Council on Mining and Metals
IMni	International Manganese Institute
ITRB	Independent Tailings Review Board
KPI	Key performance indicator
LCA	Life-cycle assessment
LDH	Load-dump-haul
LNG	Liquid natural gas
LPG	Liquefied petroleum gas
MCSA	Minerals Council of South Africa
MOU	Memorandum of understanding
NCMLF	Northern Cape Mines Leadership Forum
NDC	Nationally determined contributions
PCB	Participative coal business
PGM	Platinum group metals

List of acronyms continued

PNG	Papua New Guinea
PPP	Pollution prevention plan
RCP	Representative concentration pathways. Used in the IPCC fifth Assessment Report (AR5) in 2014, RCPs refer to the long-term (by 2100) concentrations of the full suite of greenhouse gases in the atmosphere. Different concentration pathways lead to different climate futures, with higher RCPs resulting in higher levels of global warming in the coming decades.
R&D	Research and development
ROI	Return on investments
ROM	Run-of-mine
SAGERS	South African Greenhouse Gas Emissions Reporting System
SED	Socio-economic development
TCFD	Task Force on Climate-related Financial Disclosures.
TSF	Tailings Storage Facility
VGGWSS	Vaal Gamagara Water Supply Scheme
WAF	Water accounting framework
WASH	Water, sanitation and hygiene
WUA	Water users association
WUL	Water use licence

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