

Environment

We manage our impact by incorporating environmental performance principles in our ESG management systems, environmental policies and practices. We comply with local legislation, management standards, and current and future-based best practice. Our approach goes beyond compliance as demonstrated by our participation in voluntary benchmarks such as the global CDP climate and water disclosure projects.

Our environmentally and socially responsible response to climate change reflects our commitment to sustainability and objective to become carbon neutral by 2050, and supports South Africa's just transition programmes.

Stewardship timeline

We aim to be a leading mining company through our response to climate change and environmental stewardship.



Our approach

Our environmental management programmes comply with applicable legislation, ensuring that all activities requiring licences are fully licensed, and our Sustainable Growth and Impact strategy guides the evolution of our environmental policy as we transition to a climate change-resilient portfolio.

Management standards for air quality, water, energy, mine closure and rehabilitation as well as environmental incident management and reporting support our BUs in this transition, and embed climate change mitigation and adaptation. These standards are integrated into our environmental management activities, which are also ISO 14001-certified. Our STI scheme, aligned with our decarbonisation plan and Sustainable Growth and Impact strategy, motivates employees to uphold these standards.

We evaluate our environmental impacts in terms of NEMA's precautionary principle.

Exceeding minimum regulatory requirements

To ensure that we respect human rights and maintain our environmental licence to operate, we strive to exceed minimum regulatory requirements and ensure consistent compliance. Our wheel of excellence on page 35 defines this approach. This ensures our approach to environmental stewardship is consistent across the group. It effectively integrates new assets to align our BUs in implementation, compliance, monitoring and reporting processes. It also guides BUs in acquiring necessary competencies.

Regulatory challenges

Belfast's water use licence (WUL) was submitted to the DWS for review and was granted in the fourth quarter of 2022. The renewal application for Matla's WUL was declined by DWS. However, an appeal was lodged with the Water Tribunal ensuring that the WUL is valid until a decision has been made. In the interim, Exxaro is engaging with DWS to find an acceptable resolution.



Cennergi creates clean renewable energy solutions for state-owned entities, industrial and mining customers, and communities.

Cennergi's environmental and social management system manages impacts in line with local standards and principles, the Equator Principles, the International Finance Corporation's (IFC) performance standards and the World Bank's guidelines, among other international requirements.

Accountability and responsibility

The RBR committee oversees our environmental management and impact on behalf of the board. The executive head: sustainability is responsible for implementing environmental strategies for the group, assisted by sustainability and BU managers.

Environment continued

How we performed

We intensified our focus on environmental areas that impact our journey to environmental stewardship and goal to be carbon neutral by 2050. We also intensified efforts to decarbonise our operations through implementing energy efficiency projects, implementing energy and water performance metrics across all functional areas and ensuring we close the loop on resource use. Through our university chairs, we promoted research and activities that advance sustainable utilisation of resources, the mitigation and adaptation of climate change effects, and other pertinent environmental issues.


To further improve our performance and sustainability, we are looking into strategic partnerships, applying green technologies and sound environmental management tools.

Environmental incident reporting

Our standardised environmental incident reporting system ensures our BUs manage incidents effectively and efficiently to minimise negative impact. We immediately report incidents and mitigation measures to relevant authorities.

Following the update of our environmental incident management standard in 2021 to include level 0 incidents (incidents with no impact to the receiving environment but those that pose a potential risk), we continue to monitor these incidents. In 2022, we recorded nine level 1 incidents (2021: 31).

We have not recorded level 2 (intermediate impact and/or non-compliance) and 3 (major impact and/or non-compliance) incidents over the past three financial years.

 Refer to the [databook](#) for details of our level 1 environmental incidents.



Cennergi did not record significant environmental incidents.

Future focus

- Continue developing our decarbonisation plan and intensifying mitigation measures in our operations to ensure we achieve our 2026 target of reducing scope 1 and 2 emissions by 43%
- Prioritising employees and communities in our decarbonisation journey
- Keeping abreast with developments in the climate technology and analytics areas for mitigation and adaptation purposes
- Improving our ESG performance in environmental management through carbon emissions reduction, biodiversity, waste, water and resource management

Case study: Presenting the business case for climate change action (COP27 Exxaro Story, YouTube)

We sent a delegation to the United Nations Framework Convention on Climate Change (UNFCCC) COP27 in November 2022.

Our delegation attended the event in Sharm El-Sheikh, Egypt, with the following objectives on their agenda:

- Showcase actions and opportunities by informing peers and other stakeholders about our approach to climate change, the low-carbon transition, its social impact and the just transition
- Support the South African government's commitment to addressing climate change
- Share developments and opportunities in decarbonisation (including social impact implications)
- Acquire additional ESG insight critical for Exxaro's sustainability
- Fortify our position as an environmental steward and climate change mitigation and adaptation champion
- Discuss sustainable investment and its implications for our future social impact projects
- Keep abreast of global developments in minerals, renewable energy, coal mining and social impact
- Seek partnerships and collaboration for business resilience, the just transition and scaling social impact

Our presentation focused on ensuring business resilience in a low-carbon world, changing business perceptions about biodiversity, climate risk, ESG performance and ESG sentiment in mining.

We returned from the event with the following goals:

- Prioritise data management, quality control, storage and embedment, especially for scope 3 emissions, with potential collaboration with experts working on digital transfer of data from suppliers, customers and other value chain partners
- Invest in renewable energy and investigate other clean technologies, such as carbon capture and storage
- Mitigate emissions from our future mineral operations through self-generation of renewable energy, energy efficiency measures and mine vehicle fleet electrification in the medium to long term
- Follow developments of the Climate Technology Centre and Network – particularly the programme accelerating transformative climate technology deployment
- Consider adaptation, sustainable livelihoods and human rights in the development and growth of our minerals and energy businesses
- Access the UNFCCC's loss and damage funding for vulnerable countries hit hard by climate disasters to advance our sustainable livelihoods programmes and social impact scaling, as contemplated in our Sustainable Growth and Impact strategy, in collaboration with government

Wheel of excellence

Our environmental commitments fall under the following areas, each supported by specific strategies and policies:

Environmental liabilities and rehabilitation (page 55)

Our mine plans consider land management, closure and concurrent rehabilitation with financial provision to ensure we honour our commitments.

- Approved environmental management programme with closure objectives
- Mine closure and concurrent rehabilitation procedures
- Integrated concurrent and closure plan
- Environmental risk amendments
- Rehabilitation monitoring and KPI reporting
- Closure project management

Air quality (page 36)

We manage and mitigate the negative impacts of air pollution, including dust and particulate matter, emanating from our mining activities.

- Approved air quality authorisation (atmospheric emission licence)
- Management procedure and plans
- Assessment, monitoring and reporting
- Emissions inventories

Biodiversity (page 51)

Our low-impact, high-value approach supports ecosystem health to protect indigenous flora and fauna at our operations.

- Approved environmental impact assessment authorisations
- Management procedure
- Impact assessments
- Management plans
- Ecological offset impact procedure (includes terrestrial and aquatic/wetland ecosystems)
- Monitoring and reporting
- Ecology efficiency reports
- Land management strategy
- Land management procedure
- Operational land management plan
- Land disposal strategy

Climate change resilience (page 38)

We are building our climate resilience by enhancing the adaptive capacity of Exxaro and communities and capitalising on strategic opportunities presented by the transition to a lower-carbon economy.

- Carbon measurements, data and reporting
- Carbon emissions reduction projects
- Becoming carbon neutral by 2050
- Climate change adaptation and mitigation
- Green supply chain
- Climate considerations for capital projects



Waste management (page 48)

Our cradle-to-cradle approach minimises waste production through recycling and reuse within a circular economy.

- Approved waste management licence
- Waste stream assessment
- Prevention, reuse, recycling and energy recovery
- Management procedure (including classification)
- Handling, transportation and disposal procedure
- Monitoring and reporting

Water security management (page 45)

Our water security plan is based on efficient water consumption, reuse and recycling to protect natural resources.

- WUL
- Management standards and procedures
- Risk assessment
- Water-saving targets and performance reporting
- Monitoring and reporting
- Technological water treatment options
- Integrated water management plans
- Audits

Energy management (page 43)

Our energy and carbon management programme drives efficiencies that support a just transition to a low-carbon economy.

- Measurement, data and reporting
- Energy intensity improvement projects
- Becoming carbon neutral by 2050
- Climate change adaptation and mitigation
- Green supply chain
- Energy and carbon management guidelines for capital projects



Wetland project

Air quality

Air quality management is a top priority for operational sustainability, community safety and regulatory compliance. Pollutants such as dust and particulate matter (PM), including PM₁₀ and PM_{2.5}, emanate from opencast mining activities such as drilling, blasting, crushing, screening, transportation, materials handling, windswept storage piles and exposed areas. These activities unavoidably generate dust, and therefore pose health and safety risks. We are responsible to our employees and host communities to minimise and avoid this impact on air quality and the environment.

A pollution-free environment is favourable to our business, people who live near our operations and the environment.

Our approach

Exxaro's air quality management approach aims to reduce our impact through:

- Proactive risk-based planning and risk management
- Monitoring, measuring and reporting
- Implementing mitigation measures such as dust suppression

BUs use air quality management plans and systematic risk-based planning to ensure effective application of mitigation measures, regulatory compliance and stakeholder satisfaction. We consider future mine development in these plans, and regularly reassess measures and plans with detailed reviews.

Our preventive and mitigation measures uphold our licence to operate, considering our host communities and compliance with environmental legislation, particularly the National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) and associated regulations. We comply with the conditions stipulated in our atmospheric emission licences, dust fallout limits, air quality monitoring and management, and report quantitative data on the National Atmospheric Emissions Inventory System.

Although the Grootegeeluk Reductants plant has an atmospheric emissions licence, it does not report on air emissions as it is currently not operational. Cennergi's windfarms are exempt from monitoring, measuring and reporting as they do not create dust and air pollution emissions.

We assess dust fallout rates monitored at our operations in terms of residential and non-residential limits outlined in the National Dust Control Regulations. These regulations allow two non-residential and residential exceedances per operation in a year (not within sequential months). As some of our activities are close to residential areas or sensitive receptors, we aim to minimise our

impact on nearby residents by intensifying dust fallout mitigation efforts through chemical suppression for mining sources such as unpaved roads, which contribute significantly to our dust emissions. We also contribute to air quality management efforts in priority areas, such as the Highveld and Waterberg-Bojanala priority areas, to reduce the cumulative impacts of pollutants on the environment and health of communities, especially given that ambient monitored data for criteria pollutants such as PM, sulphur dioxide (SO₂) and nitrogen oxides (NOx) continue to be exceeded in some parts of Mpumalanga due to various sources. The cumulative air quality data for the priority areas is monitored by the DFFE. We check this data regularly to assess the air quality impacts in the priority areas and provide inputs on our mitigation measures during workshops.

Air quality management plans and collaboration with our peers, through the Coaltech Research Association and the National Association for Clean Air, support our goal to reduce air pollution and carbon emissions. We also collaborate with government through multi-stakeholder meetings on air quality management in priority areas.

Accountability and responsibility

Our executive head: sustainability approves air quality policies, procedures and mechanisms. Mine managers allocate capital, implement projects and monitor our impact.

Initiatives and goals

Initiatives this year included installing a multi-pollutant ambient air quality monitor at Grootegeeluk to continuously monitor air pollutants and design appropriate mitigation measures. We have intensified our dust suppression measures to address fugitive emissions, particularly in winter, due to the high wind speeds which result in an increase in fugitive dust emissions.

Monitoring and management

While implementing our air quality initiatives, we expand our monitoring network and systematically improve our approach to maintain our target of 100% monitoring at all operations, and to continuously increase the granularity of data.

Objectives:

Progressively reduce air quality emissions within our operating boundary

Critical success factors:

Dust fallout, PM₁₀ and PM_{2.5} reduced at all operations

Method:

- Reduce dust fallout, PM₁₀ and PM_{2.5} concentrations by applying best practice mitigation measures such as wet and chemical dust suppression
- Continuous research and development of new dust suppression and air pollution mitigation technologies

Progress:

- Reduced dust emissions at operations
- Increased compliance with residential and non-residential dust fallout limits

We allocated substantial resources to managing waste dumps at Grootegeluk to reduce air pollution and have reviewed our dust monitoring networks in the operations to ensure effective air quality management and compliance to the allowable number of exceedances for the residential and non-residential limits per year (two non-sequential exceedances). Our dust monitoring networks for the majority of our operations did not require changes, except for Leeuwpan. We reviewed Leeuwpan's air quality management system based on changes in mining operations. The objective was to avoid source monitoring and ensure a comprehensive and representative monitoring network.

We invested in an advanced digital solution for real-time emissions monitoring. From 2023, we will be able to monitor a broad spectrum of emissions, including methane (CH₄), SO₂ and NO_x.

Goals	
Continuous dust fallout monitoring	Target: All operations
Continuous PM ₁₀ monitoring	Target: All operations
Meteorological monitoring to ensure availability of surface data for temperature, wind direction and wind speed (critical for dispersion modelling, baseline characterisation, ambient monitoring design, dust fallout monitoring and reporting, among others)	Target: All operations
Ensuring compliance with dust fallout limits and air quality standards	Target: Level below regulated limits
Air quality awareness and education campaigns for various stakeholders	Target: Quarterly

Dust mitigation measures

Opencast mining operations unavoidably generate dust. Mitigation measures to reduce the significant impacts on the environment and our host communities include:

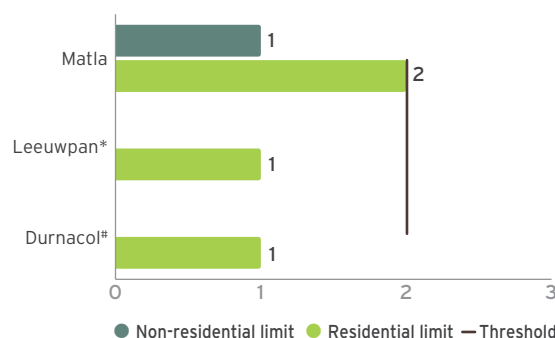
- Chemical and wet dust suppression on unpaved roads (with additives that improve effectiveness)
- Limited drop heights during offloading activities
- Vehicle speed control with proximity detection systems and speed limiters
- Vegetation on topsoil stockpiles and overburden material
- Blast design optimisation (considering wind conditions)

In addition to traditional dust suppression methods, we plant trees as windbreaks at the Belfast operations.

How we performed

None of our BUs exceeded the number of allowable exceedances (two per year) for the residential and non-residential dust fallout limits. Two exceedances are allowable for each dust fallout limit category (residential and non-residential) per year. Our objective is to comply with the residential and non-residential dust fallout limits.

Dust fallout exceedances



* Non-sequential months (Leeuwpan exceedance non-sequential).

	Maximum allowance	Limits	Highest recorded		
			2022	2021	2020
Dust fallout rate	Coal: 300mg/m ² /day	m ² /day	166	197	197
Non-residential dust fallout exceedances	Two exceedances per BU per year (within sequential months)	1 200	0	0	9 across 6 BUs
Residential dust fallout exceedances	Two exceedances per BU per year (within sequential months)	600	2 at Matla	0	0

Future focus

We aim to intensify mitigation efforts through chemical suppression of dust on primary haul roads to increase dust suppression efficiencies in the third quarter of 2023. This is critical given that unpaved haul roads are significant contributors to fugitive dust in our operations.

Case study:

Grootegeluk invests in air quality monitoring equipment (sustainability, case studies tab)


A continuous, real-time air quality monitoring station at Grootegeluk monitors and measures ambient air quality to protect people and the environment within the vicinity of the mining complex from harmful pollutants.

Climate change resilience

COP27 highlighted the need for action to address the risks of climate change as the top global agenda. Response actions include urgently reducing GHG emissions, building resilience, adapting to the inevitable impacts of climate change, and enabling climate action in developing countries.

Climate adaptation, resilience and transition refer to our capacity to adjust to current and anticipated climate change-related risks, and capitalise on strategic opportunities presented by a low-carbon and resource-constrained economy.

Exxaro's response to climate change emphasises the sustainability imperative through environmental, social, financial and legislative aspects. Our strategic objectives support our efforts to contribute to a just transition. Delivering on this requires a systemic and institutional approach, with all aspects of our business involved in this transition.



Our TCFD disclosure is embedded throughout our reporting suite and our online publications.  [TCFD index](#) (refer to the databook)

Our approach

Two of Exxaro's strategic objectives – to transition at speed and scale and to be carbon neutral by 2050 – outline our goals and commitment to fundamentally change our business to positively respond to the climate change agenda. Our Climate Change Response strategy, decarbonisation plan, alignment with TCFD recommendations and linked STI scheme across the business support the achievement of these objectives. The STI scheme incentivises carbon and energy reductions across the group. The principles and mechanisms to respond to climate change are integrated throughout our business, and are central to our thinking and actions.

We mitigate climate change and its impacts through:

- Reducing our carbon footprint, guided by our Climate Change Response strategy and decarbonisation plan. In the short term, our operational energy efficiency projects, renewable energy self-generation and potential divestment, will result in emissions reduction of 40% by 2026 for scope 1 and 2, based on a revised 2022 baseline. We are developing the medium and long-term elements of our decarbonisation plan, including the capital alignment implications
- Measuring, monitoring and reporting data and performance
- Incentivising performance through the STI scheme
- Prioritising adaptation and resilience of our operations and host communities
- Creating awareness during regular stakeholder engagements
- Supporting research and development

 [Climate Change Response strategy](#) (2020 investor tab) and  [decarbonisation plan](#) (page 13)

Carbon emissions reduction approach and management

Carbon emissions reductions are driven by our efforts in energy management and the implementation of cleaner energy sources at our operations. South Africa has revised its nationally determined contribution (NDC) target range for 2025 to 398MtCO₂e to 510MtCO₂e and for 2030 to 350MtCO₂e to 420MtCO₂e compared to 398MtCO₂e to 614MtCO₂e between 2025 and 2030 as communicated in the first NDC. The revised NDC requires us to do more to support the country's transition to a low-carbon economy.


To ensure comparability, Exxaro measures, manages and reports energy and carbon data in terms of the GHG Protocol's Corporate Accounting and Reporting Standard. Our scope 1, 2 and 3 emissions are monitored and reported annually.

Scope 1	Direct GHG emissions (measured in tCO ₂ e) from sources owned or controlled by Exxaro using diesel, petrol, gas, explosives and limestone. Production-related fugitive methane emissions are also included.
Scope 2	GHG emissions from electricity generated by utility Eskom and purchased by Exxaro
Scope 3	Emissions outside our control but emanating from our products or value chain activities such as customers burning coal supplied by Exxaro

 [GHG emissions recorded](#) (page 41) over the past three financial years

Internal performance measures	External performance measures
<ul style="list-style-type: none"> We monitor performance closely through monthly energy and carbon data reporting at all levels Monitor and report on scope 1, 2 and 3 emissions annually using the operating control accounting approach Our 2022 STI scheme tracks carbon and energy reductions at group and BU levels to inform employee and executive reward performance We continue to investigate data solutions that will give us real-time feedback, which we believe will allow us to respond quickly to emerging issues and opportunities to reduce our emissions 	<ul style="list-style-type: none"> We have participated in the CDP climate change programme since 2008 and the CDP water programme since 2010, and supplier engagement since 2019 Our CDP climate change inputs provide information on our energy consumption and intensity, carbon emissions measurement and cost performance at BU and group levels. This information is audited and assured externally every year The CDP water and supplier engagement programmes help us ensure that we align water security and supply chain risks to impacts of climate change

In the 2022 CDP climate report, Exxaro is ranked in the management category (B score), which is higher than the coal mining sector average of C.

 For more information on our CDP performance, please refer to www.cdp.net and the [databook](#).

Carbon tax compliance

Promulgation of South Africa’s Carbon Tax Act, 2019 (Act 15 of 2019) contributed to GHG emissions reduction being a business imperative as this could affect our financial and sustainability performance.

Governed by the Carbon Tax Act, the current carbon tax rate is R144/tCO₂e with several tax-free allowances. Exxaro’s carbon tax liability for 2022 was R2.6 million for production-related emissions, ie fugitive methane emissions associated with the coal seam.

Accountability and responsibility

The RBR committee manages climate change risks and opportunities. The SERC ensures we align with just transition principles. The ESG steering committee’s role is to support Exxaro’s ongoing commitment to environmental, health and safety, corporate social responsibility, corporate governance, sustainability, and other relevant public policy matters.
















Becoming carbon neutral through our decarbonisation plan

Current decarbonisation initiatives

Our decarbonisation plan includes a range of projects to reduce our emissions. These include self-generation solar PV projects and ongoing operational efficiency programmes, primarily focused on reducing diesel and electricity consumption. While it is critical to reduce our direct emissions, we are also focusing on reducing our indirect emissions. The largest contributor to our indirect emissions profile is our scope 3 emissions. It is also imperative for our stakeholders to understand the impact and importance of climate change mitigation, adaptation, and resilience. We have several ongoing educational and awareness initiatives with stakeholders across our value chain. While the impact of these initiatives cannot be measured in terms of tCO₂e saved, they are critical to ensuring that we take everyone along with us on our journey and that our transition is just. We have already seen changes in behaviour by our employees, with increasing interest in reducing their personal carbon footprints.

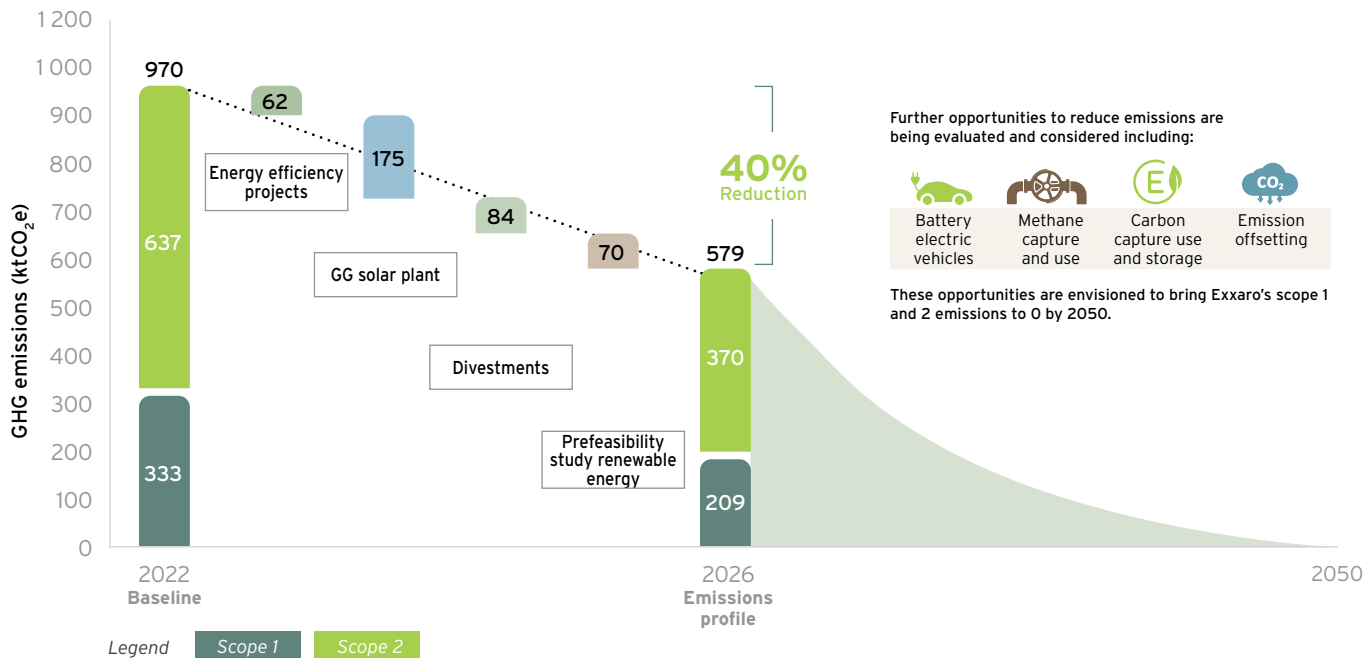
Priority

Low  High |  Quick wins

Scope 1	Scope 2	Scope 3	Carbon credits	Enablers
<p></p> <p>Feasibility on green energy potential at operations</p>	<p></p> <p>Solar PV at Tshikondeni</p>	<p></p> <p>We are engaging strategically and taking targeted measures with our key suppliers with the view of partnering and collaborating on value chain emissions reduction</p>	<p></p> <p>Community waste management/SLP</p>	<p></p> <p>Exxaro decarbonisation training and employee participation</p>
<p></p> <p>Energy and water efficiency programmes (linked to performance incentives)</p>	<p></p> <p>Solar PV at Grootegeeluk</p>	<p></p> <p>Our approach of aligning our portfolio towards low-carbon transition minerals will be key in dealing with scope 3 emissions</p>	<p></p> <p>Land management projects</p>	<p></p> <p>Decarbonisation and communication plan</p>
<p></p> <p>Compliance focus: pollution prevention plans for operations</p>	<p></p> <p>Renewable energy consumption in all our operations</p>	<p></p> <p>We are supporting industry and government efforts of developing low carbon technologies such as carbon capture and storage, which are critical for the removal of carbon emissions</p>	<p></p> <p>Rehabilitation opportunities</p>	<p></p> <p>Leadership-driven process</p>

Climate change resilience continued

Roadmap to become carbon neutral



2018

Carbon intensity baseline assessment boundary for operational BUs and not mines in closure

2020

- Rebased carbon intensity baseline
- Established decarbonisation portfolio management office and interconnected workstreams
- Total carbon intensity: 4.9tCO₂e/kTTM
- Electricity intensity: 13MWh/kt
- Diesel intensity: 2.042L/kt

2021

- Reduced carbon intensity by more than 8% against the 2018 baseline with focus on managing electricity and diesel consumption
- Decarbonisation baseline:
 - Scope 1: 327ktCO₂e
 - Scope 2: 503ktCO₂e
 - Total: 830ktCO₂e
- September 2021: ECC divestment
 - Scope 1: 59.2ktCO₂e
 - Scope 2: 25.5ktCO₂e
 - Total: 84.7ktCO₂e
- Total carbon intensity: 5.51tCO₂e/kTTM (13% increase due to fewer tonnes of material moved)
- Electricity intensity: 14.18MWh/kt (10% increase mainly due to production challenges)
- Diesel intensity: 2.000L/kt (2.05% increase mainly due to production challenges)

2022

- Implemented STI scheme to track water and energy security and efficiency targets (related to diesel and electricity consumption)
- Delivered on targets set for first half of year (BUs on or beyond targets)
- Scope 2: 637ktCO₂e
- Scope 1: 333ktCO₂e
- Energy efficiency projects (13ktCO₂e reduction)
- Total carbon intensity: 5.54tCO₂e/kTTM (0.5% increase due to increased levels of electricity consumption associated with the ramp up of the GG6 plant)
- Electricity intensity: 3.37MWh/kt (3.9% increase mainly due to an increase in electricity consumption at the GG6 plant area)
- Diesel intensity: 4.88MWh/kt (7% decrease mainly due to low production figures in some BUs, eg Belfast, and energy efficiency initiatives targeted at reducing diesel consumption)

2026

Actively reduce scope 1 and 2 emissions by at least 40% through energy efficiency projects, self-generation and consumption of renewable energy at our operations and potential divestment. We will also continue working with our value chain partners to reduce scope 3 emissions and contribute to implementation of renewable energy projects by our value chain partners.

2050

Carbon neutral for scope 1 and 2 emissions. Our objective is to also contribute to carbon neutral value chains.

How we performed

As our decarbonisation journey moved into implementation, we included climate change metrics in scorecards across the business and finalised our [capital allocation model](#) (integrated report, page 45), supported by analytics tools that informed strategic decision making. These tools enabled incremental steps towards emissions reductions against significant logistics constraints for our vehicle fleet, at our Grootegeluk operation. We addressed these constraints by implementing optimisation solutions that rectified higher carbon intensity per tonne of product mined due to sub-optimal equipment use. The optimisation solutions include:

- Mine digitalisation
- Dispatch and fleet allocation optimisation
- Truck payload management
- Shovel and truck cycle variability management
- Road condition and construction opportunities
- Out-of-cycle waste reduction

Total carbon intensity was 5.54tCO₂e/kTTM (2021: 5.51tCO₂e/kTTM) with scope 1* at 1.90tCO₂e/kTTM^{RA} (2021: 1.91tCO₂e/kTTM) and scope 2* at 3.64tCO₂e/kTTM^{RA} (2021: 3.6tCO₂e/kTTM). This translates to a 0.5% increase in carbon intensity due to the ramp-up of operations at Grootegeluk plant 6. Based on production tonnages in 2022, electricity intensity increased by 3.9% to 3.37MWh/kt (2021: 3.24MWh/kt) and diesel intensity decreased by 7% to 4.88MWh/kt (2021: 5.25MWh/kt). While our intensity increased, absolute GHG emissions decreased.

* All of Exxaro's BUs' carbon emissions are taken into account for these two intensity calculations.

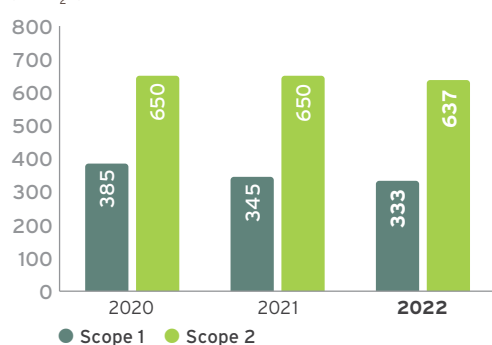
GHG emissions (ktCO ₂ e)	Year-on-year change (%)	2022	Year-on-year change (%)	2021	Year-on-year change (%)	2020 (baseline)
Target: Actual for previous year less 5%						
Scope 1	▼ -3.5	333	▼ 11.6	345	▼ 10	385
Scope 2 ¹	▼ -2	637	▼ -0.8	650	↔ 0	650
Total scope 1 and 2	▼ -2.5	971	▼ -4	995	▼ 4	1 035
Scope 3 ²	▲ +5.0	74 488 ^{RA}	▲ +2.5	70 931	▲ 2	69 220

¹ Scope 2: Electricity-based emissions are derived from the grid emission factor for South Africa, which is 1.08tCO₂e per MWh.

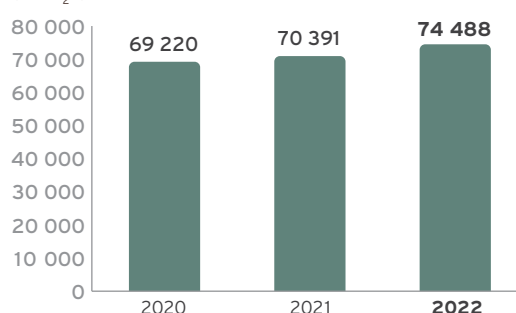
² Scope 3: Reported emissions based on the use of product sold by Exxaro (representing over 98% of Exxaro's scope 3 emissions).

Exxaro has several operational efficiency programmes that aim to reduce scope 1 and 2 (direct) emissions by 62ktCO₂e. These programmes focus on reducing diesel consumption. The solar PV project at Grootegeluk is designed to reduce emissions by 175ktCO₂e upon commissioning.

Scope 1 and 2 GHG emissions
(ktCO₂e)



Scope 3 GHG emissions
(ktCO₂e)



Carbon emissions by source (ktCO ₂ e)	Year-on-year change (%)	2022	Year-on-year change (%)	2021	Year-on-year change (%)	2020 (baseline)
Electricity	▼ -1.9	637 65.6%*	▼ -0.8	649 65.3%*	▲ 3	650 63%*
Diesel	▼ -2.2	225 23.2%*	▼ -11.8	230 23.1%*	▼ 3	261 25%*
Fugitive emissions	▼ -7	107 11%*	▼ -2	115 11.6%*	▼ 14	117 11%*
Other sources*	▼ -20	0.4 0.04%*	▼ -93.8	0.5 0.1%*	▼ 11	8 1%*

* Source proportion.

Refer to the [databook](#) for more detail on our scope 1, 2 and 3 GHG emissions.

Climate change resilience continued

Pollution prevention plans

Our 2021 to 2025 pollution prevention plans, as required by the National Environmental Management: Air Quality Act, include CO₂ emissions reduction projects that aim to reduce diesel consumption and carbon emissions at our operations.

Project	Implementation	Anticipated emissions reduction (tCO ₂ e)					Total
		2021	2022	2023	2024	2025	
Grootegeeluk in-pit crushing and conveying project	Ongoing	6 053	6 503	6 250	6 104	6 050	30 960
Road management and improvement	Ongoing	3 563	3 827	3 678	3 592	3 561	18 222
Pantograph utilisation optimisation	2021	684	735	707	690	684	3 500
Out-of-cycle time reduction	2021	1 605	1 724	1 657	1 618	1 604	8 208
Autonomous drilling	2021	193	208	200	195	193	989
Total		12 098	12 997	12 491	12 199	12 093	61 879

Assumptions used to estimate anticipated GHG emission reduction: electrical and diesel conversion factors, and the project scope, are consistent.

Leading the way

Exxaro participated in COP27 climate change deliberations and sponsored the South African COP pavilion. Key developments that Exxaro benefited from include decarbonisation and associated technologies, carbon pricing and the EU Carbon Border Adjustment Mechanism, carbon offsets and trading, policy and investment implications, human rights and sustainable supply chains, loss and damages due to climate impacts, sustainability reporting standards, phasing out of fossil fuels and value chain data management (scope 3 emissions).

Supporting research and development

We invested R8.9 million in research and development in 2022 (2021: R9.5 million). To date, we have invested R63 million in three university chairs (detailed below) whose work contributed substantially to our Climate Change Response strategy.

We are investing extensively in developing knowledge of climate change, renewable energy and sustainability. We prioritise innovation, research and development, and collaboration on sustainability issues with value chain stakeholders.

Focus areas

Wits Global Change Institute

Enhancing climate change adaptation and resilience for industry and government

- Adaptation pathways for a changing world
- Alignment of global climate change adaptation and mitigation with the SDGs
- Minimising the impact of extractive industries
- Maximising post-extractive landscapes for sustainable communities

Unisa Business and Climate Change

Publications on the coal mining sector's response to climate change and a decision-making framework for corporate climate change response

- Innovation
- Advocacy-oriented community engagement
- Climate governance
- SDG domestication
- Climate change mitigation and adaptation
- Green buildings

University of Pretoria Energy, Water and Food

Two toolkits on motor resizing and multi-drive conveyor belt design and simulation to save energy as well as technical reports on energy efficiency in South Africa

- Energy efficiency improvements to Exxaro's operations
- High-quality related services for our business



We have engaged extensively with a range of stakeholders on climate change issues. For more information, refer to the [integrated report](#) (page 39).

Future focus

Our primary focus areas in 2023 will include climate adaptation (at our operations and host communities), using climate-related data to predict the impacts of extreme weather events on our operations, communities and social impact programmes. In addition, we will intensify energy efficiency and mitigation efforts at BUs. We are evaluating various opportunities to reduce emissions, including biofuels, compressed natural gas, electric vehicles, carbon and methane capture and storage, solar farms, green hydrogen and emissions offsets.

Case study: Hlobane implements nature-based solution for climate change mitigation

We are planting trees as part of our mine closure process at Hlobane in KwaZulu-Natal to address climate change. This cost-effective nature-based solution enables carbon sequestration by absorbing carbon dioxide in the atmosphere while mitigating the impacts of climate change on people and the environment. It also addresses biodiversity management and land degradation by sustainably managing, protecting or restoring natural ecosystems. The project provides employment opportunities for local communities and forestry entrepreneurs.

We are investigating an evidence-based approach to quantifying, measuring and managing carbon sequestration results from this afforestation and reforestation initiative.

Energy management

We realise that efficient energy use is critical, particularly in South Africa where coal-based electricity supply is constrained and cost outpaces inflation. As such, we are committed to energy management that reduces GHG emissions to achieve our decarbonisation goals. We consider our value chain and support suppliers on our inclusive, sustainable and productive decarbonisation journey.

We manage our energy consumption with a view to be carbon neutral by 2050.

Our approach

To be carbon neutral, innovative and efficient energy management is crucial. As we prepare our business for the low-carbon economy, we must ensure that decarbonisation thinking is integrated into our operations with dedication to reducing direct (scope 1 and 2) GHG emissions across our BUs and value chain. To support these goals, we use the ISO 50001 energy management system.

ISO 50001 energy management system

Our group-wide energy and carbon management programme supports our goals:

- Innovative and efficient energy management is critical on our path to become carbon neutral
- Preparing for a low-carbon economy by embedding decarbonisation thinking in operations with commitment to reducing scope 1 and 2 emissions across BUs and our value chain

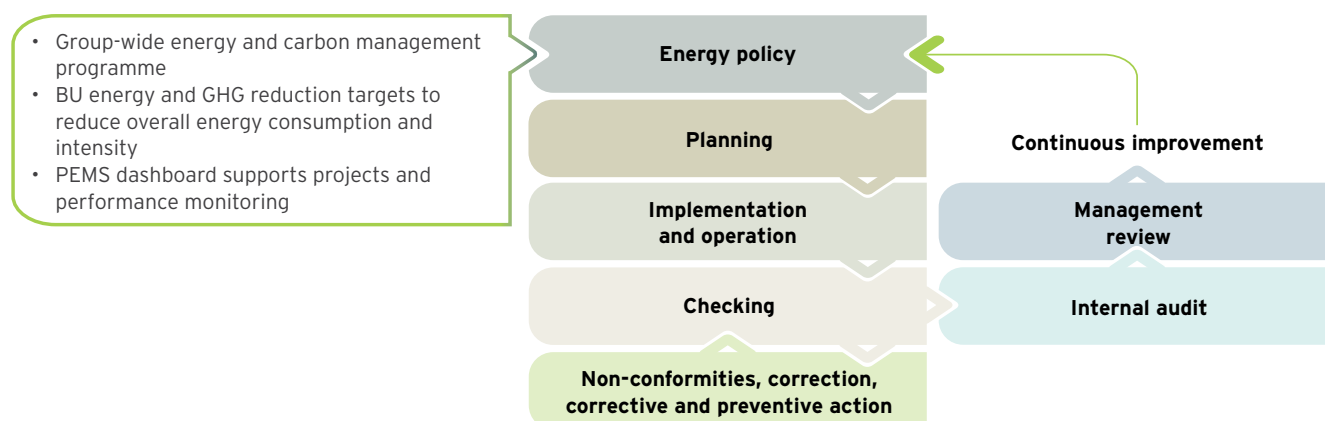
Our energy and carbon management programme aims to improve diesel and electricity efficiency to reduce energy consumption. Our technology and engineering department reduces diesel consumption at our operations with fuel additives and payload management.

We uphold our licence to operate through:

- Energy management (energy efficiency plans and reports, and intensity targets)
- Our Climate Change Response strategy (responsible resource consumption and CO₂ emissions reports)

BUs have energy and GHG reduction targets to reduce overall energy consumption and intensity.

The productivity and energy management services (PEMS) dashboard supports projects and performance monitoring to address operational inefficiencies and help each site achieve targets.



Accountability and responsibility

BU managers are responsible for achieving energy management objectives, supported by the group engineering manager and executive head: projects and technology.

How we performed

Our primary energy sources were 40.7% electricity (2021: 40%) and 59% diesel (2021: 59%). Total energy consumed decreased by 5.25% in 2022 to 5 211 418GJ (2021: 5 500 339GJ). Electricity and diesel intensity in total decreased in 2022. We submitted a 12L tax claim for one of the completed diesel energy intensity reduction projects executed at Grootegeluk. Based on the decrease of 2.4% in RoM tonnages, electrical energy intensity increased by 3.9% to 3.37MWh/kt (2021: 3.24MWh/kt) and diesel energy intensity decreased by 7.0% to 4.88MWh/kt (2021: 5.25MWh/kt).

Electricity and diesel consumption	2022	Year-on-year change (%)	2021	Year-on-year change (%)	2020
Electricity (MWh)	590 078	▲ 1.38	582 066	▼ -0.67	628 834
RoM (kt)	175 176	▼ -2.38	179 451	▼ -9.74	212 741
Electrical energy intensity (MWh/kt)	3.37	▲ 4.01	3.24	▲ 9.08	2.95
Diesel (kl)	83 226	▼ -9.4	91 838	▼ -11.70	96 143
RoM (kt)	175 176	▼ -2.38	179 451	▼ -9.75	212 741
Diesel energy intensity (MWh/kt)	4.88	▼ -7.05	5.25	▲ 2.17	4.64

Refer to the [datobook](#) for more detail on our electricity, diesel, RoM and intensities.

Energy management continued

Targets set

Each BU has energy intensity targets linked to the STI scheme. The targets were based on the outcomes of current state and opportunity scoping reviews, which began at Grootegeluk in 2021. By year end, targets were in place at all operations.

The KPIs are diesel energy intensity, calculated by the ratio of total diesel energy consumed to total RoM from the plant and waste, and electrical energy intensity as a ratio of total electrical energy consumed to total RoM not processed through the plant.

The outcomes of the reviews also informed interventions that will reduce energy consumption and GHG emissions to improve intensity (GJ per total tonnes handled) at each site. Intensity performance is tracked monthly relative to the calculated energy intensity baseline. This baseline was calculated using the energy consumption and production data from the most recent preceding year that represented each mine's steady-state operation.

We resolved challenges in collecting data during the reviews with project assumptions vetted and approved by each BU. We are improving this data collection process to enable real-time behaviour management.

Energy-saving behaviour positively impacts the business and our wider operating environment. As such, our human resources, business improvement and information management teams drive behaviour change among employees by nurturing a culture of emissions reduction and accountability through communication, awareness training and engagement. Employees support efforts to establish energy management systems with engineering teams championing initiatives. Energy management champions motivate behaviour transformation and we discuss performance in monthly forums at each BU. The enabling tools, implemented by ECS (an independent measurement and verification service) and Exxaro, are described below.

PEMS	PEMS is a digitalisation solution enabling BUs to track operational efficiencies and inefficiencies. It is designed to improve energy consumption and production against an adjusted baseline at a daily/weekly/monthly resolution. PEMS is expected to achieve a 5% reduction in fuel consumption and carbon savings at each site projected over the next five-year period from 2021. This is key to achieving energy and GHG project targets.
Energy and carbon transition profiler (SmartEPS)	SmartEPS is a web-hosted application which enables users to understand the impact of interventions with an energy and GHG profile to 2050. This solution is at user-acceptance testing phase with each BU.
Measurement, verification and identified opportunities with tax rebate	ECS quantifies the impact of energy savings and submits the data to the South African Revenue Service (SARS) for a section 12L tax rebate. One project at Grootegeluk was submitted to SARS in December 2022. The combined energy savings of this project is 2 667 221kWh with an estimated net incentive rebate value (at 28% marginal tax rate) of R709 481. ECS will further quantify the impact of priority projects at Grootegeluk, our Mpumalanga operations and FerroAlloys in 2023.
Solution user adoption and engagement	ECS conducts strategic weekly/bi-weekly/monthly/quarterly performance reviews at Grootegeluk, Matla, Belfast, Leeuwpán and FerroAlloys) to assess project status, and implementation of PEMS and SmartEPS. These sessions also address shorter interval control measures to ensure each site achieves monthly STI targets.

Future focus

From 2023, we will focus on adopting proven technologies to reduce electrical energy intensity. To this end, we will implement impactful initiatives in our Grootegeluk and Mpumalanga process plant areas.

We will also begin decarbonising our mobile equipment fleet by working with original equipment manufacturers to align on their technology road maps, and trial and implement theirs and other proven technologies at pace and economical scale over the next five years.

Case study: Tax benefits for saving energy

Exxaro is expecting a section 12L tax rebate of R709 481 from a project that improved haul truck fuel efficiency at Grootegeluk in 2019.

We improved engine operating hours and fuel consumption by reducing activities outside the load and haul cycle, and reported a diesel saving of 259 710 litres (R6 329 130 at the December 2022 price of R24.37 per litre) from January to December 2020.

The total energy saving was 2 667 221kWh. Valued at R0.95/kWh, this equates to an energy-saving tax incentive of R2 533 860.

Exxaro did not invest capital in this once-off project, which entailed tracking a behaviour-based intervention using PEMS analytics tools and a South African National Accreditation System-approved measurement and verification process. Going forward, we expect energy savings to vary according to travel distances and mine planning.

The South African National Energy Development Institute confirmed receipt of our report in December 2022.

Water security management

We understand that water security is our capacity to safeguard sustainable access to sufficient, acceptable quality water. By proactively identifying risks and planning solutions, we sustain communities, protect the environment from water-related pollution and disasters, and stabilise crucial ecosystems.

Water security management is a critical component of our overall operational and environmental management as we are sensitive to South Africa's water scarcity and the effects of climate change, particularly increased temperatures and rainfall variability.

Our approach

Our water management policy is supported by our group water strategy, which aims for excellent compliance with policies, standards and processes, stakeholder partnerships and technologies for operational water efficiency. Our water-related consumption and intensity targets are linked to our group-wide STI scheme to deliver on our Climate Change Response strategy and overarching Sustainable Growth and Impact strategy.

Our policy delivers on these strategies by guiding our integrated water and waste management plan for the current and future operations – from planning to construction, operation, decommissioning, closure and rehabilitation. We implement this policy through our water management standard, which covers mining and industrial water use, water authorisations and site-specific water management plans including:

- Water-related risk assessments
- Water conservation and demand management
- Stormwater controls
- Security of supply
- Water monitoring
- Water balance simulations

We manage water-related risks, minimise impacts and operate efficiently by:

- **Reducing, reusing and recycling water** in line with water conservation plans that support the National Water Resource Strategy
- Providing suitable barriers to our dirty water facilities that **prevent groundwater contamination**
- Committing to **protecting and improving water quality** by discharging treated water at our operations through reverse osmosis and/or sewage treatment plants

At Matla, we use reverse osmosis to treat contaminated process water to potable standards and treat sewage effluent in two plants before it is discharged into the environment.

We collaborate with other mining houses and universities through the Coaltech research initiative in projects that guide sustainable mine water management and mine closure for accurate final land use planning. The Mine Water Coordinating Body strengthens our public-private collaboration with a platform to collaborate on mine closure objectives that align with regional mine water solutions and community needs.

We also engage with other stakeholders in the catchment area to collectively manage water use. Without controlled efforts to maintain water security, we risk production stoppages, financial loss and non-compliance with WULs. The consequences could impact our licence to operate, increase competition for scarce resources, limit investment opportunities and damage our biodiversity efforts.



Cennergi's windfarms use licensed boreholes and rainwater. Employees and contractors drink plastic bottled water at operations.

Accountability and responsibility

Sustainability managers, supported by the water team and on-site environmental specialists, led by the executive head: sustainability, oversee policy implementation and practice at the operations.



The facility site manager supported by the head: corporate and social responsibility oversee policy implementation and practice at wind energy facilities.

Water security management continued

How we performed

Highlights of our water management efficiency, mitigation, maintenance and conservation measures included:

- Financial approval of Grootegeluk's Oliphantskop dam refurbishment project to be implemented in 2023/2024 (enhancing water recycling at the beneficiation plants to prevent process water losses to the pit, and reducing electricity consumption due to pumping and water quality deterioration in the pit)
- Recalibrating Belfast water balance while investigating a potential water treatment plant to reduce hydraulic load caused by heavy rains over the past three years
- Completion of the Matla new mine 1 pollution control dam linked to the Matla reverse osmosis plant
- Improved operation and maintenance of sewage treatment plants at Matla shafts 2 and 3
- Improving dirty and clean water separation, and preventing groundwater contamination with improved waste management at operations

High rainfall had a negative impact on mining conditions although this mitigated the short-term risk of water shortages.

Total water consumption (water withdrawals less water discharged) increased by 0.6% (normalised) and water efficiency increased by 0.5% due to increased consumption at our Matla operation with the new box cut construction.

Water withdrawal and discharge (ML)	2022	2021	2020
Total water withdrawal	11 486	10 890	11 798
Surface water	8 602	8 165	8 877
Groundwater	1 408	1 312	1 368
Third-party water	1 476	1 413	1 553
Total water discharged	1 068	609	874
Water consumption	10 419	10 281	10 924

Our water intensity targets align with industry norms and site-specific conditions. The 180L/t RoM target is well below the coal industry average of 380L/t RoM. This supports our strategy to reduce water intake and support the DWS's objectives to increase water conservation and reclamation.

	Target (L/t RoM)	Water intensity (L/t RoM)			Water consumption (m ³)		
		2022	2021	2020	2022	2021	2020
Mpumalanga							
Belfast	250	232	237	132	612 115	654 132	416 628
Leeuwpan	100	40	27	38	148 466	106 380	228 085
Matla	230	200	190	190	1 231 293	1 120 930	1 168 683
Limpopo							
Grootegeluk	170	148	149	150	8 344 744	7 681 560	8 198 145
Tshikondeni	79 176kL	n/a	n/a	n/a	74 532	–	–
Gauteng							
FerroAlloys	21 000kL	n/a	n/a	n/a	7 205	15 175	14 494
KwaZulu-Natal							
Hlobane	432kL	n/a	n/a	n/a	410	–	–
Total group*	180	150	149	137	10 418 765	10 280 828	10 923 823

* Includes ECC assets in 2020 and 2021.

Our water recycling target of 38% overall water recycling ratio (defined as the total water recycled divided by total water used including recycled water) is substantially higher than the coal industry average of 6%, as outlined in the national water use efficiency benchmarks of the DWS. In 2022, we exceeded our target with an overall recycling ratio of 47%.

Water recycling ratio (%)	2022	2021	2020
Grootegeluk	47	43	40
Matla	50	42	44
Leeuwpan (estimated)	30	30	30
Belfast	38	28	38
Group total*	47	46	45

* Includes ECC assets in 2020 and 2021.

Tailings storage facilities and dams

Our tailings management system focuses on operation, monitoring and decommissioning of tailings dams. It uses comprehensive risk-based management and governance systems in line with internationally recognised good practice. Exxaro aims to align tailings management with the Global Industry Standard on Tailings Management.

Our dam assets contain clean or polluted water. According to South African dam safety legislation, dams with a wall height exceeding 5m and capacity exceeding 50 000m³ are considered a safety risk. Classified dams are categorised as I, II or III according to risk potential. Category III has the highest hazard potential.

The table below shows dams with a safety risk, as classified by DWS.

	Category I	Category II
Matla	-	Brine ponds
Grootegeluk	-	Cyclic ponds
Leeuwpans	-	Witklip dam
Durnacol	Durnacol dam no 4	Durnacol dam no 7 Langley dam no 2 Langley dam no 3
Tshikondeni	Unwa dam	-

Future focus

While we continue our efforts to improve water efficiency through various infrastructure projects and enhancements, we will set an internal water price in 2023 to fully understand the actual cost of water versus the current cost to adequately address scarcity and quality concerns.

Case study: Water management in the face of climate change

We are adapting our water management practices to prepare for the uncertainty of a changing climate. The uncertainty cascades from the type of emission scenario and how that will influence temperature, rainfall distribution and intensity as we navigate an uncertain future.

We use downscaling techniques to assess hydrological variables from different available global circulation models. We incorporate these changes into our stochastic rainfall models used in forecasting water balance. These models are then used to predict flooding events, evaluate storage potential, assess infrastructure shortcomings and evaluate changes in water resource availability.

Waste management

We manage the impacts of our waste streams by aligning our policies and procedures with sustainability principles and leading practice. We are transforming our business into a circular mining economy so that the waste we produce is reused and recycled with sustainable benefits for host communities that depend on Exxaro for their livelihoods.

By recycling and reusing the waste we produce, we uphold our licence to operate with a cradle-to-cradle approach that minimises waste production.

Exxaro understands that our sustainability journey should embrace the cradle-to-cradle principle where we can attain zero waste operation. We are evaluating the opportunities presented by the circular economy concept which focuses effort on the management of material to eliminate the need to dispose of unused material. Cradle-to-cradle waste management is a closed cycle: waste from one process is used in other processes to encourage elimination or minimisation of waste.

Exxaro's BUs apply the "avoid, reduce, reuse and recycle" waste management hierarchy to prevent and avoid waste as much as reasonably practicable. Exxaro is working on initiatives such as:

- Innovation and alternate treatment for integrated waste management
- Evaluating cost effective options for recycling, reuse, reduction emissions and other end-of-life recovery option
- Opportunities for cost saving and optimisation
- Industrial symbiosis to stimulate green business effectively

Our approach

Exxaro's evolving environment policy and management standard for hazardous and non-hazardous waste governs our approach. We ensure prevention, minimisation, reuse, recycling, energy recovery and safe waste disposal in compliance with the National Environmental Management: Waste Act, 2008 (Act 59 of 2008) and supporting legislation.

We regularly review the policy and management standard to ensure relevance and alignment with legislation. As requested by our investors, we are set to release individual policies, separate from the overarching environment policy, for waste management and related disciplines in 2023.

Our management procedures include waste classification and efficiency reporting, as required by waste management licences, informed by sustainability KPIs aligned with ESG indices to drive continuous improvement.

KPI	Target
Disclosure of working with others to reduce pollution, waste or resource use by participation in specific local or global initiatives as well as collaboration with other companies using the same waste streams as inputs such as industrial ecology	Ongoing Impact Catalyst initiatives
Disclosure of three years' hazardous waste generation in tonnes	Ongoing
Total costs of environmental fines and penalties during the financial year	December 2022
Policy or commitment statement to address, reduce or avoid the impact of waste or improve efficiency	December 2023
Independent verification of operations' environmental data using an international assurance standard and declaring assurance level	December 2024
Financial quantification of pollution, waste or resource use specifying costs associated with their impacts (including shadow costing) and investment in research and development on reducing or avoiding their impacts, including funding of research and development organisations	December 2024
Time-specific targets (unquantified and quantified) to reduce or avoid waste	December 2025
Disclosure of three years of non-recycled waste generation in tonnes	December 2025
Disclosure of three years of waste recycled in tonnes	December 2025
Progress against previously set targets (unquantified and quantified) to reduce or avoid waste	December 2028

In line with leading practice, Exxaro supports the **proximity principle** (treat and dispose of waste in reasonable proximity to the point of generation), **duty of care** (we are ethically responsible for waste management) and the **precautionary principle** (we are proactive in mitigating environmental risks).

BUs are responsible for managing their general and hazardous waste. General waste comprises:

- Recyclable domestic waste (plastics, polymers, cardboards, metal cans and papers)
- Non-hazardous recyclable industrial waste (rubber products such as waste tyres and conveyor belts, scrap metals and industrial products)
- Inert, non-recyclable waste (rubble and demolition waste separated at source) collected, recycled or taken to safe disposal sites by specialist service providers

BUs manage hazardous waste and report volumes monthly. Examples of hazardous waste emanating from our operations include used oil, contaminated soil, medical waste, used personal protective equipment and sewage. In compliance with the South African Waste Information System, sites producing more than 20kg/day of waste are registered and maintain compliance certificates. As we do not have on-site waste treatment processes, we receive the certificates when certified contractors take hazardous waste (including used oil, hydrocarbons and sewage) to licensed facilities. Medical professionals manage waste produced by on-site clinics at Matla and Grootegeluk.



Material waste at Cennergi's facilities includes general waste, oil rags and used oil. Cennergi implements waste separation at source to increase recycling, where possible, and minimise waste sent to landfill.

We pursue innovative waste handling, transportation and disposal solutions at Grootegeluk where a waste tyre processing contractor assists in converting used tyres into reusable material in compliance with legislation and to reduce our liabilities.

Exxaro stores used off-the-road tyres in a facility with controlled access, stacking plans and fire prevention measures at Grootegeluk before removal by a specialist recycling contractor for beneficial reuse:

- Exxaro has been working with government's Waste Bureau to dispose of waste tyres in compliance with the regulations since 2013
- Part of government's R2.30/kg levy funds waste tyre recycling. Exxaro is in discussions with Waste Bureau to remove these tyres which were bought post 2013

The success of the Exxaro project elicited further corporate participation with all stakeholders such as government, local communities and other mining industries. This is the first time in the mining industry that such a project was conducted, giving Exxaro an opportunity to lead in waste tyre management. The project was rolled out at Leeuwpan to remove its waste tyres. The project also showed that while mining will impact an area, a responsible approach enables us to meet our commitment to sustainability and reduce long-term environmental liabilities while operating the mine.

To expand the Grootegeluk waste tyre management initiative with a service that will benefit South Africa's mining industry, we are evaluating proposals to establish an integrated waste management facility in Lephalale, Limpopo. The Impact Catalyst was appointed to conduct the prefeasibility study for the integrated waste management solution.

Further to this, we pursue responsible waste management through:

- Our SLPs, which include recycling initiatives to empower and uplift local communities
- Using our mining waste post-mining by collaborating with SMMEs to convert our waste to useful products, eg waste tyres and discard dumps
- Collaborating with government, research institutions and industrial partners in monitoring developments that address climate change and job creation through waste stream conversions
- Our participation in Business Unity South Africa and Minerals Council discussions on waste-related issues
- Being involved in the waste industry forum and waste management initiatives directed by the DFFE
- Investing in waste management research and development to identify new technologies that ensure safe handling of materials
- Incorporating post-mining sustainable economies into host communities in collaborative initiatives with partners such as the Impact Catalyst

Accountability and responsibility

Our sustainability managers, supported by on-site environmental specialists, under the leadership of the executive head: sustainability, oversee the implementation of our policy and practices at operations.

Initiatives

As part of Business Unity South Africa, we approached the DFFE to address our concerns about the definition of waste in the National Environmental Management Laws Amendment Act, 2022 (Act 2 of 2022). On 27 June 2022, the DFFE agreed to send an explanatory note with government's definitions that would assist proposed sectoral engagements.

How we performed

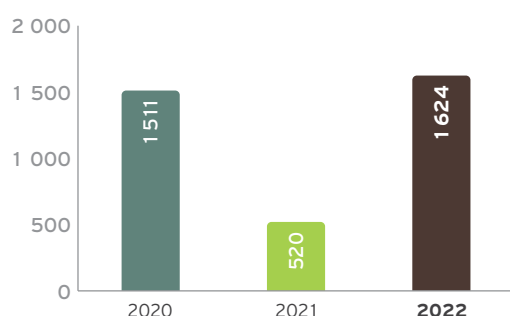
In its grievance register, Exxaro did not report any waste grievances, fines or penalties and did not receive any environmental fines and penalties related to non-compliance on waste management during the financial year.

General waste recycled decreased by 9% to 2 768t (2021: 3 018t) due to less ferrous and non-ferrous scrap produced at Grootegeluk.

General waste recycled (t)	2022	2021	2020
Ferrous and non-ferrous scrap	2 620	2 950	2 860
Paper	46	28	22
High-density polyethylene	102	34	29
Plastics	—	6	3
Total	2 768	3 018	2 914

Hazardous waste sent to landfill


(t)



The total weight of hazardous waste generated at our managed coal operations and sent to landfills in 2022 increased by 68% to 1 624t (2021: 520t) due to clean-up operations in May, June and August at Grootegeluk. This resulted in a 30% increase in the amount of hazardous waste taken away and disposed of in a registered landfill.

Waste management continued

Waste management in 2022	
Head office	Renewed contracts for recycling and general waste disposal at head office
Grootegeluk	Completed the fire protection system installation in the temporary waste tyre storage area and stacked tyres as per the approved layout at Grootegeluk <ul style="list-style-type: none"> Renewed our hazardous waste handling contracts at Grootegeluk and Matla Placed medical waste, including waste generated from COVID-19 preventive measures (masks, gloves and screening) at the Matla and Grootegeluk clinics, in specific containers
Matla	Began appointing a new service provider (currently TL Ideas, an ESD beneficiary) to manage our waste recycling station at Matla
Leeuwpan	Took ownership of the optimised sewage treatment plant at Leeuwpan
Belfast	Appointed Phambili Services, an ESD beneficiary, to manage general and hazardous waste



Cennergi's operation and maintenance contractors are responsible for waste management at both wind energy facilities. Cennergi did not report any waste grievance, fines and penalties during the year.

Future focus

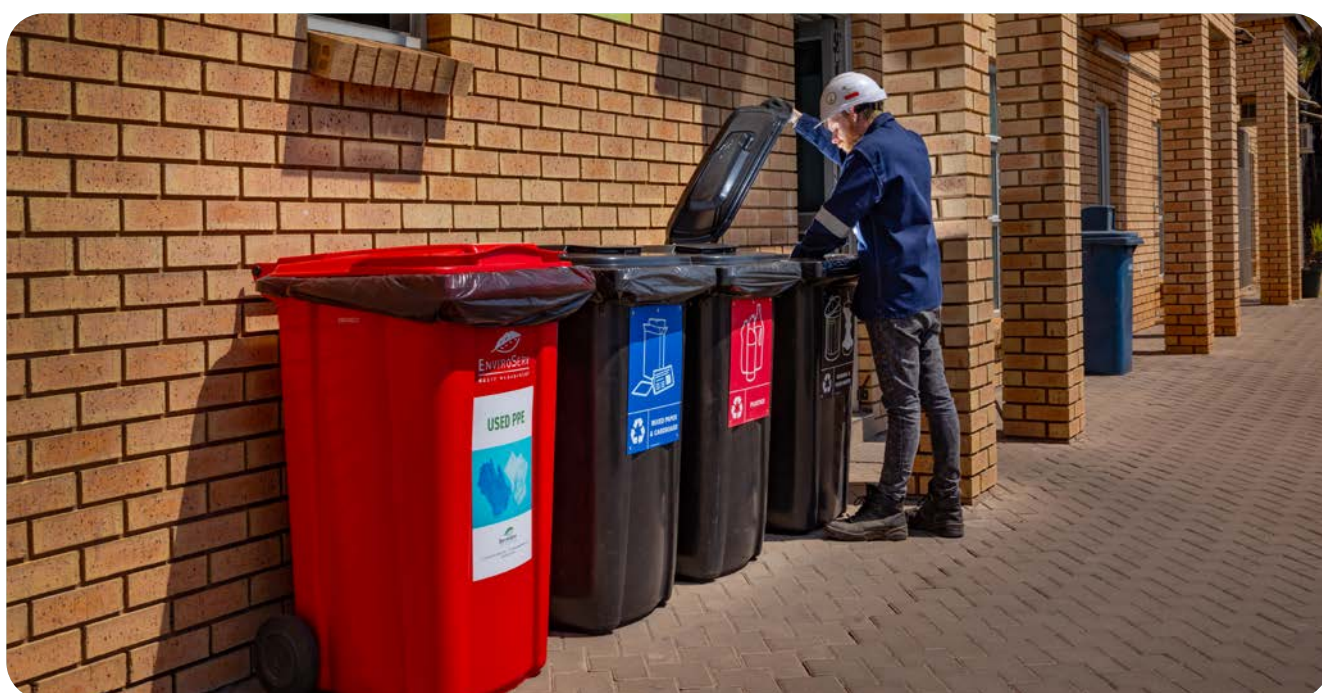
We will optimise our 2023 reporting to set targets that will enable us to divert 80% to 85% of recyclable waste from landfill sites by 2025. We plan to use alternative waste reduction or avoidance technologies and opportunities to procure equipment that supports our commitment to the circular economy concept.

At Grootegeluk, we will continue the successful waste tyre reclamation project with a new service provider, establish partnerships with other NGOs and seek access to additional project funding.

As advised by FTSE Russell, we will include additional KPIs in our reporting.

Our new waste management policy will be approved and published in 2023. The policy outlines waste reporting, management and mitigation. Detailed procedures and KPIs will ensure we honour our commitments. The dashboard that tracks waste volumes generated, recycled and sent to registered landfills will include KPIs such as total costs of environmental fines and penalties, as recommended by FTSE Russell. This will enable us to improve our disclosure.

Assessments across our operations determined the scope of work needed to achieve these targets. Data collected on recyclable materials from the waste stream assessments will optimise our 2023 reporting.



Waste management at FerroAlloys

Biodiversity

Conservation is a priority for Exxaro to avoid biodiversity loss for the sake of wildlife, economic activities and people who depend on the natural resources impacted by our mining activities. We therefore assess our potential impacts before we mine, and conduct biomonitoring and environmental incident reporting. Communities benefit from employment created by contractors who will eventually hand over invasive plant control contracts to local community members.

We strive to be a low-impact, bio-regenerative organisation for current and future generations.

Our approach

Understanding our impacts enables us to implement effective biodiversity management plans with standards that inform our monitoring and reporting processes, and uphold our licence to operate.

In compliance with the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004), we are committed to preserving biodiversity-rich ecosystems that protect species on the International Union for Conservation of Nature (IUCN) Red List and control the impact of invasive alien vegetation.

Our holistic approach to biodiversity management combines:

- Cost-effective solutions
- Environmental responsibility
- Conservation of biodiversity-rich areas within mining rights
- Management of IUCN Red List species
- Control of invasive plants (categories 1a, 2 and 3)
- Integration of biodiversity into social impact studies
- Collaboration with key stakeholders to achieve our biodiversity goals (Mpumalanga Tourism and Parks Agency, DFFE, Limpopo Economic Development, Environment and Tourism, DWS, Eastern Cape Parks and Tourism Agency, and Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs)



Our renewable energy business manages biodiversity around its facilities with an environmental management programme. This approach aligns with the Equator Principles and the IFC's Performance Standard 6 guidelines on biodiversity conservation and sustainable management of living natural resources.

Accountability and responsibility

Our biodiversity management programmes and stakeholder engagement are overseen by a team at our operations and head office, including executives and mine management, and sustainability and environmental specialists.

How we performed

We experienced minor challenges such as restricted access to privately owned land within our mining right area for the removal of invasive alien plants and delays in permit approval by authorities for species relocation from the mining area into conservation land at Belfast. We therefore cleared 58% less invasive alien vegetation compared to the previous year.

We did not record any biodiversity-related grievances in 2022. Environmental grievances can be raised at environmental stakeholder engagements and as part of the complaints process at each operation. Grievances are managed by environmental personnel with the support of head office specialists and actions are monitored.



Baboon spider relocation at Grootegeluk

Biodiversity continued

Biodiversity relocation and conservation programmes

Our programmes were based on various biodiversity needs at BUs.

Waterberg (Limpopo)



Grootegeluk and Belfast: Baboon spider and succulent relocation

Our team works closely with authorities in relocating baboon spiders and protected succulent species as our mining footprint expands. This reflects our commitment to continuous biodiversity vigilance for conservation of protected and endangered species.



Grootegeluk: Conservation in Manketti Game Reserve

Our 22 000ha Manketti Game Reserve continues to optimise land use and the sustainability of Grootegeluk.

Managed by Ferroland Grondtrust, a wholly owned subsidiary of Exxaro, the land was a cattle farm until indigenous wildlife was introduced more than 18 years ago. The thriving game reserve generates income from commercial hunting, game trading and accommodation at Manketti Lodge. It maintains the ecological balance of the prescribed area and manages land not impacted by mining operations.

Mpumalanga



Matla and Belfast: African grass owl and bat protection

Digby Wells (environmental consultants) discovered a pair of African grass owls with chicks at Matla in 2022 before construction of a river diversion canal. As other breeding pairs were found on the site in 2013 and 2016, Exxaro has partnered with the Endangered Wildlife Trust to develop a monitoring programme that could enhance our existing processes. We are considering transferring skills from this monitoring programme across the Highveld.

Within the Belfast conservation area, we also assist the Birds of Prey NGO with the safe and controlled release of grass owls and bats. By installing owl boxes and bat banks, we create a balance within the ecosystem along the Klein Komati River and surrounding agricultural areas. Grass owls help control vlei rat populations and bats reduce insect species that are considered pests in local communities.

Eastern Cape



Cennergi: Bird and bat fatality curtailment

Since 2016, as part of our commitment to mitigate the impact of wind turbines on birds and bats, Cennergi has employed local carcass search companies. These companies monitor bird and bat fatalities in accordance with the South African bird and bat wind energy facilities guidelines.

At Amakhala Emoyeni, a bat curtailment programme will be implemented between October 2022 and May 2023 to reduce fatalities. The avifauna specialists prepare the semi-annual bird and bat monitoring reports submitted to lenders, BirdLife Africa, Endangered Wildlife Trust, the DFFE and other relevant authorities.

In 2022, no red data mortalities were recorded at Tsitsikamma. Unfortunately, one secretary bird (*sagittarius serpentarius*) fatality was recorded at Amakhala Emoyeni on 21 September 2022.

Amakhala Emoyeni: Cape vulture management

Cennergi supports the Endangered Wildlife Trust's Eastern Cape vulture safe zone research. This programme aims to reduce Cape vulture fatalities at operating and proposed wind energy facilities. It also stabilises the local population by addressing threats in the safe zone. It is the first habitat safe for vultures within wind energy facilities and the surrounding landscape.

Vultures have incredible eyesight during the day that enables them to spot an animal carcass from around 6km away. We also implement the on-site Cape vulture food management programme, which entails removing livestock and wildlife carcasses to minimise collisions with wind turbines. In 2022, no Cape vulture fatalities were recorded.

Alien plant eradication

The positive outcomes of monitoring, controlling and eradicating invasive alien plant species on our sites include improved water quality and surface water runoff, flourishing indigenous vegetation, increased species diversity, and availability of productive land.



Progress in 2022

Across our sites, we progressed in avoiding:

- Biodiversity decline
- Indigenous animals being prevented from feeding or nesting in the area due to fauna changes
- Extinction of indigenous species due to genetic pool loss (pine, wattle and hakea trees prevent fynbos species growth)
- Greater risk of catastrophic events (fire and flooding) due to ecological imbalance
- Lower productivity of rangeland due to selective grazing
- Soil erosion and dam and river siltation due to invasive alien species consuming more water than indigenous flora
- Sandy and nitrogen-poor natural soil

Invasive alien plant control continues at BUs and will start at Grootegeluk in 2023. The tender process to appoint a service provider began in the third quarter of 2022.

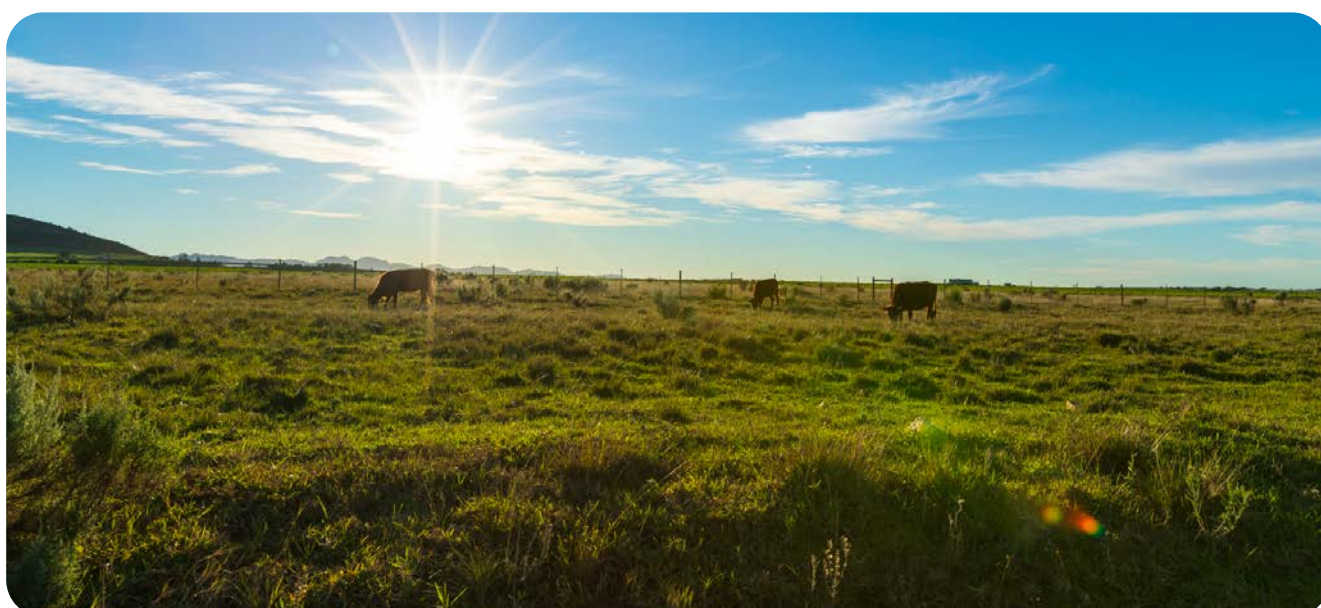
	Stage 1 Development of invader species management plan	Stage 2 Physical implementation (removal of invader species)	Stage 3 Maintenance (eradication of invaders on rehabilitated land)
Belfast	✓	✓	→
Leeuwpan	✓	✓	✓
Matla	✓	✓	✓
Grootegeluk	✓	●	→
Tshikondeni	✓	✓	→

✓ Completed ● To start in 2023 → Ongoing

Land cleared of invader plants (ha)	2022	2021	2020
Leeuwpan	86	118	146
Matla	0	23	70
Belfast	19	0	0
Tshikondeni	132	264	198
Total	236	405	414



Since 2016, full-time local SMMEs have successfully managed Cennergi's alien plant control programme.



Farmland around Cennergi's Tsitsikamma windfarm

Biodiversity continued

Pan research

Following an assessment of pans at Belfast by the Council for Scientific and Industrial Research in 2019, and subsequent monitoring by Exxaro since 2020 to avoid deprivation, an external reviewer conducts monthly and quarterly evaluations.

Research concluded in 2022

Recommendations from our completed pan research project are being evaluated to determine the next steps.

Wetland rehabilitation

We monitor and evaluate our wetland rehabilitation activities to ensure on-site mitigation measures deliver anticipated returns.

Belfast

We completed rehabilitation of the wetland system adjacent to Belfast in 2020. The second phase will begin in 2023 to improve wetlands within the mining right area. We will appoint a contractor to execute the implementation plan.

Grootegeluk

In 2021 the proof-of-concept study in the Grootegeluk mining rights area was completed and six seasonal pans were created using donor material from pans that will be lost to mining.

The seasonal pans referred to low laying areas that occur naturally in the landscape. These pans have a clay base that captures and stores water in the rainy season. During the rest of the year, they are dry.

The clay and biological material was stripped from the “donor” pans in front of the pit area, which would otherwise have been lost to mining, to test if similar pans could successfully be created. Six pans were created testing various scenarios, where donor clay was used for sealing and the biological layer (filled with eggs of the invertebrates that occur within the natural pans) was used for seeding the invertebrate species into the newly created pans. Over time, it is expected that the biodiversity in the created pans will resemble that of the originally harvested/lost pans, should the study show to be successful. The five-year programme to monitor the project’s success started in January 2022. The outcome of the monitoring programme will determine if the pans can be successfully recreated as part of future rehabilitation or offsetting.

 [Pan recreation project](#) (page 58)

Biomonitoring continues in terms of the WUL requirements for Grootegeluk, Tshikondeni and Thabametsi.

Matla

A detailed report of wetland monitoring will be submitted to the DWS in 2023.

Leeuwpans

We will review the implementation of the wetland offset initiative in 2023 following the termination of the divestment process in 2022.

Future focus

Exxaro intends to introduce detailed regional biodiversity management plans based on our impact assessments in 2022. Plans will ensure compliance, and inform targets and KPIs being developed for each BU.

Case study: [Rhino conservation invests in people and wildlife](#) (media and insights, press releases tab)

Exxaro worked with the Peace Parks Foundation and Mozambique’s National Administration for Conservation Areas in relocating seven black rhino – identified as critically endangered on the IUCN Red List of Threatened Species – from our Manketti Game Reserve in Limpopo to Zinave National Park in Mozambique during the year.



Wetland rehabilitation at Belfast

Environmental liabilities and rehabilitation

Understanding that responsible mining practices continuously evolve, we have a holistic and integrated approach to mine closure, taking into account environmental protection, social wellbeing and financial performance.

Environmental rehabilitation is an opportunity to uplift our employees and communities with sustainable alternative land use.¹

Our approach

We manage our environmental liabilities and rehabilitation in compliance with legislation and evolving responsible mining practices. Our licence to operate depends on a holistic and integrated approach to land management, mine closure and concurrent rehabilitation. Our approach therefore considers impacts on employees, communities, the environment, government and infrastructure. Further, our proactive management of environmental impacts minimises residual liabilities (ie water quality and quantity, and topsoil health) that could affect Exxaro's financial performance by completing concurrent rehabilitation timeously and to prevent water ingress into rehabilitated areas.

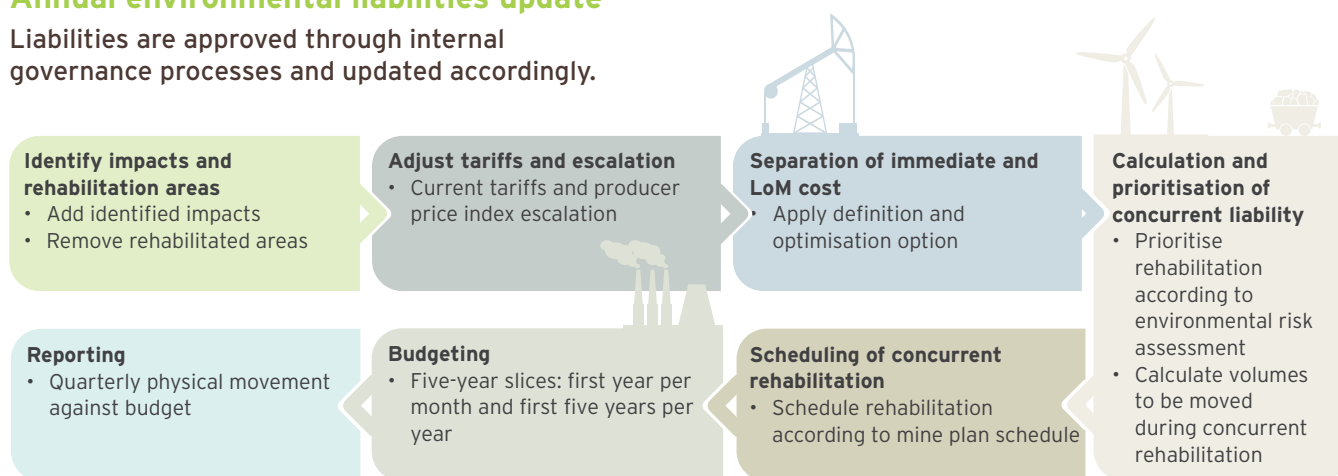
Independent technical and financial specialists, and our internal sustainability and finance departments, with expertise and experience in environmental management, calculate financial provisions in terms of GNR 1147 (financial provision for prospecting, exploration and mining operations).


We await promulgation of draft financial provision regulations for mine closure and rehabilitation (GN 765) issued on 27 August 2021. In the meantime, discussions continue between the environmental policy committee of the Minerals Council, on behalf of Exxaro and our mining peers, and the DMRE. The proposed regulations will repeal GNR 1147. All our BUs will be continuously assessed according to GNR 1147. In the meantime, we conduct annual external assessments as necessary (at Matla, Belfast, Grootegeluk, Hlobane and Durnacol in 2022).

 Minerals Council's [position on financial provisioning](http://www.mineralscouncil.org.za) (www.mineralscouncil.org.za)

Annual environmental liabilities update

Liabilities are approved through internal governance processes and updated accordingly.



 An external consultant reviews Cennergi's financial provisions for facility closure and rehabilitation every three years. We then review and adjust cost estimates for concurrent and final closure rehabilitation programmes, as necessary. Periodic environmental management programme performance assessments inform amendments to rehabilitation plans and closure objectives.

Accountability and responsibility

Our sustainability managers, supported by the rehabilitation team and on-site environmental specialists led by the executive head: sustainability, oversee the implementation of our policy and practices.

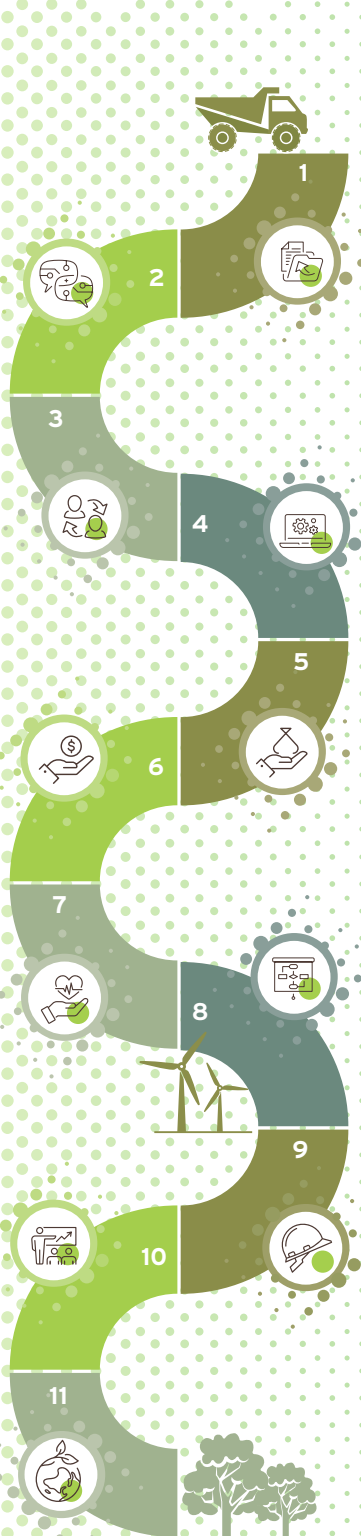
¹ Mine rehabilitation is the restoration of the post-mined landscape to the intended post-mining land use.

Environmental liabilities and rehabilitation

continued

Integrated stages of mining and mine closure planning

We strive to integrate land and rehabilitation liability management in daily mine planning to minimise final closure costs for each operation and optimise final land use after closure.



Information management

- Use cutting-edge systems and tools to manage environmental liabilities and rehabilitation
- Operations report concurrent rehabilitation KPIs on Middle Eye every two weeks

Social

We are working towards transferring **90% of post-mining land to emerging farmers in local communities by 2026.**

To effectively and efficiently manage Exxaro-owned land to support current and future operations, assist with biodiversity offsets and create social impact, we categorise our land parcels as follows:

Long-term agricultural leases

Our **minerals succession programme** supports farmers by enabling access to resources (funding, mechanisation, inputs and training) in a three-year contract with an external service provider.

Available land for emerging farmers and communities

- **Mpumalanga**
 - Strathrae: 5 447ha (seven farmers on 4 495ha of land used for crop and cattle farming)
 - Sheepmore: 740ha (two farmers on 740ha of land used for cattle farming)
 - **KwaZulu-Natal**
 - Durnacol: 190ha (110ha leased to one female farmer for cultivation)
 - **Limpopo**
 - Lephallale: 296ha (112ha leased to three entities for intensive vegetable farming)
- Land is used for diversified agriculture (dry land maize, soya bean cultivation and livestock farming)
- Internal and external audits evaluate farm transfer success
- Minerals succession programme supports farming project growth

Donations

- Donate land where either a right is established (land claim or labour tenant) or social impact can be achieved through donation to local municipalities (such as cemeteries)
- Donate property with land claims to government for redistribution
- Support resettlement and local government in areas where our operations impact communities
- Help uplift communities (such as Phumlani agri-village in Belfast) through livelihood restoration programmes

Current and future operations

- Areas earmarked for operations are closely managed and protected from the risk of land grabs to ensure our sustainability (such as Thabametsi at Grootegeluk)

Biodiversity and conservation (such as Manketti Game Reserve)

- Ensure operations co-exist in harmony with the surrounding natural environment
- Maintain biodiversity management plans (including alien invasive control) and sensitive ecosystem enhancement to uphold our environmental licence to operate
- Control invasive alien plant growth to improve water quality and surface water runoff, keep indigenous vegetation healthy, increase species diversity and ensure availability of productive land

Human resources

- Equip employees with portable skills, eg vegetable farming to pursue alternative employment and participate in gainful economic activity
- Develop and implement a communication plan for employees
- Employee training to implement and manage mine closure plans

Infrastructure

Infrastructure (such as power lines, water pipes, buildings and dams) that can be used to implement and support a sustainable final land use is retained and incorporated into the final closure environmental management plan. Such infrastructure is then normally donated to a relevant entity managing the implementation of such plans.

Assets

Any redundant but serviceable assets (such as vehicles and furniture) that can be utilised to support any social impact programmes are retained and transferred to a relevant entity managing the implementation of such plans.

Operations in active closure in 2022:

Tshikondeni, Durnacol, Hlobane and Strathrae (2021: four)



Financial

We annually review mine closure and rehabilitation financial provisions and rehabilitation plans and closure objectives are amended after environmental management programme performance assessments. Cost estimates of activities in the concurrent and final closure rehabilitation programme are reviewed and adjusted. External auditors visit our sites, review documents and audit the provisions twice a year.

Exxaro's Environmental Rehabilitation Fund (EERF) and additional bank guarantees provide for new developments and cover shortfalls in financial provisions. The EERF's assets are managed in terms of asset and liability modelling aligned with risk, return and liability on each site. The objective is to maximise investment growth in the cost of liability provisions. An external specialist supports EERF trustees with technical skills required to profile and identify suitable structures for assessment by the trustees. Current implementation includes:

- Two income building blocks benchmarked to cash rates and investing in government treasury bills, banks and corporate paper
- Three growth building blocks targeting inflation-linked returns and investment in insurance and bank-guaranteed products
- Equity-driven portfolios without explicit investment guarantees but portfolio managers controlling capital risk by managing volatility
- Quarterly contributions to the EERF based on closure cost estimates at LoM without considering guarantees in place

Total unscheduled closure costs in 2022: R8 427 million (2021: R7 581 million)

Growth of Exxaro and Matla rehabilitation trust funds (combined): R19 million (2021: R217 million)

Mainly cash contributions, interest earned on investments and fair value adjustments.

Bank guarantees at year end: R3 606 million (2021: R3 606 million).

Update provisions twice a year highlights potential rehabilitation alternatives that could decrease the long-term closure liabilities of operations.



Health and hygiene

- Programmes to address health and safety issues as well as employment opportunities for communities are in place.



Mining plan

Each BU has five-year conceptual concurrent rehabilitation plans, schedules and associated budgets to:

- Set measurable targets
- Avoid backlogs and related liabilities
- Enable managers to implement strategies without cash flow constraints
- Include concurrent rehabilitation in operational tracking



Safety and risk control

Health and safety at mines in closure is just as important as any operational mine. We apply the same health and safety standards and policies to all Exxaro's operations, including mines in closure. Security risks are a major challenge at any closed operation and infrastructure and assets need constant safeguarding during a closure process.



Interested and affected parties

- Socio-economic activities that must continue after mine closure
- Identify the needs and expectations of stakeholders and socio-economic impacts
- Assist host communities in acquiring skills for commercial activities and infrastructure use after mine closure
- Ensure opportunities are available to improve quality of life
- Align closure with community expectations to honour SLP commitments
- Develop and implement plans for engagement with communities, government and NGOs, among others
- Help mine owners and operators achieve liability-free closure within a reasonable timeframe

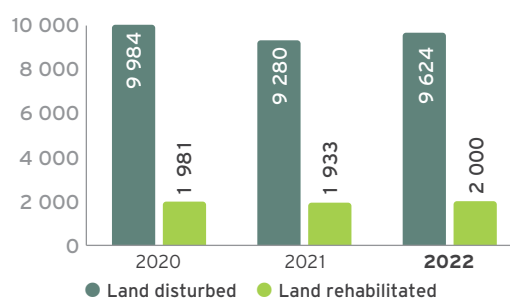


Environmental

The disturbed footprint includes buildings, roads and mining areas to be rehabilitated in terms of the environmental management programme and the final land use plan (when maintenance and monitoring are needed).

How we performed

Land disturbed versus land rehabilitated (ha)



Refer to the [databook](#) for more detail on land disturbed versus land rehabilitated.

Environmental liabilities and rehabilitation

continued

Future focus

We will align our mine closure and rehabilitation approach with the Sustainable Growth and Impact strategy in 2023.

Our strategic objectives include:

- Embedding concurrent rehabilitation and mine closure in the management of operations at BUs
- Aligning with rehabilitation standards that ensure sustainable alternative post-mining land use (including vegetation that can be used for carbon sequestration)
- Clear and measurable concurrent and ongoing rehabilitation targets
- Building accountability into operational management KPIs
- Reducing financial environmental liability

Case study: Novel approach to rehabilitation at Grootegeluk (sustainability, case studies tab)

To mitigate the impacts of expanding the Grootegeluk complex, Exxaro is recreating non-perennial pans within the landscape.



Phumlani agri-village in Belfast