



# Environment

- 41 Environmental Management
- 46 Climate Change and Energy Usage
- 49 Water Management

## Stakeholders

- ▶ Employees/contractors/unions
- ▶ Local communities
- ▶ Host Governments/regulators

## At a glance

**79%**  
PROPORTION OF WASTE RECYCLED IN FY 2018

**28.8 kWh/t** (KPI ≤ 28 kWh/t)  
ELECTRICITY EFFICIENCY PER TONNE

**0.03 tCO<sub>2</sub>-e/t**  
CARBON INTENSITY PER TONNE

**0.65 m<sup>3</sup>/t** (KPI ≤ 1.20 m<sup>3</sup>/t)  
CLEAN WATER INTAKE FOR PRODUCTION

**59%** (KPI ≥ 50%)  
PERCENTAGE OF RECYCLED WATER USED ON MINE

# Environment

## Schematic of how we manage this



### Key achievements

- ▶ No major environmental incidents reported for eight consecutive years.
- ▶ 83% of operations certified to ISO 14001:2015.
- ▶ Appointment of the Group Closure and Rehabilitation Specialist as a member to serve on the South African Roster of Experts ("RoE") of the United Nations Convention to Combat Desertification ("UNCCD").
- ▶ Successful implementation of our Water Management Strategy.
- ▶ All integrated water use licences awarded.
- ▶ Independent verification of GHG emissions reporting according to ISO 16064-3.
- ▶ Successful 10% reduction in total carbon footprint for a fourth consecutive year.
- ▶ Restatement of the GHG base year based on operational changes.
- ▶ Expansion in the number of activities included in Scope 3 GHG calculations.

### Key challenges

- ▶ Implementation of rehabilitation schedules.
- ▶ Identification of local waste recyclers in the Northern Cape.
- ▶ Ageing Government-controlled infrastructure supplying production water to Finsch.
- ▶ Identifying and implementing additional measures to improve water use efficiency even where maximum efficiency has already been met.
- ▶ Obtaining verifiable data from operations due to the unavailability of monitoring equipment.
- ▶ Expanding energy requirements throughout the Company.
- ▶ Difficulty in verification of source documentation at operational level. Processes to be implemented to link source documentation with environmental data sets.

### Objectives for FY 2019

- ▶ Implementation of an integrated water management strategy.
- ▶ 1% annual reduction in carbon emissions (FY 2015 to FY 2020) from the base year of FY 2016.
- ▶ Year-on-year improvement in waste recycling.
- ▶ Five-year clean-up for legacy underground waste (initiated in FY 2018).

### Company policies

- ▶ Group HSE Policy
- ▶ Environmental Management System ("EMS") for each operation
- ▶ Group standard on the optimisation of waste management

### Standards we follow

- ▶ ISO 14001:2015
- ▶ ISO 14064-3
- ▶ ISO 31000
- ▶ ISO 19011

**▶ Read more about how we apply corporate governance within Petra in our 2018 Corporate Governance Statement published in our Annual Report**

## Environmental Management

### Managing our environmental impacts

We recognise that our value emanates from the natural world; therefore, protecting the environment in which we operate is fundamental to how we run our business.

Environmental management is the responsibility of every employee. The principles of pollution prevention and continual improvement are integrated into our strategic planning, management systems and daily activities. We also promote environmental awareness amongst our employees and the communities in which we operate.

At an operational level, an Environmental Management System (“EMS”) is in place for each mining licence. This sets out the detailed processes

for the identification of environmental risks and implementation of action plans to mitigate the impacts of our activities. As per Clause 6.1.2 of ISO 14001:2015, the impacts of our activities, products and services are evaluated considering a life cycle perspective. This is not a life cycle analysis (“LCA”) in the strict definition as an LCA is not relevant to diamond production but rather the analysis of a continuum of interlinked stages from service providers and suppliers through the use of resources up to final disposal of waste products/packaging material.

All our operations, with the exception of one (thus 83% of operations), are certified to the international environmental standard ISO 14001:2015 through the British Standards Institution (“BSI”).

### Group HSE Policy

The Group HSE Policy is the guiding document for setting operational performance objectives and focuses on the following key areas:

- ▶ continual identification, elimination or control of environmental risks;
- ▶ the employment of appropriate assessments when planning new or modified facilities, processes or any other mining projects; and
- ▶ continual focus on the reduction of the environmental footprint of our operations and related activities by:
  - ▶ optimising the consumption of non-renewable resources, such as water and electricity, to guarantee the sustainability of our operations;
  - ▶ implementation of the waste hierarchy (avoid, reduce, re-use, recycle, treat and dispose);

- ▶ endeavouring to protect and restore natural biodiversity and sensitive environments;
- ▶ identifying and undertaking specific programmes to reduce the carbon footprint of our business; and
- ▶ concurrent rehabilitation of mining areas, where practicable, in order to ensure a sustainable end land use.

This Group HSE Policy and selected Group Standards are provided to all suppliers, service providers and contractors as it is expected of people working for or on behalf of Petra to comply with the principles and commitments contained in these documents.

Various Group strategies have been developed as a result of this policy, including: water management, mine closure and rehabilitation, ecological management, and climate change adaptation.

### Risk management

Through our annual risk analysis processes, we identify significant environmental risks that provide focus for implementing or improving the required mitigation controls.

#### Potential key risks caused by our operations

- ▶ Impact on water resources, both through inefficient use and potential contamination of natural water sources: read about our focus on this area on pages 49 to 51.
- ▶ Inefficient energy consumption from non-renewable sources: read about our Carbon Reduction Strategy on pages 46 to 48.
- ▶ Endemic habitat change: read about our approach to the management of biodiversity on pages 43 and 44.
- ▶ Permanent changes in topography: read about our rehabilitation and closure plans on pages 44 and 45.
- ▶ Changes in land use and land capability: read about our rehabilitation and closure plans on pages 44 and 45.

#### Key risks to our operations

As part of Petra’s process to migrate to the ISO 14001:2015 standard, a number of key risks to the Company have been identified. These are:

- ▶ Illegal mining activities damaging previously rehabilitated areas: this is specifically relevant in the Kimberley area, where illegal miners are entering already rehabilitated areas.
- ▶ Poor management and maintenance of local Government-owned infrastructure: when municipal-operated waste water treatment facilities are mismanaged, untreated sewerage

effluent can enter operations through storm water trenches; the responsibility is then with the mine to undertake the clear-up.

- ▶ Negative perceptions of the environmental impacts of diamond mining: negative perceptions come into play when new projects are applied for that require authorisation from Government agencies and public participation processes. This is due to the poor reputation of other commodities such as coal and gold mining, especially where they concern acid mine drainage. Diamond mines therefore have difficulty in convincing the authorities and the public that their operations do not use harmful reagents and are therefore much less harmful to the environment.
- ▶ Climate change: climate change is a key risk to the Company, especially in how this could impact the availability of water to our operations. Read more about our approach on pages 46 to 48.

## Environmental Management continued

### Stakeholder engagement

Petra has processes in place to engage with its stakeholders on environmental matters, including the handling of issues raised by its local communities. The public participation processes in South Africa for obtaining environmental authorisations also make provision for direct communication with communities where their views and needs are included into management programmes.

### Environmental incidents

We aim to minimise environmental incidents at all our operations and have put in place processes to manage any incidents which may occur as effectively as possible. We classify incidents according to their severity, ranging from minor to major. Incidents are recorded and managed on an ongoing basis and are only recorded as closed once all allocated actions have been addressed and the effectiveness of the corrective actions have been verified.

For the reporting year, ten significant environmental incidents were reported. See page 72 of the report on the detail of these incidents.

For the past eight years, no 'High' or 'Major' environmental incidents were reported at any of the Group's operations.

### Spillage management

0

**SIGNIFICANT SPILLAGES<sup>1</sup> AT OUR OPERATIONS IN FY 2018**

Any hydrocarbon spillage on soil or tailings are either treated in situ or removed to a formal bioremediation site depending on the practicality and situational risks of the area. Approved biocides are applied according to a set procedure to ensure maximum biological digestion of the hydrocarbons. Soil samples are analysed to determine the level of digestion before the treated material is placed back on location, signed off as treated or stored to be used as rehabilitation material.

### Waste management

Petra manages separate waste streams within the organisation:

- ▶ business waste<sup>1</sup>;
- ▶ hazardous waste<sup>1</sup>; and
- ▶ mining waste<sup>1</sup>.

### Business and hazardous waste

The Group is consistently implementing processes to assist with waste management and disposal. Waste management objectives and targets are set for business and hazardous waste at each operation, with these KPIs regularly monitored through internal assessments and external audits as part of ISO 14001:2015 certification.

In addition to the normal systemic management tools implemented, Petra has also developed a Group standard on the optimisation of waste management, based on international best practice and which aims to identify all waste streams that can be eliminated. For those streams that cannot be eliminated, the best practical options for repurposing and recycling optimisation are suggested.

We strive to improve recycling of waste generated at our operations and to prevent unnecessary wastage as part of the international waste hierarchy. By increasing recycling volumes, the overall volume of waste that needs to be disposed to landfill reduces.

The overall volumes of combined waste (business and hazardous) generated by the Company increased by 115% to 31,032 t (FY 2017: 14,407 t), as a result of a clean-up of scrap metal at Williamson (18,586 t). The percentage of waste recycled by Petra increased from 31% in FY 2017 to 79% in FY 2018 as a result of the scrap metal clean-up at Williamson. Omitting the effect of the inclusion of the scrap metal at Williamson on numbers, the total amount of business and hazardous waste generated by the Company decreased by 14% to 12,446 t as a result of an improvement in waste management at all operations.

21%

**DECREASE IN HAZARDOUS WASTE DISPOSAL IN FY 2018**

In line with this trend, 3,225 fewer tonnes of non-hazardous waste were disposed compared to FY 2017 and the amount of hazardous waste to be disposed reduced by 21%. See page 74 for a detailed breakdown of waste disposed, recycled and incinerated.

A small percentage of waste is incinerated. This is medical waste generated at mine clinics and sewerage screenings at the Lime Acres (Finsch) waste water treatment works. Williamson does not have access to a hazardous waste disposal facility. Therefore it incinerates its small volume of hazardous waste as well. This practice and the installation conforms to EU standards and practices.

Petra only uses reputable waste handling companies that are vetted for legal compliance prior to awarding tenders. Most of the waste handling companies are ISO 14001 certified, which adds to the level of assurance provided that waste is handled, transported and disposed of in a responsible manner. This includes the management of hazardous waste.

All on-site waste handling areas are audited internally as well as externally as part of the mines' ISO 14001 management systems. Off-site handling and disposal sites are inspected on an ad hoc basis.

1. See Glossary for definitions.



## Environmental Management continued

### Waste management continued

#### Business and hazardous waste continued

Petra adheres strictly to the Basel Convention in that no industrial or hazardous waste is shipped or transported over international borders as part of the Company's operations. All waste generated by the Company is recycled or disposed of within the country of origin.

#### Mining waste

Petra operates a number of different mining waste facility types:

- ▶ Coarse residue deposits ("CRD"): all ore mined and processed through the processing plants may contain a percentage of waste rock in addition to the diamondiferous ore. CRDs are dry waste facilities with a maximum moisture content of 5%.
- ▶ Fine residue deposits ("FRD"): the slurry fraction of mining waste produced as part of ore processing. The small ore particles are deposited in suspension with water in dam-like structures of various designs (valley dams and ring dams are preferred).
- ▶ Paste facilities: a process whereby coarse and fine materials are blended to form a paste consistency to be deposited simultaneously in the same facility.
- ▶ Waste rock dump (overburden): portion of mined ore that is not diamondiferous and not treated through the ore processing plants.

The Company's mining waste areas are planned, operated and maintained according to the country of operation's legislative framework. In addition, external professional engineers are appointed to monitor the safety of these facilities, according to international best practice. Each site has a unique operating procedure that is implemented with the utmost care to reduce risk and protect the communities downstream of the facilities.

None of the mining waste facilities are lined as the risk to groundwater and soil pollution is minimal. The chemical content of all operations' mining waste facilities were analysed according to the relevant legislation in South Africa<sup>1</sup>. All the results indicated that the mining waste will not pose an unacceptable risk to the environment and is not hazardous.

Only one of the Petra operations is depositing mining waste into a mined-out pit. All other facilities are land-based disposal sites.

#### Materials

The liberation of diamonds requires a process that involves mining, crushing, washing and screening of ore, followed by the recovery and sorting of concentrates where after the raw product is shipped off site for further classification. During this process, the minimum raw materials are used, with the largest input being:

#### Non-renewable resources:

- ▶ energy (in the form of fuel and electricity);
- ▶ water; and
- ▶ construction steel.

#### Renewable resources:

- ▶ timber.

#### Chemicals:

- ▶ explosives;
- ▶ lubricating oils and grease;
- ▶ moisture sealant; and
- ▶ DMS material (Ferro-Silicon).

No toxic chemicals are produced as a by-product of the diamond mining and processing operations.

Bulk chemical storage areas are built according to SANS 10263-0:2017 specifications to prevent

pollution from accidental spillages and inappropriate handling.

The Company's procurement position is such that preference is given to recycled products as far as practically possible.

#### Packaging material

Only re-usable canisters are used for the shipment of the Company's product. Therefore no waste is generated by the transport of our product.

#### Transportation impacts

Petra identified the impact from various transportation activities as part of each operation's ISO 14001:2015 risk assessment process. Impacts due to the transportation of employees, ore and product were evaluated. The identified impacts include:

- ▶ consumption of non-renewable resources (fuel and electricity);
- ▶ air pollution due to exhaust gases and dust liberation; and
- ▶ nuisance noise.

#### Biodiversity and land management

We recognise that our activities have the potential to significantly affect the biodiversity and topography. Biodiversity impacts associated with mining and exploration include: habitat destruction, vegetation clearance, introduction of invasive species and permanent change to the original ecological processes. We therefore monitor for such impacts at set frequencies during and after operations. Therefore mitigation strategies are implemented only if the impact could not be avoided.

The Company has implemented measures to integrate biodiversity in the management of its operations, including:

- ▶ environmental impact assessments prior to any 'Greenfield' development;
- ▶ training of all employees on biodiversity during the induction process; and
- ▶ relevant biodiversity management guidelines in the form of a Group standard on ecological management.

None of our producing mining operations are located in or adjacent to protected areas.

Approximately 55km<sup>2</sup> of land under exploration licence by Petra is located in Botswana's Central Kalahari Game Reserve ("CKGR"). This area is noted as sensitive and special measures are in place to protect the fauna and flora. These measures include, but are not limited to:

- ▶ vegetation clearing is limited to the footprint of the prospecting activities;
- ▶ areas showing erosion due to storm water flow are addressed timeously. The treatment of the erosion depends on the type of erosion observed;
- ▶ vehicle and equipment repairs take place off site;
- ▶ existing roads are used as far as practicable and the construction of additional roads is limited;
- ▶ relocation of affected woody plant;
- ▶ the purchasing of firewood from local communities is not permitted; and
- ▶ buying meat/biltong from surrounding communities is prohibited.

1. Waste Classification and Management Regulations (GN R. 634 of 2013) as promulgated in terms of the National Environmental Management: Waste Act No. 59 of 2008.



## Environmental Management continued

### Biodiversity and land management continued

As part of Petra's commitment to conserve its biodiversity, protected habitats are established and maintained for local vegetation and wildlife.

# 10,581 ha

**PROTECTED WILDLIFE AREAS AT FINSCH, CULLINAN, KOFFIEFONTEIN AND KIMBERLEY**

Williamson maintains a large forest reserve of some 906 ha, thereby protecting the indigenous biodiversity unique to the Shinyanga province in Tanzania.

In all but one of Petra's operations, the area protected is either equal to or greater than the area disturbed. The only exception is at the KEM JV operation, where large areas have been used for storing the historical tailings dumps (KEM's tailings resources total 140 Mt). Most of these areas are in the process of being reclaimed and remediated.

These protected areas are managed according to the Group ecological management standard that was developed with the aim of promoting biodiversity and aiding in carbon sequestration. Based on the international mitigation hierarchy, Petra's ecological management standard focuses on (in order of preference) the avoidance, minimisation, restoration and offset and compensation of any impacts. There are currently no offset or compensation projects registered owing to the fact that these two options are viewed as least desirable and will only be entertained as an absolute last resort.

A number of Red Data List species have been identified in our areas of operation or protection. Where appropriate, protected plants are relocated, or 'no-go' areas are established around species that cannot be relocated, such as the 'Cullinan ant colony', situated on 1 ha of undisturbed land in the middle of Cullinan's coarse tailings facility.

Programmes are run with international NGOs to assist with research into fauna, such as the secretary bird (*Sagittarius serpentarius*) programme at Koffiefontein in conjunction with BirdLife Africa, which has been running for the last six years. More recently, work is being carried out to register the Benfontein-Rooifontein-Dronfield complex in Kimberley as an important bird and biodiversity area ("IBA") and formal provincial protected environment.

### Biodiversity certification

There is no current standard to certify biodiversity management. The Endangered Wildlife Trust is working on a Biodiversity Disclosure Project, but it will still be a few years before this is up and running.

Other companies have sourced recognition through sponsorships to the Endangered Wildlife Trust, subscription to the Integrated Biodiversity Assessment Tool ("IBAT") or registration of specific projects on the International Union for Conservation of Nature ("IUCN") website. Petra is doing similar work with BirdLife Africa as mentioned above.

Petra's Ecological Management Strategy captures the principles of the IFC's Performance Standard 6 ("PS6"): Biodiversity Conservation and Sustainable Management of Living Natural Resources. The IFC only requires compliance to PS6 for funding of projects.

Most of the mining houses in South Africa are part of the National Biodiversity and Business Network. Petra supports the initiative by taking part in meetings and discussions.

The 2E2I (Effective Environmental Improvement Interventions) initiative from the Department of Environmental Affairs is to develop a platform for information sharing on restoration projects throughout the whole spectrum of industries in South Africa. This initiative is almost ready for implementation.

The BS 8583:2015 'Biodiversity – Guidance for businesses on managing the risks and opportunities' is listed as a standard by the British Standards Institution ("BSI") but no certification body is currently accredited for issuing such certification. Petra will investigate this standard for future certification.

### Achievements in biodiversity management

The Petra Group Mine Rehabilitation and Closure Specialist, Anja van Deventer, is a scientist who specialises in the field of land degradation and restoration. During April 2018 Ms van Deventer was formally appointed by the Department of Environmental Affairs ("DEA") as a member to serve on the South African Roster of Experts ("RoE") of the United Nations Convention to Combat Desertification ("UNCCD").

### Rehabilitation and closure plans

Petra has implemented a standardised Group-wide approach on concurrent rehabilitation, with the objective of generating a non-detrimental, sustainable solution for the environment and socio-economic state of our communities that are left after mine closure. Progress on rehabilitation schedules is assessed annually by internal and external specialists. Necessary changes to the execution plans are communicated to mine management, which is responsible for on-site resources.

The environmental impact from Petra's mining activities is not expected to last long after the cessation of the operations, due to our strategic approach and our commitment to our values at each step of the mining chain. Each project is planned with the end of mine in mind, creating the potential to reduce double handling of mining waste and managing impacts timeously before the end of the life of mine ("LOM"). Special measures are put in place to address residual impacts.

## Environmental Management continued

### Rehabilitation and closure plans continued

Rehabilitation budgets are allocated to each operation to address impacts through concurrent rehabilitation activities. Annual closure provision assessments are performed by external specialists to identify shortfalls in the provided funds. These funds are set aside, as per legislation, to cater for post-closure liability.

The total rehabilitation and mine closure fund for Petra during FY 2018 was US\$74.8 million.

General consensus in the mine rehabilitation community is that it is not possible to reinstate the previous pristine environment after mining has taken place. However, it is possible to restore the productive potential of each site to the benefit of its local communities. Most of our current mining areas were previously used for agriculture, thus having the potential to sustain a community. Care will therefore be taken to reinstate that economic potential, with the most appropriate end land use of each area determined within ten years before mine closure. This is achieved by setting clear rehabilitation and closure objectives for all operations in line with Government-approved Closure Plans. This will achieve our goal of 'no net loss'.

Operation	Closure objective/target examples
Finsch	Rehabilitate disturbed areas to their pre-mining land capability and use potentials.
Cullinan	Promoting ecological and biodiversity integrity in areas that support natural ecological systems.
Koffiefontein	Promote a sustainable post-closure land use.
Williamson	To achieve a level of safe decommissioning options for all structures that were established due to the mining activities at WDL, site rehabilitation and ecosystem restoration to meet the legislative requirements.
Kimberley	To reinstate a mixed land use that is stable and safe in the long term, potentially comprising wilderness, heritage tourism and urban development aligned to the IDPs of the area, taking account of the unavoidable remaining constraints posed by the reclaimed mine site.

### Rehabilitation of the Dutoitspan cemetery

Sometimes erroneously referred to as the 'Chinese cemetery', the Dutoitspan cemetery is Kimberley's oldest official cemetery (although it is likely that there would be older individual graves, or possibly clusters of graves, long gone from memory and sight). The condition of this cemetery has, over the years, deteriorated and it had reached a general state of disrepair that was not indicative of the historical significance of this site. Vandalism and desecration of graves were widespread throughout the cemetery and the land had also become overgrown with trees, shrubs and grass, several of which are invasive.

KEM JV initiated a project of cleaning and renovating the Dutoitspan cemetery after taking ownership of the property in question. This project, which started at the beginning of June 2017, enables the Company to pay respect to those who are long gone but who made a huge contribution during their lifetime in the Kimberley area.

On 15 July 1871 (the day before the discovery of The Big Hole), The Diamond News reported that there were at least 43 graves in the cemetery, of which 15 were children who had died of croup. Some of the individuals who are buried in this cemetery were pioneering members of the workforce in the mining fields of Dutoitspan and Bultfontein during the 1800s.

Originally in the shape of a coffin, the cemetery was extended and reasonably well maintained up to the 1980s. Through the project, the graves have been cleaned and rubbish, trees, shrubs and overgrown grass have been removed.

Approximately 350 headstones have been mended and 98 graves have been exposed from beneath layers of sediment with a special machine used in the gold mines to clean gold dust. This constitutes the first application of these machines in the field of grave restoration.

The KEM JV environmental team and mine management are honoured and privileged to be able to pay their respects to those who were once part of the mine and their families through the implementation of this project. A memorial wall is in the process of being erected in memory of all the people involved in diamond mining. The grand reopening of the cemetery and revealing of the wall took place on 26 September 2018.



Photo courtesy of Evd Westhuizen-Coetzler.