

Environment

In this section we discuss our environmental impact in the context of resource use and efficiency, impact management, rehabilitation and waste management. All our mines are ISO 14001 certified and annual audits are conducted to measure the effectiveness of our systems.

Environmental governance is provided by the board safety and sustainable development committee and other relevant committees at head office and operations. The board bears overall responsibility for environmental monitoring and performance.

Our SHE policy and associated environmental standards guide the operations. The environmental management systems, formulated in line with ISO 14001 requirements, enable the mines to identify all aspects and impacts associated with their activities and to determine corrective measures.

All our operations use a group sustainable development database to capture environmental data, which is subject to verification by external auditors.

Process	Used at what stage	Purpose
Impact assessments	Project initiation or expansion	Define key risks/impacts
Environmental management programme	Project implementation, operation and closure	Manage/mitigate impacts
Legal register	All stages	Track changes in applicable legislations and their impact
Risk assessment	All stages – part of all processes	Manage/mitigate impacts
Monitoring and reporting	Part of impact management	Assess performance against environmental management programmes, for example
Internal audits	All stages	Ensure management programmes are implemented and performance is in line with expectations
Data verification	All stages	Ensure data collection is correctly reported and executed and systems for analysis are in place
Supplier and contractor audits	All stages	Ensure suppliers and contractors comply with Kumba environmental requirements
Closure planning	Ongoing	Ensure financial provision for closure is adequate and aligned to rehabilitation options

Our environmental objectives for 2008 are to:

- Review reporting of energy, water and CO₂ emissions with the energy and water efficiency model
- Drive implementation of energy efficiency initiatives to reduce energy consumption by 15% by 2014
- Set targets for water consumption and identify saving initiatives
- Continue to identify projects to reduce CO₂ emissions
- Obtain approval from DME on updated closure cost estimates and preferred rehabilitation method
- Implement waste management plans
- Achieve zero level 2 and 3 incidents (definition p89).

Resource management

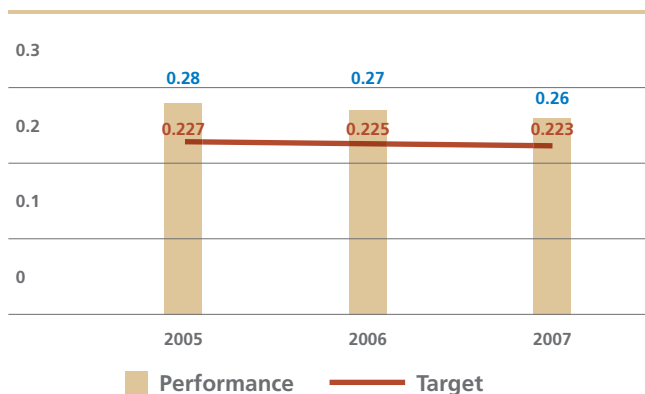
In this section we focus on water and energy consumption. Currently, energy efficiency in South Africa is of utmost importance and an issue that requires our commitment and attention.

Water management

Sishen and Thabazimbi mines are in semi-arid regions. This implies that at Kumba we need to be extra efficient at managing our use of water, controlling our discharges and their quality and managing our impacts on groundwater resources.

Although Kumba achieved an overall water saving of 3.7% in 2007 compared to 2005 and 2006, the target of 0.223m³ per tonne was not met. This was due mainly to the full-scale construction of a new processing plant for SEP and increased production. Two major water reduction projects were implemented at Sishen Mine, namely the construction of a new return water dam and a new slimes handling process. The new slimes handling process involves increasing the density of the discarded slurry, which reduces the amount of water 'wasted' through slimes deposition, and reducing the surface area of the slimes dam ponds, thus reducing evaporation.

Water consumption (m³/tonne)



Sishen Mine also uses treated effluent from the Kathu sewage treatment plant. Approximately 20% of the mine's water requirements are provided by this treatment plant, thus reducing reliance on external sources. Another important management action that has decreased water use is the treatment of permanent roads using a chemical dust suppressant instead of water. A trial was undertaken in 2007 to identify a suitable chemical suppressant for use on non-permanent roads. Sishen Mine will implement the findings of this study in early 2008.

A water and energy efficiency task team was established in 2007. This team is responsible for developing water and energy policies, strategies, goals and savings initiatives. Several savings initiatives were identified at the end of 2007 for further investigation in 2008. A modified baseline will be used in future for reporting progress against targets. The target for water reduction will be revised in 2008 in consideration of secondary factors affecting water consumption at the mines.

Groundwater management

The health of underground aquifers at both Sishen and Thabazimbi mines is vital to the sustainability of the mines and neighbouring communities. The mines obtain 57% of their supply from groundwater reserves.

At Sishen Mine, farmers surrounding the operations have alleged that the mine's dewatering activity has affected their water supplies and their ability to water their livestock. Formations of swallets (similar to sinkholes) were also visible in the banks of the Gamagara River near the mine. Several studies were conducted by specialists appointed by the mine to determine the impact of dewatering on neighbouring farmers. After some farmers disputed the findings of the study, the University of the Western Cape was appointed by the Department of Water Affairs and Forestry (DWAF) to review the study. A peer review raised doubts on the boundaries of the impact zone as defined by previous investigations. Consultations with affected farmers and DWAF have been ongoing to determine the scope of additional work. In the meantime, the mine is providing water to affected farmers. Agreements to provide assistance for grazing were also reached with the majority of downstream farmers.

In addition to these actions, the mine undertook a project to backfill the swallets to re-establish the normal path of the river. This work was completed at the end of September 2007. A formal river diversion to channel water around the backfilled portions will be investigated in 2008.

Case study: Sishen Mine water conservation initiatives

Sishen Mine is in a semi-arid area. The mean annual rainfall is 349mm while the average annual evaporation rate is 2,026mm. Low rainfall coupled with high evaporation requires all water users in the region to apply strict measures to reduce evaporation, as well as stringent water conservation measures. Through its environmental management system, the mine is committed to using its water resources efficiently.

The existing beneficiation plant at the mine, which produces about 29Mt of ore per annum, uses a wet process in which run-of-mine ore is washed, separated, sieved and sorted. At the end of the beneficiation process, all process water is sent to sludge thickener dams where the sludge settles out.

From these dams, the separated clean water is returned to the beneficiation process and the sludge is pumped to four individual slimes dams. In the slimes dams, the remaining solids settle out and water is recovered.

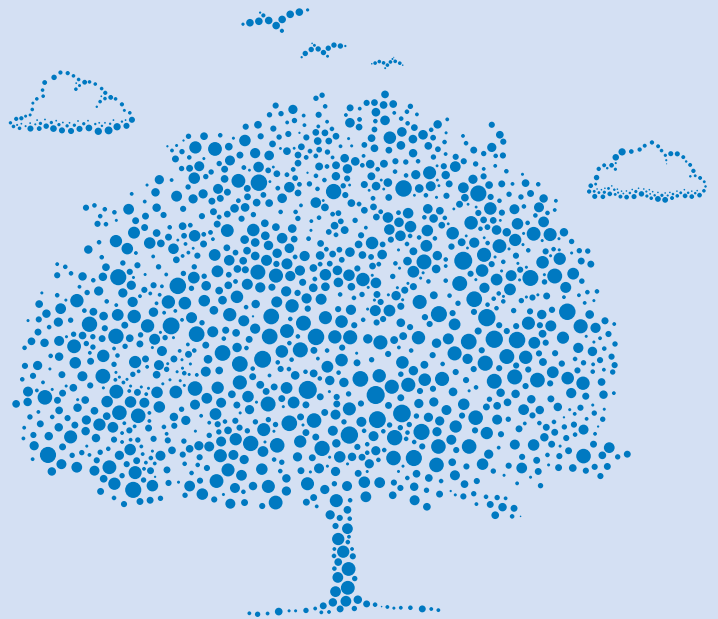
The slimes dams were historically a major source of water loss. A large volume of water was stored in the dams to allow sufficient retention time for sludge to settle out. Water was lost from this pool through evaporation and seepage. To improve water conservation, the mine has recently optimised slimes dam management and constructed a return water dam as a part of the Sishen Expansion Project (SEP).

In 2006, the new return water dam was constructed adjacent to the existing slimes dams at a cost of approximately R6 million. Instead of returning recovered water directly from the slimes dams to the beneficiation plant as in the past, recovered water now flows from the slimes dams via a silt trap to the return water dam. From this dam, water is pumped to the beneficiation plant. The advantages of the silt trap and return water dam include:

- A shorter retention time for water on the slimes dams
- Smaller water pool area on the slimes dams
- The return water dam is lined and allows for a deeper pool with a smaller surface area.

These advantages result in no seepage and lower evaporation losses. An intensive engineering redesign was initiated to increase sludge density for the new SEP plant. By increasing the density of sludge sent to the slimes dams, more water is effectively extracted at the thickener dams and returned to the beneficiation process, resulting in less water being sent to the slimes dams where it can evaporate.

Other practical measures implemented by Sishen Mine to conserve water include separating the clean and dirty water systems. Now all dirty water on the mine is collected via a series of drains, treated and used in the plant and other processes.



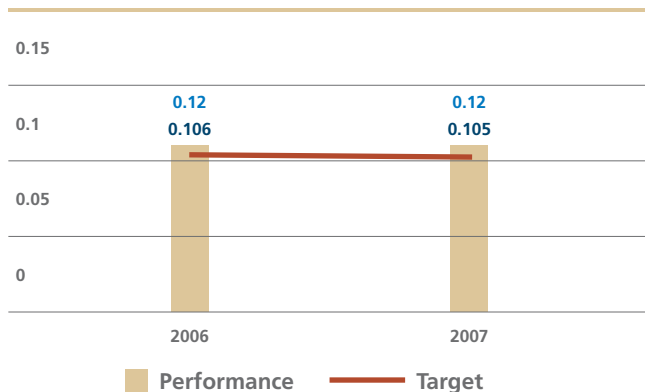
Energy consumption

In the current South African context of low energy security, it is becoming increasingly important to reduce fuel (diesel, petrol) and electricity consumption. This is critical from a risk, financial and environmental perspective. The water and energy efficiency task team is developing a model for reporting water consumption, energy consumption and CO₂ emissions against a modified baseline.

The model will use 2004 data as a baseline. The baseline will then be altered every year, taking into account primary and secondary factors such as future expansions to measure actual energy consumption against the modified baseline and to determine if energy savings were realised for a particular year.

In line with the sector target, Kumba has committed to achieve a 15% saving in energy use by 2014. This is equivalent to 1.5% savings per year as determined from the 2004 baseline. Kumba also shed 10% of its electricity requirements in early 2008 to comply with Eskom's request that business reduce its energy consumption. Kumba's energy consumption for 2006-2007 is shown below:

Energy consumption (GJ/tonne)



Energy consumption and CO₂ emissions

Energy	2007	2006
Total diesel (ℓ/tonne)	2.30	2.15
Electricity (MWhr/tonne)	0.038	0.037
Energy from fossil fuels (GJ/tonne)	0.08	0.08
Energy consumption (GJ/tonne)	0.12	0.12
CO ₂ /tonne	0.02	0.02
Total production (Mt)	32.4	31.5

No significant reductions could be shown in energy efficiency in the period due to:

- A new processing plant was constructed and partially commissioned as part of the Sishen Expansion Project.
- Diesel consumption was greatly affected by longer hauling distances due to pit expansion and increased volume of overburden removed to expose the ore body.

However, several energy efficiency initiatives were implemented during 2007, namely:

- Shortening hauling distance to the pit at Thabazimbi Mine by changing the entrances to Kwaggashoek and Donkerpoort.
- Efficient use of the beneficiation plant at Thabazimbi Mine to drive the reduction in electricity consumption. The main aim is to produce at full capacity and stop the plant completely as required, instead of running at reduced throughput.
- Using a trolley system at Sishen Mine, known as pantograph: the diesel engine drives the alternator to generate electrical power. This power is channelled to the wheel motors where the trolley system uses power collected from power lines by means of a pantograph (when the mine is able to draw 100% of its power supply). Fuel consumption of a truck reduces from 330ℓ/hr to 24ℓ/hr because the engine switches from full revolutions per minute to low idle when it gets its power from the overhead power line.
- The application of chemical dust suppression at Sishen Mine also reduced the rolling resistance for mining equipment. The road is more stable due to the hard layer formed after applying the chemical, and with the smooth rolling of the truck less fuel is consumed, and less grading is required.

In addition to these initiatives, the energy efficiency task team is investigating variables that influence monthly consumption and identifying possible projects to reduce consumption rates. Energy and water champions nominated at the operations will identify opportunities for savings at operational level.

Waste and emissions

Emissions

In 2007, Sishen Mine began developing an air quality management plan to monitor dust pollution. The project will be completed in April 2008. The adequacy of the monitoring network will be reviewed against proposed legislative amendments to ensure the mine complies with all legal requirements.

In line with sector targets, Kumba is committed to a 10% reduction in CO₂ emissions by 2014. The largest component of our CO₂ emissions results from direct and indirect energy consumption; it follows that we are addressing emissions by tackling our energy consumption through energy-efficiency initiatives. Kumba CO₂ emissions from 2006 to 2007 are indicated in the table on page 85.

Waste

Kumba is guided by the 'reduce, reuse, recycle, and recover' approach (4Rs). Our company waste management standard and business unit waste management procedures guide the application of this approach.

In 2007, our attention was drawn to the Polokwane declaration in terms of waste management. Considering the limited amount of space left for landfill sites and the amount of waste generated by our operations, the need to review our current waste management practices was critical.

The mines have on-site waste management systems to ensure that minimal environmental impacts occur. The system consists of various service points equipped with a number of waste skips. Different skips are provided for different types of waste, and some separation takes place at source. The temporary accumulation areas are managed appropriately to reduce risks such as spills. Currently, recyclable items and hazardous waste are taken to a temporary storage yard for removal by recycling companies. The remainder is disposed of at authorised landfill sites.

Although waste is managed via the environmental management system and removed from service points regularly, areas which require more attention and focus are improved record keeping and monitoring of total waste generated, recycled and disposed. Our 2008 objective for waste management is to ensure that the mines have fully implemented their integrated waste management plans (IWMP). These plans will address all components of the waste hierarchy from generation to final disposal. Sishen Mine has completed its integrated waste management plan, which was approved by the safety and sustainable development committee for implementation, while Thabazimbi Mine's is due for approval in the first quarter of 2008.

Based on the outcome of work scheduled for 2008, targets will be set for waste management in support of the Polokwane declaration's goals of reducing waste generation and disposal by 50% and 25% respectively by 2012.

The main objectives of the integrated waste management plans are to:

- Establish a waste generation baseline.
- Develop a waste database to capture information on waste generation, collection, re-use, recycling and disposal.
- Ensure temporary and permanent waste storage areas are environmentally and socially acceptable and comply with relevant legislation.
- Provide an appropriate and effective waste collection and transport system to on-site waste generators.
- Contribute to local economic development and upliftment of local communities.
- Ensure waste is classified in accordance with the minimum requirements for handling, classification and disposal of hazardous waste.
- Increase awareness among employees, contractors and local communities on the importance of responsible waste management.

Both mines have started recording some of the waste generated and have also developed a database for capturing this data.

Waste reported by Sishen Mine in 2007

	General waste disposed (tonnes)	Hazardous waste disposed (tonnes)	Scrap metal recycled (tonnes)	Used oil recycled (1000ℓ)	Paper and wood recycled (tonnes)
Quantity	336	70	3,197,109	389,825	561

Thabazimbi Mine statistics will be reported once recording systems are fully in place.

Due to the remote location of our operations, our hazardous waste needs to be transported long distances to authorised domestic waste sites for final disposal.

Hazardous waste is taken to Holfontein in Springs, and local waste taken to either municipal or the mines' own disposal sites. We are conscious of both the cost and impact of transporting and disposing this waste, and are continuously seeking to implement projects to address this, including:

- Using old oil as a fuel in explosives at Sishen Mine.
- Using centralised collection points for hazardous waste so that centralised pick-ups can be used to minimise redundant travel.
- Waste awareness campaigns to promote correct separation of waste to eliminate mixing hazardous and general waste.
- Waste contractors must provide proof of permits to transport hazardous waste, and must provide safe disposal certificates for each load removed.
- Ongoing waste recycling where practicable.

Land management

Land management involves several aspects: rehabilitation of mined-out areas, biodiversity conservation, land management, and closure planning. Kumba owns 40,895 hectares of land. Land management plans are being developed at both our operations to ensure that all land under our management is responsibly managed. Our targets for these aspects are as follows:

Land management targets

Aspect	Management intervention	Progress	2008 targets
Rehabilitation and closure	Identification of preferred rehabilitation method. Apply outcome of research done by Sishen Mine at Thabazimbi Mine.	Preferred rehabilitation method already established for Sishen Mine. This will be discussed in context of Thabazimbi Mine with DME in 2008 to seek approval.	Begin rehabilitation using approved angle. Complete studies on socio-economic and bio-physical components of closure plan.
Biodiversity	Finalisation and implementation of biodiversity action plan for Sishen Mine.	Some progress was made at Sishen Mine and Thabazimbi Mine's management plan has been completed. Implementation to be completed by end 2008.	Develop and implement biodiversity action plans. Peer review plans.

Environmental incidents

Kumba had a 2007 target of zero level 2 and 3 incidents.

Mine	Level 1	Comment	Level 2	Comment	Level 3
Sishen	35	Minor diesel, oil and waste spillages	1	Hydro-carbon polluted water	0
Thabazimbi	21		0		0
Total	56		1		0

The number of level 1 incidents reported in 2007 (56) reduced slightly compared to 64 in 2006. The incidents were mostly related to hydrocarbon (diesel and oil) and waste spillages, which were promptly rectified. One level 2 incident was reported at Sishen Mine, involving the spillage of hydrocarbon-polluted water from a pollution control dam into the storm water system. The spill was cleaned up promptly and no pollution was released outside the mine's boundary. A new pollution control dam has been constructed, which will prevent similar occurrences. Zero level 3 incidents were reported in 2007.

An incident is an unplanned occurrence or event.

Level 1

Level 1 is an incident that resulted in:

- a minor impact on the physical or biological environment (air, land, water or habitats) with no significant or long-term impairment of the ecosystem function or surface/ground water resource; and/or
- an inconvenience/disturbance/disruption/annoyance (including odour, dust, noise, traffic problem, loss of water supply) of short duration and with no long-term effect on the community; and/or
- a release of material (gas, liquid, solid) or energy which has the potential to cause illness, injury or property damage to the public, or one which causes short-term discomfort or reversible health effect to the public; and/or
- minor repairable damage to commonplace structures of cultural significance, or minor infringement of cultural values; and/or
- instances where, for example, stack tests have been outside the permitted limit, or water samples taken by or for the Regulator, or to check legal compliance, have been outside the permitted limits and/or a letter is issued by the Regulator. "A letter issued by the Regulator" must be interpreted in the context of the local Regulatory terminology.

Repeated or continuous Level 1 incidents must be escalated to Level 2 if the cause is not rectified or the impact mitigated within an acceptable period of time. "Acceptable period of time" must be justified by the operation based on the relevant circumstances.

Level 2

Level 2 is an incident that resulted in:

- a moderate impact on the physical or biological environment (air, land, water or habitats) with limited impairment of ecosystem function or surface/ground water resource; and/or
- a minor impact to fauna or flora in a statutory designated area (i.e. National Park); and/or
- an inconvenience/disturbance/disruption/annoyance (including odour, dust, noise, traffic problem, loss of water supply) of moderate duration or with medium-term effect on the community; and/or
- a release of material (gas, liquid, solid) or energy which cause severe but reversible illness, non-disabling injury or moderate property damage to the public; and/or
- damage to rare structures of cultural significance, or significant infringement of cultural values/sacred locations; and/or
- formal intervention by the authorities, e.g. Caution, Prohibition or Improvement Notice has been issued. "Caution, Prohibition or Improvement Notice" must be interpreted in the context of local Regulatory terminology. Or where prosecution and convention has led to fines totalling less than US\$100,000 per event.

Repeated or continuous Level 2 incidents must be escalated to Level 3 if the cause is not rectified or the impact mitigated within an acceptable period of time. "Acceptable period of time" must be justified by the operation based on the relevant circumstances.

Level 3

Level 3 is an incident that resulted in:

- a significant impact on the physical or biological environment (air, land, water or habitats) with extensive or long-term impairment of ecosystem function or surface/ground water resource; and/or
- an impact to unique or protected species or habitats; and/or
- an inconvenience/disturbance/disruption/annoyance (including odour, dust, noise, traffic problem, loss of water supply) of long duration or with long-term effect on the community; and/or
- a release of material (gas, liquid, solid) or energy which causes chronic illness, permanent disabling injury, fatality or extensive property damage to the public; and/or
- irreparable damage to highly valued structures or sacred locations; and/or
- instance where prosecution has led to conviction and fines totalling more than US\$100,000 per event.

Case study: Rehabilitation

Thabazimbi Mine

Thabazimbi Mine is rehabilitating its waste rock dumps according to commitments made in its approved environmental management plan. The process of rehabilitation started in the 1990s. Several experiments have been undertaken in conjunction with the University of North-West to find the most effective rehabilitation method. Over the years, several improvements and much progress has been made on rehabilitation work at the mine.

The dump rehabilitation process consists of the following steps:

- The crown of the waste rock dump is levelled with an excavator and a bulldozer to a safe slope angle of between 18-20°; this is a safe angle at which to work.
- After levelling, a bulldozer makes indentations in a process called 'moonscaping'. The indentations are about 20m apart on the downward slope and staggered to ensure they do not form continuous lines. The function of the moonscape is to retard runoff water and prevent erosion of the slopes.
- Two indigenous trees and two clumps of grass are planted per indentation.
- After vegetation has been planted, a mixture of fertilizer is applied. The area is watered three times a week until rains have fallen.
- All flat surface areas on the waste rock dumps are ripped with a bulldozer; trees and clumps of grass are planted 5m apart in the ripped furrows, fertilized and watered in the same manner as moonscape areas.
- Vegetation planted the previous year is fertilized every new year.

Remaining challenges include:

- Identifying a process whereby indigenous grasses can be more rapidly established and on a larger scale.
- Identifying a process whereby vegetation establishment can be hastened on longer slopes.

The mine has begun experiments using indigenous grasses to overcome these challenges.

Sishen Mine

The disturbed mining area at Sishen Mine comprises 6,193ha. Rehabilitation of mine rock dumps first started in 1985, and one of the initial problems encountered was how to stabilise and vegetate the slopes of mine dumps.

To establish the most effective and efficient way of achieving this, the mine, in collaboration with the University of North-West, researched and tested different combinations of soil, slope and vegetation as part of the move to stabilise the slopes of mine waste rock dumps, vegetate them and improve the scenic quality of the pit in the long term. The difficulties in making this a successful endeavour include the steepness of the rock dump slope, the ability of indigenous vegetation to colonise the slopes permanently as well as soil factors that would affect this colonisation.

The process began in 2003. Trials involved numerous plots on a range of slopes to which various seeding, fertilization and care regimes were applied.

The results of this study, as well as earlier trials, indicate the following:

- Sustainable vegetation cover can be achieved at a fairly gradual slope angle on the western and southern slopes, but for practical limitations in terms of reshaping for surface water and erosion control.
- Application of the equivalent of 150 tonnes of organic material such as compost to increase water-holding capacity as well as bacterial activity in the growing medium per hectare is vital for vegetation success.
- All 'banks' should be back-sloped and surface water flow on these well managed through contouring.
- A seed mixture of several grass species proved most successful – *Cenchrus ciliaris* (Malopo) (Blue buffalo grass) seems to be the species that will dominate, while *Heteropogon contortus* (spear grass), *Digitaria eriantha* (finger grass), *Antheophora pubescens* (wool grass) and *Fingerhuthia africana* (thimble grass) are perennial grasses that will play an important role in determining rehabilitation success. *Melinis repens* (Natal red top), *Enneapogon cenchroides* (nine-awned grass) and *Aristida adscensionis* (annual three-awn) are the annual species found to perform very well.
- It is recommended that tree/shrub species should be planted on the slopes and banks to break straight lines and increase the biodiversity of the site.