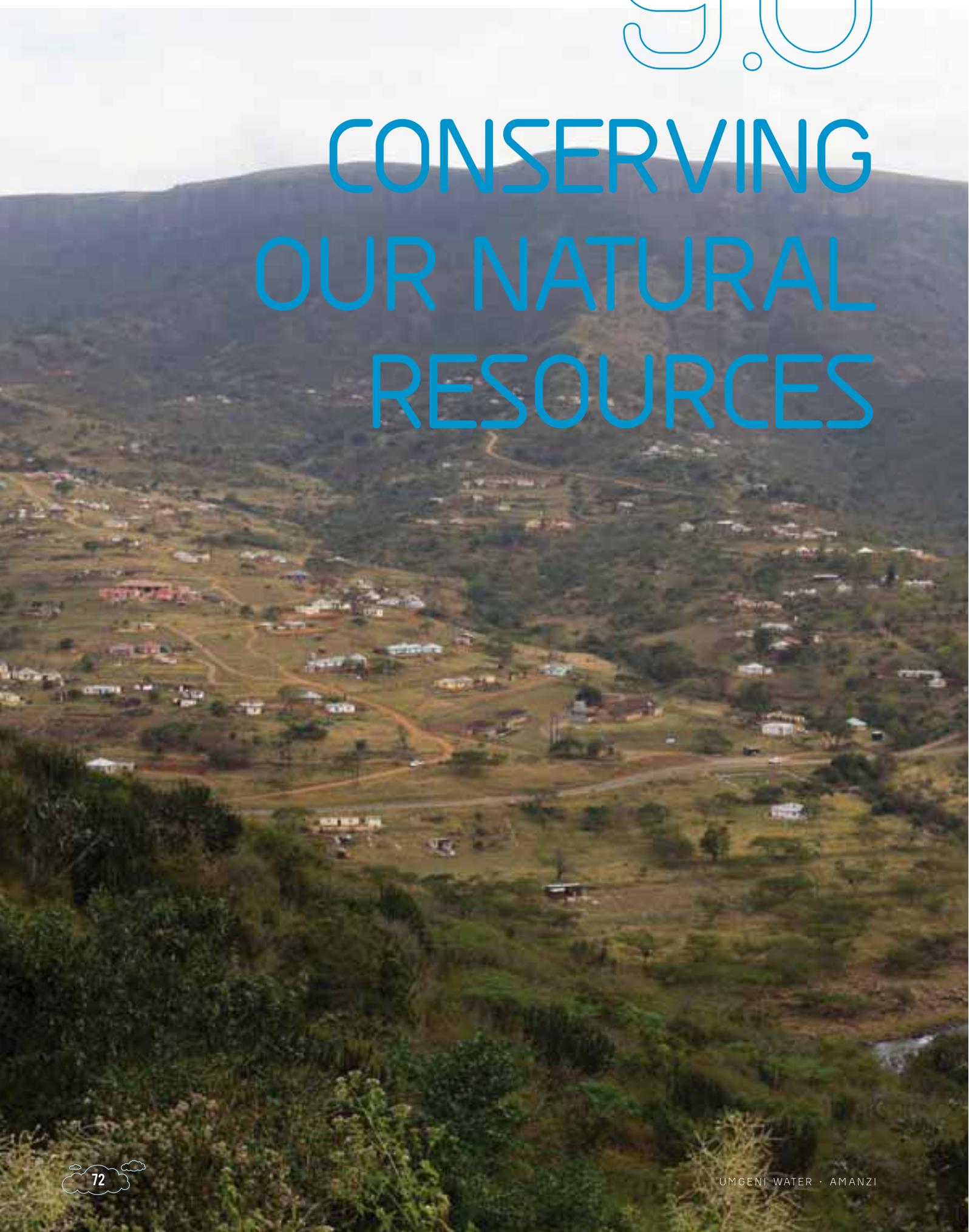




9.0

CONSERVING OUR NATURAL RESOURCES



9.1 ENVIRONMENTAL SUSTAINABILITY, INCLUDING WATER RESOURCES ADEQUACY

MANAGEMENT APPROACH

Umgeni Water strives for sustainable growth and will ensure the organisation continues to provide and extend sustainable water services to all areas. Mindful of its high reliance on adequate supplies of raw water resources, energy, chemicals and other natural resources to undertake its core business services, Umgeni Water is committed to protecting, conserving, efficiently using and sustaining these resources.

Umgeni Water currently implements environmental management programmes and plans throughout the life-cycle of its projects, which is during planning, construction, operation and decommissioning. The different environmental management programs and plans are categorised into:

- Corporate environmental management focusing on aligning the business activities towards environmental sustainability and promoting a shift towards a green economy,
- Operational environmental management focusing on ensuring compliance of the organisation with applicable governing environmental legislations and regulations and avoiding and or minimising environmental impacts as a result of business activities, and
- Integrated environmental management focusing on the identification, mitigation and implementation of management plans for potential environmental impacts for infrastructure projects.

In addition to the mandatory disclosure requirements for a public water services entity in South Africa, Umgeni Water continues to improve alignment of its environmental indicators with the internationally accepted GRI – Global Reporting Initiative – indicator disclosure requirements, in terms of materiality and relevance. Aspects include: materials, including chemicals and water resources, energy efficiency, greenhouse gas emissions and carbon footprint mapping, biodiversity, and waste management, amongst others.

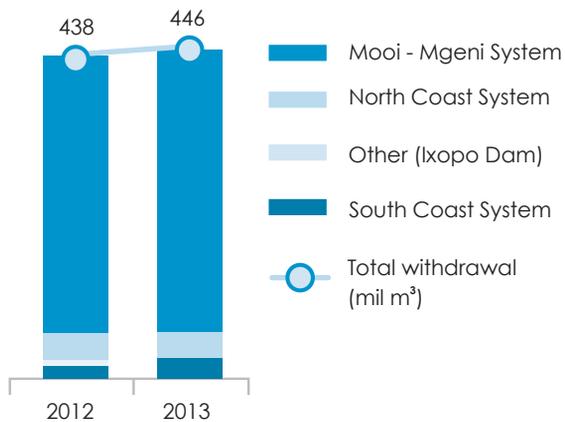
WATER RESOURCES ADEQUACY

The core function of Umgeni Water, which is treatment and supply of bulk potable water, is highly dependent on the availability of sustainable water resources. The reconciliation between water resource availability and water demands is therefore of primary importance to the organisation and forms an integral part of its infrastructure planning process. Understanding what water resources are available to the organisation both currently and in the future, and what impacts affect the level of assurance from these resources, is key to achieving the balance between supply and demand and in maintaining the assured level of supply required by the customers.

A map of water resources quality and quantity is shown in **Figure 9.2**.

Umgeni Water primarily sources water from ten impoundments on three major water resource systems namely, the Mgeni System (Mooi and Mgeni rivers), the North Coast System (Mdloti River) and the South Coast System (Nungwane, Mzimayi and Mzinto rivers). Total water withdrawal by source is shown in **Figure 9.1**.

Figure 9.1 Water Withdrawal by Source (million m³)



In the year, progress was made with the following water resources developments:

- Imvutshane Dam (UW) construction,
- Spring Grove Dam (DWA-TCTA) partial completion and impoundment in progress,
- Mkomazi Project (DWA) detailed feasibility study,
- Hazelmere Dam raising (DWA) detailed design,
- Darvill WWTW Reuse project feasibility study, and
- East Coast Region Desalination detailed feasibility study.

CLIMATE CHANGE AND WATER RESOURCES

The potential impact of a changing climate on the hydrology and water security of the four main supply dams in the Mgeni catchment has been assessed using thirty-one(31) different future climate scenarios.

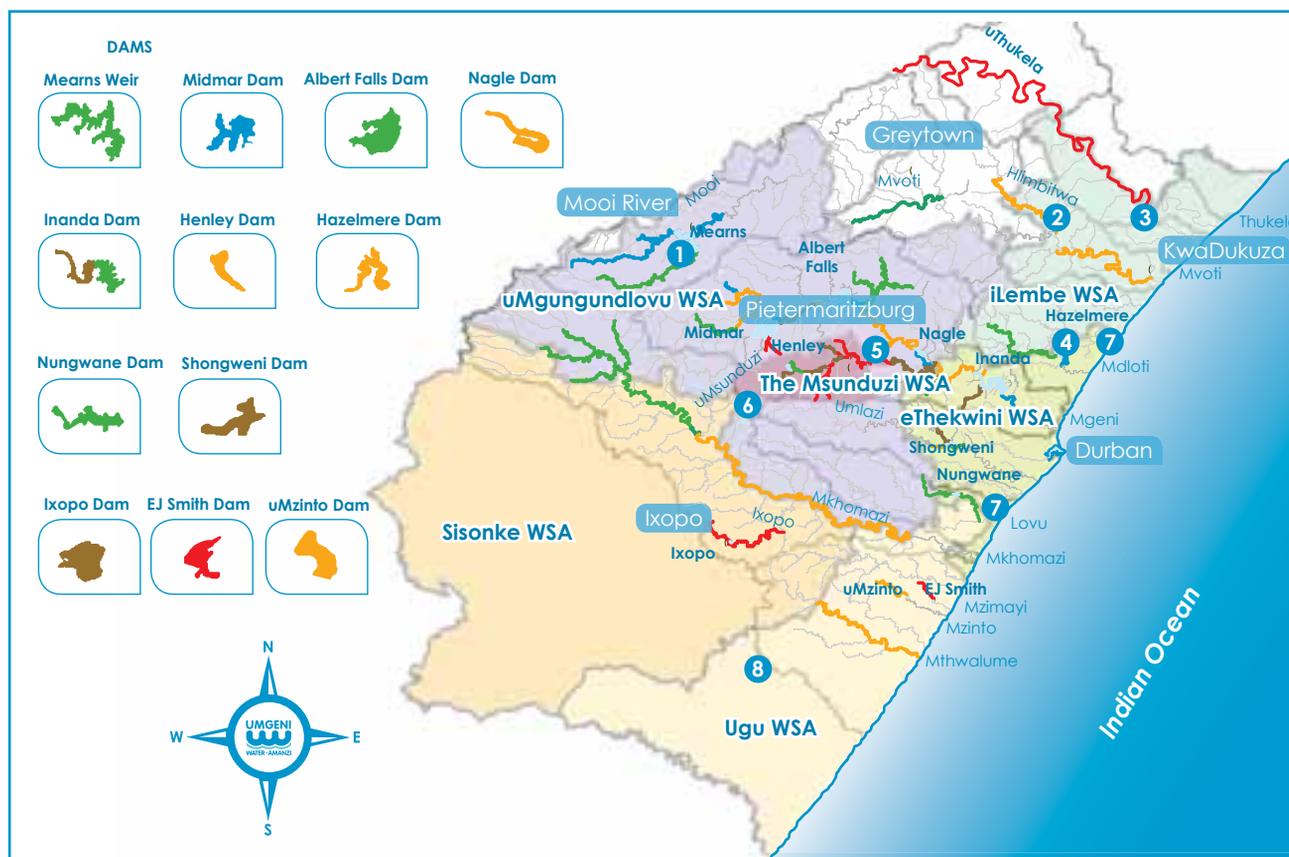
The assessment of different scenarios has resulted in a range of possible alternatives, each with an equal possibility of occurring in the future. The scenarios have therefore been packaged in a Scenario Selection Tool to facilitate the assessment of impacts for different permutations.

In many respects, this study is the first of its kind in South Africa and the rest of world. This is due, not only to being contemporary in terms of determining the impact of climate change on water security per se, but also to the extensive number of climate models used in this assessment, and the coupling of several complex modelling techniques.

Unfortunately, the range of possibilities in the future remains large and unpredictable. Since each of the thirty-one (31) modelled scenarios have an equal possibility of occurring in the future, definitive conclusions and recommendations based on these results, are unfortunately not possible. The increased variability will make the future less predictable and thereby impose additional risk and vulnerability.

Several recommendations emanate from this study which Umgeni Water is assessing to taking forward, whilst continuing to explore traditional and new methodologies to improve the management and supply of water.

Figure 9.2 Major water resources and water quality status



Legend

River and Impoundment Quality

- Excellent
- Good
- Satisfactory
- Poor
- Unsatisfactory
- Not Monitored

WATER RESOURCES PROJECTS

1. Spring Grove Dam (DWA-TCTA) partial completion and impoundment in progress
2. Imvutshane Dam (UW) construction
3. Lower Thukela run of river abstraction
4. Hazelmere Dam Raising (DWA) detailed design
5. Darvill Wastewater Re-use feasibility
6. Mkhomazi Project (DWA) detailed feasibility
7. Seawater desalination detailed feasibility
8. Mhlabatshane Dam complete

RAW WATER QUALITY

The status of raw water quality per supply source/ catchment is represented in **Table 9.1** and **Figure 9.2**. Water quality risks that are currently associated with Umgeni Water’s raw water resources are due to the presence of feedlots in some catchment areas, the presence of wastewater treatment works upstream of some impoundments, seasonal changes (rainfall/storm events, impoundment stratification) and sewer problems in some towns. These risks are inclusive of: Algal blooms and aquatic weed problems associated with eutrophication, chemical contamination (including iron and manganese), elevated turbidity and faecal contamination (and associated pathogen risk) and erosion runoff contamination.

Umgeni Water has set resource quality objectives for abstractions for water treatment that it will continue to use as alert triggers for mitigation

against increased public health risks and higher treatment costs.

- Water quality management plans include:
- Monitoring quality of raw water resources to assess source quality for treatment.
 - Assessing risks associated with trends in eutrophication, chemical contaminants, pathogens and suspended solids, and effectiveness of raw water quality objectives,
 - Engaging in catchment management activities to influence resource quality and quantity objectives that will balance environmental objectives whilst safeguard consumer health, and
 - Improving quality of waste discharges from its sites.

DWA is kept continuously apprised of the quality and risks associated with the source water trends to continue to ensure the long-term sustainability of South Africa’s water resources.

Table 9.1: Water Quality of Raw Water

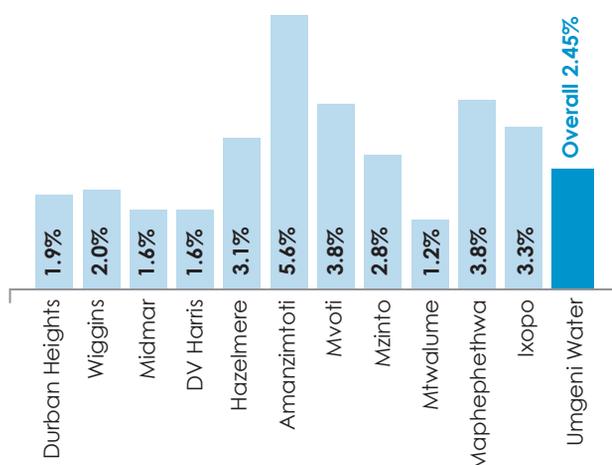
System	Catchment	Impoundment	2009	2010	2011	2012	2013
Mooi-Mgeni (812mil m ³) ¹	Mooi-Mgeni	Mearns Weir, Midmar Dam	Good	Good	Good	Good	Good
	Mgeni	Albert Falls Dam	Good	Good	Good	Good	Good
		Nagle Dam	Moderate	Moderate	Moderate	Moderate	Moderate
		Inanda Dam	Moderate	Moderate	Moderate	Moderate	Good
North Coast (17.9mil m ³)	Mdloti	Hazelmere Dam	Moderate	Moderate	Moderate	Good	Moderate
	Mvoti	Run-of-river abstractions				Moderate	Good
South Coast (6.0mil m ³)	Nungwane, Lovu	Nungwane Dam	Moderate	Moderate	Moderate	Moderate	Good
	Mzimayi	E J Smith Dam	Poor	Poor	Poor	Poor	Poor
	Mzinto	Mzinto Dam	Poor	Poor	Poor	Moderate	Moderate
	Mtwalume	River Abstraction	Moderate	Moderate	Moderate	Moderate to Poor	Moderate
Ixopo (0.6mil m ³)	Ixopo, Mkomazi	Ixopo Dam	Moderate	Moderate	Poor	Poor	Poor

¹Gross Capacity

WATER LOSS MANAGEMENT

During the year, resources were used assiduously and water balancing and water loss management measures were instituted in the treatment systems. The total water loss level has been maintained below the target of 5% with 2.45% achieved. (Figure 9.3)

Figure 9.3 Water loss (%)



WATER REUSE

Umgeni Water is currently investigating the option of treating domestic sewage from its Darvill Wastewater Treatment Works to potable standards. The proposal would then be to return the treated water back into the distribution system at Umlaas Road. The water could then be used to augment the supply to the Western Aqueduct (due for completion mid-2018) which will serve the high growth areas along the western corridor of the eThekweni Metropolitan Municipality. The advantage of this is that water is made available higher up in the system. A full feasibility study of this scheme will be undertaken before any decision is made on

whether or not to proceed with the project. The feasibility study for this wastewater reclamation project will be completed in 2014.

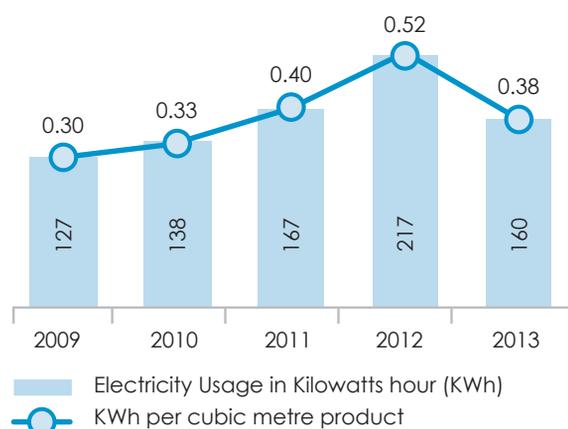
MATERIALS USAGE AND EFFICIENCY

Water is one of the most significant input materials for Umgeni Water and is covered in previous section followed by energy which is discussed below. In addition, Umgeni Water has a high reliance on water treatment chemical resources and is therefore committed to improving the usage efficiency thereof.

ENERGY USAGE AND EFFICIENCY

Energy is a key input to water and wastewater treatment processes, and in 2012/2013 Umgeni Water utilised a total of 160 million kWh of electricity. Figure 9.4 shows energy usage and efficiency. The decrease over the previous year (2011/2012: 217 million kWh) can be attributed to a reduction in raw and potable water pumping in the year which is subject to optimal matching of storage levels with demands from the various systems.

Figure 9.4: Electricity Usage and Efficiency Trends



An energy audit for all operational sites was completed in the prior year and the plans resulting from this are to be implemented in the business plan cycle and include:

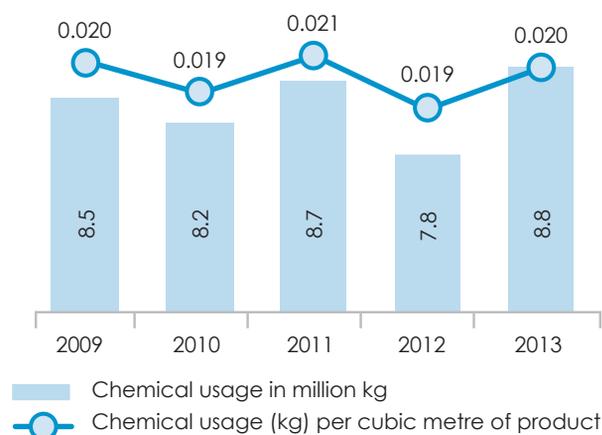
- The Mooi-Mgeni Transfer scheme hydropower project,
- Darvill WWTW cogeneration initiative - utilising digester methane to produce electricity. The preliminary investigations indicate that there is potential to produce approximately 22 MWhr electricity per day. The project is in preliminary design and EIA stages. Construction is envisaged for 2014/2015,
- Optimal management of pumping, and
- Implementation of energy efficient lighting measures aligned to national initiatives.

CHEMICALS USAGE AND EFFICIENCY

Umgeni Water closely monitors its chemical usage (Figure 9.5). The current initiatives in place to maintain or improve treatment efficiency include:

- Water treatment process audits, which identify areas to improve operational efficiency,
- Monitoring and reviewing seasonable variations in the quality of the water column in dams, such that raw water abstracted is optimal for treatment, and
- Participating in catchment management activities and forums, and contributing to the information base, including water quality, which helps shape and influence decisions for sustainable catchment land-use activities and developments.

Figure 9.5: Chemical Usage and Efficiency Trends



CARBON FOOTPRINT AND EMISSIONS REDUCTION INITIATIVES

Umgeni Water's direct CO₂ emissions arise from fuel usage for transport (vehicles), general waste and from generators and boats, while indirect CO₂ emissions are primarily due to electricity usage, and to a minor extent flights.

The organisation's carbon footprint is primarily due to electricity consumption, and has accordingly been increasing over the years (Figure 9.6).

Figure 9.6: CO₂ Equivalents (tonnes)



The major contributing activity to Umgeni Water's carbon footprint is from indirect emissions - electricity consumption and implementing energy efficient measures would therefore contribute to the reduction of the carbon footprint.

Current initiatives to reduce the organisation's carbon footprint include development of an electricity co-generation plant at the Darvill Wastewater Treatment Works. The energy generation system will comprise a biogas pre-treatment unit and two generators. The plant will utilise the methane gas generated in the bio-digesters to produce electricity. Preliminary studies indicated that approximately 40% of the total energy requirement of the wastewater treatment works can be generated from this source.

Electricity is used for pumping raw water from various resources to treatment plants, during treatment in treatment processes, and during pumping of bulk potable water product to customer points.

Umgeni Water also implements on-going carbon offsetting initiatives which include:

- On-going tree planting initiatives during the year, and
- Implementation of the Darvill artificial wetland project.

Table 9.2: CO₂ Equivalents (tonnes)

CO ₂ equivalents (tonnes) per activity	2010	2011	2012	2013
Electricity	131 851	163 392	208 071	153 280
Travel: Car	1 407	1 334	2 086	137
Travel: Air	143	143	81	71
Waste	989	299	262	196
Other fuel	40	40	98	82
Total	134 430	165 064	210 598	153 766

BIODIVERSITY MANAGEMENT

Umgeni Water has developed a biodiversity management strategy with the view to establishing the biodiversity status of Umgeni Water's operational areas as well as highlight areas of high conservation status. On-going biodiversity management activities being implemented include:

- Biodiversity management being implemented by Msinsi Holdings,
- Biodiversity Impact assessment as a component of EIAs,
- Alien and aquatic vegetation control,
- Management for listed tree removals during construction of new infrastructure, and
- Bio-monitoring of river systems.

Biodiversity Impact Assessment as a component of EIA's

Umgeni Water has thirty-four (34) projects in various phases of planning, design, construction and rehabilitation. Mitigation for a key pipeline project constructed through a protected area, the Bill Barnes Nature Reserve, required construction to be limited to existing pipeline servitude. Threatened and endangered species were identified on five (5) projects including *Boscia albitrunca* in the Ngcebo WTW upgrade, *Hypoxis hemerocallides* and *Crinum macowanni* on the Lower Thukela BWSS, Drakensberg Moist Foothill Grassland species which support the endangered Oribi and Wattle Crane on the Mpofana BWSS project, Midlands Mistbelt

Grassland with the endangered *Hypoxis* (Wild Potato), *Watsonia* and *Moraea* on the Richmond Pipeline project (see case study) and *Barringtonia racemosa* on the Hazelmere to Bifurcation pipeline.

Biodiversity aspects are being determined on a further five (5) projects in the planning / design phases. Mitigation measures carried out include design considerations to avoid rare species, amendment to the procedure for excavation (see case study), plant rescue and minor re-routing during construction to avoid listed endangered tree species.

CASE STUDY: RICHMOND PIPELINE DEVELOPMENT.

The construction of a pipeline from Pietermaritzburg to Richmond began in March 2013. During the preliminary inspection of the working servitude by the Contractor's rehabilitation specialist an area of Midlands Mistbelt Grassland which was observed as being rich in forbs and dominated by *Themeda triandra* and transformed by Ngongoni grass (*Aristida junciformis* subsp. *junciformis*) was identified **(a)**. This grassland has high species biodiversity and is listed as threatened. Several species which are considered to be of conservation concern including *Hypoxis* (Wild Potato), *Watsonia* and *Moraea* species were observed **(b)**.

The area was deemed as worth conserving and in conjunction with the Rehabilitation Specialist,

a decision to protect the site as best as possible was taken.

With the onset of winter the topsoil was removed in the form of sods and stored with the least disturbance as possible **(c)**. The pipe was then laid and covered immediately and the topsoil was returned as close as possible to the site from which it was removed.

The sods are then set in place by hand and bulbs planted and turned upwards to promote growth. Once completed, the area will be seeded with rapidly growing grass to protect the exposed soil from erosion. The rehabilitation of this area is planned to be completed prior to the expected summer rains.



(a) An area of Midlands Mistbelt Grassland, dominated by forb-rich, tall, Red Grass *Themeda triandra* grasslands transformed by Ngongoni grass.



(b) One of the *Moraea* species flowering in the adjacent grassland.



(c) Top soil removed prior to excavating the pipeline trench- note large sods which will be reset once pipeline is completed.

Alien Plant Management

Umgeni Water continued to implement the Working-for-Water programme as an implementing agent to the Department of Environment Affairs, for the Mvoti to Mzimkhulu Water Management Area (WMA). In 2012/2013 Alien plant clearing was undertaken in several catchment areas, clearing in excess of three thousand, five hundred and seventy-six hectares (3 576 Ha) of alien weeds. Alien vegetation cleared included ten (10) of the most prolific alien weed species infesting the areas including:

- Upper Mgeni – project starts at the source of the Mgeni River and ends when it meets the Lions River Project: 258.72 Ha cleared,
- Lions River Project – project starts at a district road linking Dargle and Nagle Dam and ends at Midmar Dam: 798.35 Ha cleared,
- Mgeni Valley Project –project starts at Midmar Dam and ends at Albert Falls Dam: 622.09 Ha cleared,
- Nagle Project –project starts at Albert Falls Dam and ends at Nagle Dam: 652.16 Ha cleared.
- Karkloof Project –: 630.75 Ha cleared,
- Mvoti Project - encompasses a large part of Greytown: 327.07 Ha cleared, and
- Midmar Project – This starts at Midmar Dam and ends at Albert Falls Dam: 287.07 Ha cleared.

Monitoring of and reporting on seven (7) strategic water resource areas for the prevalence of floating aquatic weeds was undertaken in the year. Areas monitored include the Mgeni River at Midmar dam, Albert falls dam and Inanda dam, Msunduzi river from Pietermaritzburg to the confluence with the Mgeni River, Mpushini stream, Ixopo dam and EJ Smith Dam.

Category 1 alien invasive weeds including Water hyacinth, Water lettuce and Kariba weed were observed in the water bodies visited. In the previous reporting period the spread of Water Hyacinth in the Msunduzi/Mgeni River system posed a serious threat to Inanda Dam. To address the fragmented approach to weed management an aquatic weed working-group (AWW) was established consisting of all role players. The objective of this group was to promote sustainable control and reduce costs. The AWW began mass releases of the biocontrol agent and chemical control in summer of 2012 into heavily infested areas of the Msunduzi/Mgeni River resulting in a marked decrease in plants numbers which has been maintained to this period. The success can be clearly seen as the canoeists in the various canoe marathons held in this period enjoyed clear passage to Inanda dam.

SASS monitoring of river systems by UW

The South African Scoring System 5 (SASS 5) hydro-biological assessment tool was used to assess the river health above and below the dams managed by Umgeni Water to assess the impact of impoundment on our water resources.

Twenty-five (25) samples upstream and downstream

of the eight (8) dams monitored, were successfully taken and analysed. In most cases, despite the minor differences seen between the downstream and upstream points, downstream river health was maintained. In one case, the Mzinto dam, the river health below the dam was vastly better than that upstream due to impacts upstream from urban development.

MSINSI HOLDINGS LAND AND SUSTAINABLE RESOURCE MANAGEMENT

Msinsi Holdings (Pty) Ltd, a wholly-owned subsidiary of Umgeni Water is mandated to manage the land and biodiversity of the areas around the dams owned or managed by Umgeni Water in a way that balances the divergent factors of local community development, provision of recreational facilities for the public and water resources/biodiversity protection.

These reserves are located at:

- Albert Falls Dam,
- Nagle Dam,
- Inanda Dam,
- Shongweni Dam, and
- Hazelmere Dam.

Detailed management plans for each of the reserves, in line with industry best practice, have been completed and form the basis for all operations in the reserves. In the past year, Msinsi has been successful in protecting the habitats and ensuring an ecologically sustainable and protected water environment through implementing its resource management plan, which focused on:

- The management of the game and species according to the carrying capacity of each reserve,
- Local community development,
- Recreation for the public,
- Grassland management,
- Control of pollution inside the purchase areas, and
- Removal of alien invasive plants, both terrestrial and aquatic.

Msinsi Holdings continues to be seen as a significant player in the conservation and tourism sector in KZN. The close proximity of the Reserves managed by Msinsi Holdings to the urban centres of Durban and Pietermaritzburg make these little pockets of biodiversity all the more valuable. Msinsi Holdings will continue to ensure that the ecosystem services provided by the resources it manages on behalf of Umgeni Water are sustainably managed.

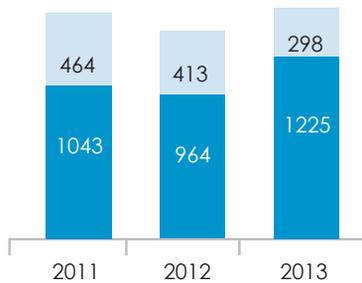
WASTE MANAGEMENT

The tracking of waste generated, disposed of and recycled at Umgeni Water is undertaken at operational areas to varying extents with progressive improvement in monitoring and evaluation systems each year.

The generation of hazardous waste has increased in the past year while the generation of domestic (general) waste has decreased. **(Figure 9.7 (a))** The increase in hazardous waste is attributed to the Wiggins and Msunduzi systems, the latter system which now also captures the data for hazardous waste from the Darvill, Howick and Ixopo WWTWs.

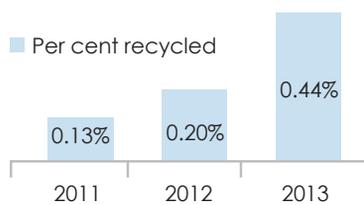
Figure 9.7 (a) Waste Produced

■ General Waste (kg per mil m³)
 ■ Hazardous Waste (kg per mil m³)



Currently a small percentage of general waste is recycled and this has increased from 0.13% in 2011 to 0.44% in 2013 **(Figure 9.7 (b))**, overall for the organisation. Some sites are more successfully, e.g the Midmar system recycles 19.5% of its waste. To improve recycling for the organisation, Umgeni Water has appointed a co-operative who commenced work in June 2013.

Figure 9.7 (b) Waste Recycled



Umgeni Water continued to work on initiatives to comply with the National Environmental Management Waste Act (NEMWA 58 of 2008) and the associated regulations that have recently been promulgated:

- Umgeni Water as a hazardous waste generator complies with the requirements of the new South African Waste Information System (SAWIS),
- A project is under way to have all Water Treatment Works residues classified,
- Waste Management training was undertaken for all SHEQ officers and environmental scientists for development of site waste management plans, and
- A feasibility for developing a new disposal site in the coastal system for the disposal of water treatment works residues will commence in 2013/2014. This initiative will contribute toward additional recycling and reuse of Umgeni Water waste.

ENVIRONMENTAL PERFORMANCE OF THE OPERATIONAL SITES

The organisation continues with the implementation of environmental management at all operational sites and implements recommendations from the previous period's environmental audits which:

- Assess whether the site is complying with all relevant environmental legislation,
- Assess internal policy and procedural compliance,
- Assess the status of energy, waste and biodiversity management at the site, and
- Recommend management.

For the period under review, thirty-four (34) sites were audited to assess environmental compliance and management. Common and major findings included:

- Presence of aquatic alien weeds in some water resource impoundments,
- Terrestrial alien plant infestation,
- Inadequate waste separation and management,
- Challenges with quantification and environmentally acceptable disposal of water treatment residues, and
- Hydrocarbon spillages.

An environmental legal compliance law expert is being contracted to update the organisation's environmental legislation register, which will be used to increase education, awareness and environmental management at all levels.

ENVIRONMENTAL INCIDENTS DURING THE FINANCIAL YEAR OF 2012/2013.

Incident management systems are in place to ensure that pollution is properly responded to. A number of incidents did occur, but were minimised and mitigation undertaken. Monitoring was conducted to assess possible impacts, and where relevant, responsible authorities were kept informed. The most severe incident was cracking of a valve in the North Coast which damaged the La Mercy reservoir and resulted in the uncontrolled rapid release of 2.5 ML of potable water. The resultant scour of Tongaat Hulett sugar farm property was severe and the eroded soils were deposited on an adjacent farm impacting on a vegetable farming enterprise.

Integrated Environmental Management

There are fourteen (14) projects in the planning, design or procurement phase currently being managed through the Integrated Environmental Management system.

In compliance with the regulations emanating from the National Environmental Management Act, some projects required a basic assessment or a scoping and full environmental impact assessment study to be conducted. Over and above this and in keeping with environmental legal compliance, for projects not triggering listed activities under the act, the organisation continued with its commitment regarding excellent environmental practise of conducting a screening assessment and developing an internal project specific environmental management plan to address any potential environmental impacts and devising mitigation measures for implementation.

To date, no fines were issued for non-compliance and the organisation has been fully compliant with the act with no negative relations with the authority and will continue to keep a close working relationship. **Table 9.3** shows some key capital projects that require environmental authorisations.

Table 9.3: Bulk Infrastructure Projects that will require environmental authorisations:

Project name	Requirements
East Coast Desalination	Obtain EA
Greater Mpofana Regional Scheme	Amend existing EA
Lower Thukela BWSS	Amend existing EA
Midmar WTW, Sludge Plant and Raw Water Pipeline Upgrade	Obtain EA
Nungwane Raw Water Aqueducts	Obtain EA
Ngcebo WTW Upgrade	Obtain EA
Darvill Wastewater Treatment Works Upgrade	Obtain EA
uMshwathi BWSS	Amend existing EA

Thirteen (13) projects currently in construction phase are monitored for compliance against the Environmental Management Plans by independent external Environmental Control Officers, Environmental Site Officers and Environmental Scientists as per the conditions of the environmental authorisations.

Overall environmental performance has been satisfactory with minor challenges in implementation of rehabilitation, prevention of hydrocarbon and cement spillages, waste management and management of alien plant invasion. The organisation will continue to strive for good environmental practice and management of these challenges.

