dube tradeport

SOUTHERN AFRICA'S PREMIER
AIR LOGISTICS PLATFORM

DUBE TRADEPORT STATE OF THE ENVIRONMENT REPORT 2013/14






29° SOUTH

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THE VARIOUS COMPONENTS OF THE ENVIRONMENT PROVIDE THE RESOURCES NECESSARY FOR LIFE TO FLOURISH. IN ADDITION, THE NATURAL RESOURCES AND GOODS AND SERVICES PROVIDED BY THE ENVIRONMENT CONTRIBUTE TO THE FUNCTIONING OF ALL ECO-SYSTEMS. THE PROGRESSION OF HUMAN DEVELOPMENT IS OFTEN TO THE DETRIMENT OF THE ENVIRONMENT AND NATURAL ECO-SYSTEMS.

80% **OF AGRIZONE GREENHOUSE WATER DEMAND IS RAINWATER HARVESTED**

CEO'S FOREWORD

THE DUBE TRADEPORT DEVELOPMENT HAS THE AMBITIOUS GOAL OF BEING THE GLOBAL TRADE GATEWAY FOR SOUTHERN AFRICA, BY INCREASING ECONOMIC OPPORTUNITIES BETWEEN KWAZULU-NATAL AND THE REST OF THE WORLD.

Whilst this exciting development has so much more to offer, threats of climate change impacts, increasing population size and prevailing poverty threaten our finite resources. Dube TradePort Corporation has consciously designed its approach to business to achieve a sustainable environment and business. Sustainability is an enabler of innovation.

For this reason, innovation to ensure a sustainable future is at the core of the strategies, plans and policies, products and services found at Dube TradePort. The first State of the Environment Report for Dube TradePort, undertaken in 2011/12, provided baseline information regarding the state of our environment.

In our previous report, we committed to 'explore our progress towards a clean, liveable and healthy environment, the sustainable use of our natural resources, and the maintenance of biodiversity. It shows that demonstrable improvements have been made in some areas, such as biodiversity, air and water quality, the rebuilding of our natural capital and greater adoption of climate-smart living practices by all sectors of the Dube TradePort Corporation community. At the same time, the report also reflects the dominant issues of the business community concern over water security, drought and cleaner energy, underpinned by increasingly compelling evidence of climate change. Our commitment to improvement must remain to arrest and reverse the decline in conditions occurring across a range of Dube TradePort's natural systems'.

This second State of Environment Report is no different, as it documents the progress made and the accomplishments of - and challenges facing - Dube TradePort Corporation.

The willingness of Dube TradePort Corporation to undertake this process exemplifies the corporation's commitment to environmental sustainability in pursuing its overall sustainability agenda. This report helps us understand the effectiveness of our management approach, so that we may tailor our programmes and responses to address immediate and long-term environmental challenges.

Thus far, many policies, procedures and programmes have been put into place that will invaluably enhance the systematic achievement of Dube TradePort Corporation's sustainability goals. Aspects related to clean practices, public transport, stakeholder engagement, renewable energy, responsible water management and investment in the youth, are being encouraged and practised, although there always remains room for improvement. I have no doubt that Dube TradePort Corporation will continue to lead by example.

Ms Saxen van Coller
Chief Executive Officer

THE DUBE TRADEPORT DEVELOPMENT

THE DUBE TRADEPORT DEVELOPMENT IS A GOVERNMENT-SUPPORTED ENTERPRISE WITH THE AIM OF CREATING ECONOMIC OPPORTUNITIES THAT BENEFIT KWAZULU-NATAL AND THE BROADER SOUTHERN AFRICAN REGION. IT IS INTENDED TO ACT AS THE GLOBAL TRADE GATEWAY FOR SOUTHERN AFRICA, BY PROVIDING A GATEWAY BETWEEN KWAZULU-NATAL AND THE REST OF THE WORLD.

It is the first 'Greenfield,' South African international airport, with dedicated zones for hotels, offices, warehouses, a cargo terminal, a retail sector and an agricultural zone. Located approximately 35km north of Durban, it is in close proximity to two of the major sea-ports in South Africa and is connected to the rest of Africa by road and rail.

The current status of the 2060 Master Plan for Dube TradePort includes:

- **Dube City or Support Zone 1:** This is a modern urban 'green' hub, neighbouring King Shaka International Airport's passenger terminal complex. This world-class business and leisure centre lends itself to mixed land-use, including office, hotel, conference, entertainment, retail and knowledge-intensive activities. It's overall layout and design encompasses pedestrian-friendly zones, a tree-lined boulevard, dedicated cycle lanes and open spaces. Dube City aims to provide a secure, cosmopolitan environment that is within walking distance of the airport.
- **Dube AgriZone:** A 20-hectare development, with 16 hectares of greenhouses for flower and vegetable production, packhouses, a dedicated distribution centre, a tissue culture laboratory and an indigenous plant nursery. The aim is to provide a centre for excellence and a model of new technology, production methods, training and research in high-value agriculture in KwaZulu-Natal for the entire SADC region.
- **Dube Cargo Terminal:** 13 000 square metres of warehouse floor space, 2 000 square metres office space and an annual handling capacity of 100 000 tonnes of cargo, with a projected capacity of 2 million tonnes by 2060. The terminal uses an Elevated Transfer Vehicle which has a mechanised and digitally operated inventory control system. This state-of-the-art facility is one of the most secure of its kind in Africa and is one of the most technologically advanced facilities of its kind in the world.
- **Dube TradeZone:** This is a specialised precinct providing prime, fully-serviced real estate. It is ideally positioned for new-generation warehousing, logistics and distribution, manufacturing, assembling, air-related cargo distribution, high-tech aerospace services, electronic manufacturing, automotive industries, clothing, textiles and cold-storage activities.
- **Dube iConnect:** The entire precinct is supported by Dube iConnect, KwaZulu-Natal's premier Local Cloud service provider, benefiting local businesses. Providing world-class IT and tele-communications services to users in and around Dube TradePort, Dube iConnect also offers disaster recovery and rack space.

In both its first State of the Environment Report (SoER) in 2011/12 and in this report (2013/14), Dube TradePort Corporation has set out to provide an update of the baseline environmental information since the operation of the Phase 1 development and to determine the effectiveness of measures already in place. The willingness of Dube TradePort Corporation to undertake this process cements the corporation's commitment to sustainability and the environment.

A SoER describes the condition of the environment against a set of key environmental indicators. It provides an evaluation of the status of the environment and establishes linkages to the socio-economic and political environment. The report is based on the international Driver-Pressure-State-Impact-Response (DPSIR) framework, which is used for most South African SoE Reports. Indicators used under this framework are representative of various environmental aspects or features. Table 1 contains a summary of the various chapters, issues and indicators reported on, as well as the findings and trends that have been identified:

TABLE 1: SUMMARY OF THE 2013/14 REPORT FINDINGS

THEME	ISSUE	INDICATORS	DESCRIPTION	TREND
Governance	Integrated environmental management	Percentage compliance with authorisations, licences and permits (%)	The Dube TradePort Corporation remains compliant and continues to maintain a high level of compliance of 98%.	→ (Stable)
		Percentage budget allocated to environmental management (%)	A budget is allocated to the environmental management of Dube TradePort and surrounding areas when/where applicable. This also includes the development and application for relevant strategies, policies, licences and plans. The presence of an environmental management team further supports the commitment to this cause.	→ (Stable)
	Sustainable procurement	Percentage of locally sourced services and materials (%)	A trend could not be determined for this indicator due to both a lack of data and a lack of historical data with which to compare. This is a performance indicator identified for improvement on the Dube TradePort Corporation's part. It is recommended that initiatives, such as the inclusion of preference points for the use of local materials, as linked to a more qualitative assessment of procurement controls, be added to tender documents and that surrounding communities be encouraged to produce products that may be used by the Dube TradePort Corporation.	→ (Stable)
	Sustainable development	Percentage of tenants on green leases (%)	Unfortunately, there are currently no tenants on green leases.	→ (Stable)
		Percentage energy from renewable sources (%)	The energy sourced from renewable sources is on the increase at Dube TradePort Corporation.	↑ (Improving)
		Percentage emissions off-set (%)	A trend could not be determined for this indicator due to both a lack of data and a lack of historical data with which to compare. However, the study conducted toward a public transport strategy is a move toward decreasing emissions.	→ (Stable)
		Percentage investment in skills development of staff (%)	The CSI Annual Report 2013/14 states that it has been a productive year, with much effort made to ensure that the investment was on Dube TradePort's key focus areas, such as education and skills development.	→ (Stable)
		Percentage staff employed from surrounding communities (%)	The Dube TradePort Corporation continues to generate jobs (locally) but there has not been an increase or decline.	↑ (Improving)

EXECUTIVE SUMMARY

TABLE 1: SUMMARY OF THE 2013/14 REPORT FINDINGS

THEME	ISSUE	INDICATORS	DESCRIPTION	TREND
Natural and cultural heritage	Existence of heritage resources on Dube TradePort land and how they are impacted on	Number and type of natural heritage sites	Concerted effort has been made to determine and identify heritage sites and to preserve sensitive sites.	↑ (Improving)
		Number and type of cultural heritage sites		↑ (Improving)
		Current use of heritage sites		↑ (Improving)
		Access to heritage sites	Sensitive sites are handled with great care and consideration for the public. At present only one site has been found to be of significance to the public – grave sites. A memorial garden was created, with input from the public. The public has full access to the site, including for educational purposes. In addition, the site will be made more accessible, as a whole, with pathways and trails developed for public usage.	↑ (Improving)
Waste management	Waste generation and characterisation	Waste generation by source and type (tonne/annum)	For the period January to March 2014, Dube TradePort Corporation has produced approximately 51,8 tonnes of solid waste across 29° South, Dube AgriZone, Dube TradeHouse, and Dube Cargo Terminal.	→ (Stable)
	Waste minimisation and disposal strategies	Percentage waste diverted from landfill, e.g. reduced, re-used, recycled (%)	The Support Zone has managed to recycle 63% of waste, while Dube TradeHouse recycled 57% of its waste. Dube AgriZone recycled 34%.	↓ (Declining)
		Percentage waste disposed (tonnes OR %)	Support Zone: 60% of waste was disposed of at landfill. Dube AgriZone: For the first three months of 2014, 34% of waste was recyclable and 66% of waste was sent to landfill. The amount of waste sent to landfill has reduced from 70% in 2012.	↑ (Improving)
Air quality	Air pollution and climate change	Carbon dioxide emissions by source (CO_2e/annum)	The highest contributor to the carbon footprint is the landing and take-off of aircraft, which contributes 64,1% to the total carbon emission, followed by buildings energy, which contributes 26,6% of the carbon emissions.	↓ (Declining)

TABLE 1: SUMMARY OF THE 2013/14 REPORT FINDINGS

THEME	ISSUE	INDICATORS	DESCRIPTION	TREND
Air quality	Air pollution and climate change	Percentage emissions off-set (%)	Dube TradePort Corporation has initiated the following green initiatives in order to counter and off-set the carbon footprint emanating from the aerotropolis: • Development of a carbon footprint calculator in order to off-set the carbon footprint of the business. The carbon footprint calculator was established in the early stages of development of King Shaka International Airport and the TradePort. • Dube TradePort Corporation tenants and third party developers within the Dube TradePort precinct are encouraged to incorporate green leasing clauses into their lease contracts in order to disclose data regarding their energy and water consumption, waste data and carbon footprint. • The use of Euro 5 emission trucks, which run on a low sulphur diesel fuel and use additives which reduce toxic exhaust emissions. • The installation of solar panels on the rooftops of Dube AgriZone. The solar panels generate 220 kilowatts at peak and reduces carbon emissions by 294 tonnes per year. • Green Star rating for the design of the Dube TradePort Corporation office building in Dube City, showing innovative technology for reducing energy requirements, such as light sensors, building orientation to maximise natural light and smart metering.	↑ (Improving)
Biodiversity and ecology	Species and ecosystem diversity	Increase/ decrease in species diversity (number of species)	Whilst it is still early to pronounce any significant improvements in biodiversity, Dube TradePort Corporation has made significant efforts to remove alien plant species and improve the management of natural areas. These efforts have the potential to result in the improvement of biodiversity in the region.	↑ (Improving)
		Increase/ decrease in natural eco-systems (ha)	From both the Biodiversity and Ecology chapter and the Land and Transformation chapter, it can be seen that the area of natural eco-systems has been maintained and, in some instances, increased. Although some development/land cover change has occurred, this has predominantly seen the loss of degraded habitats and historical sugar cane fields.	↑ (Improving)
		Area of critical eco-systems rehabilitated (ha)	As of 2013, 10 ha has been prepared and 58,2 kg seeds sown. In addition, about 30,04 ha have been prepared for sowing of 6 484,75 kg of grass seed.	↑ (Improving)

EXECUTIVE SUMMARY

TABLE 1: SUMMARY OF THE 2013/14 REPORT FINDINGS

THEME	ISSUE	INDICATORS	DESCRIPTION	TREND
Biodiversity and ecology	Alien and invasive species	Increase/ decrease in alien and invasive species (ha)	Alien clearing work has resulted in approximately 650 ha cleared to date, since the commencement of this activity in 2012. In addition, 98,69 ha have been sprayed and treated to minimise re-growth.	↑ (Improving)
Inland water and wetlands	Water demand versus availability	Water demand per category (m^3/day)	Municipal water consumption from both the AgriZone and Support Zone in 2012 accounted for almost 45% of total water consumption for Dube TradePort. In 2013, however, there was a visibly significant decline in the amount of municipal water consumed at Dube AgriZone and a slight decline at the Support Zone. Overall, daily municipal water consumption across the Dube TradePort development was halved from 524 m^3/day in 2012, to 294 m^3/day in 2013.	↑ (Improving)
	Water quality of natural systems	Increase/ decrease of treated water quality (various) – e.g. grey and black water treatment	The Southern Waste Water Treatment Works (SWWTW) waste water treatment works is operating according to design standards and continues to produce treated effluent generally compliant with GLVs. The number of days when effluent is below standard has decreased. However, high levels of ammonia require specific attention.	↑ (Improving)
		Increase/ decrease of quality of storm-water run-off (various)	Several parameters were exceeded during the reporting period, particularly chlorine, copper, oil and grease, and faecal bacteria, E.coli, which were consistently above the special limit values at all stations, with copper and zinc levels generally higher than the general standards. These two parameters were particularly high at stations 11 and 3, reaching 6 and 3 times the general limit values, respectively. Conductivity, pH, cadium, and cyanide were also recorded to be above the special limit values.	↓ (Declining)
		Surrounding wetland health status (various)	On-site wetlands were described as 'significantly modified' as a result of sugar plantations and alterations to natural hydrology through the construction of drainage canals. In terms of functional value, these wetlands scored Moderately Low to Intermediate for the majority of the eco-system services assessed. Off-site wetlands exhibited greater functional value than on-site wetlands, scoring as Moderately-High to High for the eco-system services they provide. The health state of these systems was categorised as Largely Modified, predominantly as a result of hydrological and vegetation impacts within each wetland and the catchment.	→ (Stable)

TABLE 1: SUMMARY OF THE 2013/14 REPORT FINDINGS

THEME	ISSUE	INDICATORS	DESCRIPTION	TREND
Inland water and wetlands	Water quality of natural systems	Surrounding river health status (various)	The Umdloti River catchment is largely modified by urbanisation (Verulam), sand mining activities, municipal sewerage treatment infrastructure and extensive cultivation of sugar cane. The ecological state of the Umdloti River above the town of Verulam is considered good, while the downstream state of the river within the Mount Moreland estate is deemed as poor, highly stressed, and deteriorating over time, as reflected by the aquatic biota and water quality data. The Tongati River is described as transformed, largely through agricultural activities, and possesses little remaining environmental resource assets. The Hlawe River, which drains the industrial areas of Tongaat and surrounding agricultural land, is considered to be highly stressed. The ecological state of the Hlawe River has been consistently categorised as poor and this was attributed to poor water quality.	→ (Stable)
Land and transformation	Land use and rate of change	Loss/gain of land use types (ha)	Although a great deal of land use changes have taken place between 2005 and 2008, much of the loss of natural land has been in degraded areas. Overall, the percentage gain of settlements is recorded as 26,48%, while there have been small gains in bushland (2,26%), dense bush (4,11%), forest (0,16%) and wetlands (0,03%). and losses of grassland (-8,16%) and grassland/bush clumps. (-4,73%) have also been recorded. Unfortunately, updated information will only be available after June 2014.	→ (Stable)
		Rate of change of land cover (%)	In 2005, transformed land cover accounted for approximately 65% of the study area, while this increased to an estimated 75,5% in 2008. These figures imply an annual rate of change in land cover from untransformed to transformed of approximately 3,4%. While this rate of change would be concerning on a sustained basis and/or on a larger scale, it is noted that this will diminish greatly over time as construction and development draw to a close and as rehabilitation begins to show results.	→ (Stable)

EXECUTIVE SUMMARY

The SoER is an important tool that can be used by decision-makers to determine how best to utilise natural resources and ecological goods and services and to determine the best management and monitoring to improve or maintain the current state. The findings of the SoER were mostly positive, although there were some indicators that identified areas where the management focus will need to be adjusted. Overall, the report should be used to highlight Dube TradePort Corporation's successes and inform the process of continuous improvement.

It should also be noted that the selection of appropriate indicators is an important set in ensuring that the SoER reflects a complete overview of Dube TradePort. These indicators should, therefore, be continuously revised. The indicators presented in this report are based on the 2011/12 report to ensure that the two reports can be compared in an effort to identify trends. However, all the indicators were also reviewed to ensure appropriateness for the current report, as well as additional indicators suggested.

Equally important is the availability of data to ensure reporting on the selected indicators. Monitoring and reporting consistently will allow the Dube TradePort Corporation to compare the findings of report iterations and track trends. In most instances, monitoring and reporting is taking place.

HOWEVER, WHERE NEW INDICATORS HAVE BEEN ADDED, OR NEW PROJECTS ARE BEING UNDERTAKEN, THERE IS A NEED TO ENSURE CONSISTENT MONITORING TAKES PLACE.

1 INTRODUCTION

The various components of the environment provide the resources necessary for life to flourish. In addition, the natural resources and goods and services provided by the environment contribute to the functioning of all eco-systems. The progression of human development is often to the detriment of the environment and natural eco-systems. The quantity and quality of our natural resources have become a priority concern and there has been a concerted effort by all spheres to ensure that environmental integrity is preserved.

A State of Environment Report (SoER) is used to describe the conditions of the state, trends over time and also to provide insight into what has been done in response to these changes. As such, the SoER provides a report card on the quality of the environment. Following the general definition of a report card, the SoER aims to define:

- What is happening within Dube TradePort?
- Why is this happening?
- Are these changes significant?
- What is being done to address these changes?
- What are the sustainable development objectives for Dube TradePort Corporation, its divisions, staff, tenants and the surrounding communities?
- What can be done to achieve a more sustainable state of living for all people and eco-systems?

The SoER is an important tool that can be used by decision-makers to determine how best to utilise the environment and to determine the best management and monitoring to improve or maintain the current state. The SoER forms part of a multitude of platforms that can be used to inform and implement the principles of sustainable development.

As of December 2013, national and provincial 'environmental outlook' reporting is required in terms of an amendment to the National Environmental Management Act, Act 107 of 1998. According to the National Environmental Management Laws Second Amendment Act, (Act 30 of 2013), both the National Minister and Provincial MECs have to prepare four-yearly Environment Outlook Reports.

The Dube TradePort development is a Government-supported enterprise with the aim of creating economic opportunities that benefit KwaZulu-Natal and the broader Southern African region. This has already materialised during Phase 1 of the construction of King Shaka International Airport and Dube TradePort Support Zone 1, TradeZone 1 and the AgriZone. Dube TradePort has contributed an estimated R6 billion to low-income households and has also contributed R8,4 billion to South Africa's GDP during its construction and operational phases.

In both its first SoER in 2011/12, and this report (2013/14), Dube TradePort Corporation has aimed to provide an update of the baseline environmental information since the operation of the Phase 1 development and to determine the effectiveness of the measures already in place. The willingness of Dube TradePort Corporation to undertake this process cements the corporation's commitment to sustainability and the environment and has ensured that all operations and activities are compliant with sustainability principles and the reduction of impacts on the natural environment.

Dube TradePort is intended to act as the global trade gateway for Southern Africa by providing a gateway between KwaZulu-Natal and the rest of the world. It is the first 'Greenfield,' South African international airport with dedicated zones for hotels, offices, warehouses, a cargo terminal, a retail sector and an agricultural zone. Located approximately 35km north of Durban, it is in close proximity to two of the major sea-ports in South Africa and is connected to the rest of Africa by road and rail.

Dube TradePort comprises several development zones, namely Dube AgriZone, Dube Cargo Terminal, Dube City (Support Zone 1) and Dube TradeZone, all supported by Dube iConnect. The purpose and activities taking place in each of these zones are discussed in the sub-sections that follow.

1.1 DUBE CITY OR SUPPORT ZONE 1

Dube City aims to provide a secure, cosmopolitan environment that is within walking distance of the airport (www.dubetradeport.co.za). This is a city that reflects the unique cultural diversity of KwaZulu-Natal, with architecture that makes full use of the superlative coastal climate and the surrounding natural environment. It is pedestrian-orientated, with walkways and parks.

Dube City (Support Zone 1) covers a total area of 12 hectares and offers fully serviced sites that have development rights. It is a developer-driven, high-quality, managed public environment. Once complete, it will be one of Africa's first green precincts. Some of its numerous sustainable features include:

- Correct orientation of buildings to minimise energy use;
- Accommodation of public transportation, cycle lanes and the encouragement of alternative forms of transport and the maximisation of public, pedestrian-orientated space;
- Encouragement of the use of renewable energy, rainwater harvesting and grey water recycling;
- Use of indigenous landscaping;
- Encouragement of permeable paving and environmentally-friendly materials in construction;
- All buildings being required to have green roofs;
- The provision of recycling areas;
- Encouragement of landscape elevations; and
- Encouragement of Green Star ratings for all buildings (minimum 4-star rating).

Dube City, at completion, according to the 2060 Master Plan, is illustrated in Figure 1.

1 INTRODUCTION

FIGURE 1: DUBE CITY LAYOUT

FIGURE 2: NURSERY IN THE AGRIZONE

FIGURE 3: DUBE CARGO TERMINAL

The first phase of development includes:

- Main access roads;
- Pedestrian boulevards;
- Dube Square, the heart of Dube City. This consists of an urban amphitheatre and stage, water features and restaurants. It will be the meeting place for people from around the world; and
- 29˚ South, the new Green-Star-rated office of Dube TradePort Corporation.

1.2 DUBE AGRIZONE

The AgriZone is a 20-hectare development with 16 hectares of greenhouses for flower and vegetable production, packhouses, a distribution centre, a tissue culture laboratory and an indigenous plant nursery. The aim is to provide a centre for excellence and a model of new technology, production methods, training and research in high-value agriculture in KwaZulu-Natal for the entire SADC region.

As part of green initiatives at Dube TradePort, the AgriZone has become one of the first smart high-tech agricultural holdings that comprise a climate-controlled growing area under glass in Africa. Rainwater harvesting takes place at the greenhouses and is collected and stored in storage ponds. Water is also supplied through the use of boreholes. As stated on the Dube TradePort Corporation website, the closely monitored and controlled climate within the greenhouses enables the production of a larger quantity of produce than through traditional farming practices. The off-set of wetlands and the rehabilitation of habitats in and around Dube AgriZone have helped to mitigate the impacts of the development. The offset programme, which forms part of wetland protection and the rehabilitation of natural habitats within Dube AgriZone, has resulted in the mitigation of the negative environmental impacts of the development.

1.3 DUBE CARGO TERMINAL

The Dube Cargo Terminal has direct airside access and is linked to Dube TradeZone. The terminal is SARS and CAA approved and recognised as a Part 108-Compliant facility. Dube Cargo Terminal consists of 13 000 m^2 of warehouse floor space, 2 000 m^2 office space and has the capacity to handle 100 000 tonnes of cargo annually, with a projected capacity of 2 million tonnes by 2060.

The terminal uses an Elevated Transfer Vehicle (ETV), by ICM, which has a mechanised and digitally operated inventory control system.

The terminal also has the advantage of having comprehensive regulatory services, such as SARS, the Departments of Health and Agriculture and the border police located in-house, which contributes significantly towards the speed, efficiency and security of importing and exporting.

FIGURE 4: DUBE TRADEHOUSE, LOCATED WITHIN DUBE TRADEZONE

1.4 DUBE TRADEZONE

This specialised precinct provides prime, fully-serviced real estate. It is ideally positioned for new-generation warehousing, logistics and distribution, manufacturing, assembling, air-related cargo distribution, high-tech aerospace services, electronic manufacturing, automotive industries, clothing, textiles and cold-storage activities.

It is located:

- Within one kilometre from the International Passenger Terminal;
- Adjacent the world-class Dube Cargo Terminal, comprising 13 000 m^2 of warehouse floor space, 2 000 m^2 office space and currently capable of managing 100 000 tonnes of cargo per annum; and
- Two kilometres from the hi-tech Dube AgriZone.

Development within Dube TradeZone:

- Ensures a high-quality-managed public environment with excellent security;
- Is master developer-driven;
- Is subject to Special Zone 10 (Airport) Umhlanga Town Planning Scheme No. 1 development rights, which are already in place; and
- Is subject to review by the Dube TradePort Design and Review Panel, which will ensure development consistency and quality within the TradePort area.

The land use within this zone is:

- Logistics;
- Assembly;
- Warehousing;
- Light Manufacturing;
- Processing;
- Freight-forwarding;
- Commercial;
- Consolidators; and
- High-value cargo.

1.5 DUBE ICONNECT

Dube iConnect aims to provide world-class telecommunications, IT and value-added services to users in and around the TradePort. Dube iConnect is an ECNS and ECS accredited licence-holder and is committed to providing services that are in line with global advancements in technology, therefore ensuring that the quality gap is reduced between Southern Africa and the rest of the world.

Some of the benefits of Dube iConnect include:

- A total package, offering the most economic IT solutions for businesses;
- A single supplier point-of-contact for fast and efficient service and troubleshooting;
- Very competitive rates, due to the leveraging derived through the benefits of bulk purchasing;
- Many free interconnect services within the precinct (voice-to-voice, video, and the like);
- A professional, experienced and highly-qualified on-site support team; and
- The latest technology.

2 REPORTING FRAMEWORK

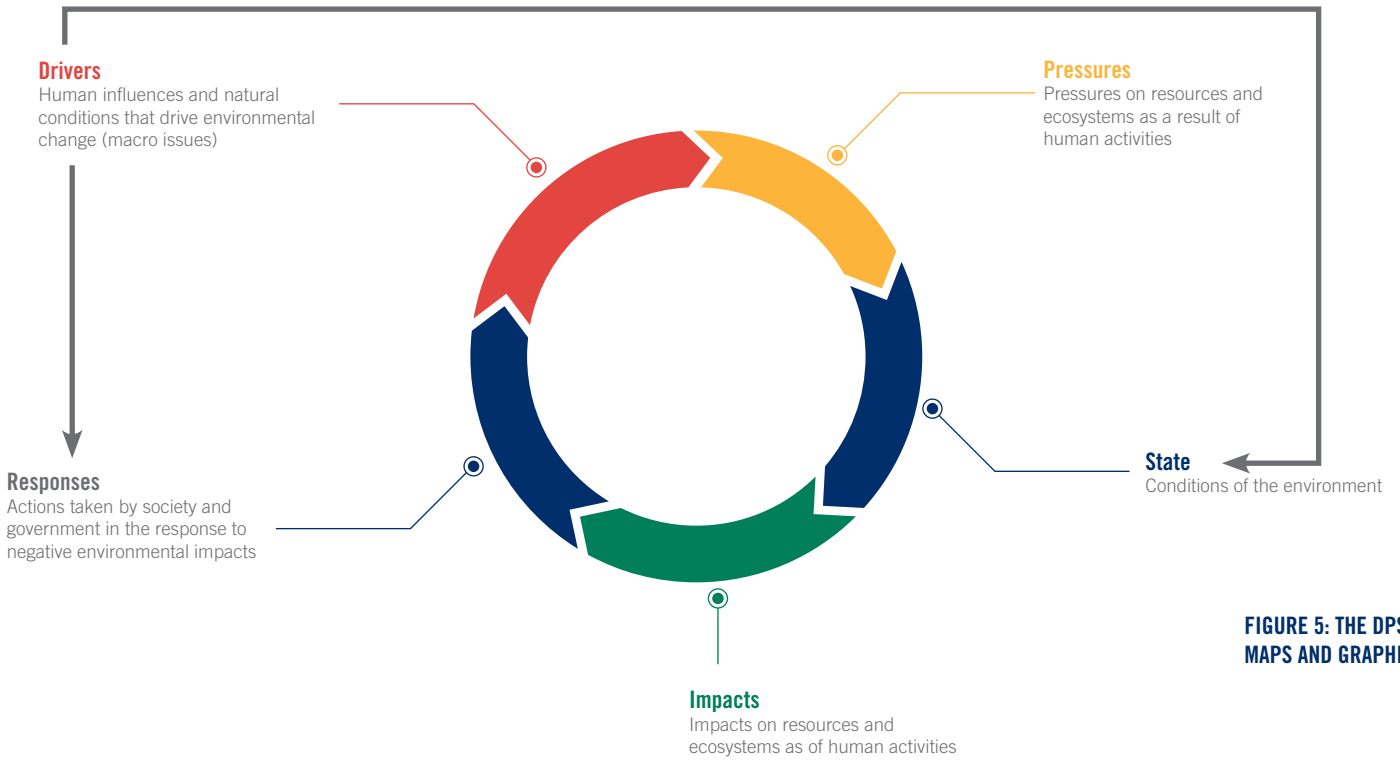


FIGURE 5: THE DPSIR REPORTING FRAMEWORK (ADAPTED FROM UNEP/GRID-ARENDAL MAPS AND GRAPHICS LIBRARY, 2002))

2.1 STATE OF ENVIRONMENT REPORTING

A State of Environment Report (SoER) describes the condition of the environment against a set of key environmental indicators. It provides an evaluation of the status of the environment and establishes linkages to the socio-economic and political environment. The report is designed to cover a full range of environmental issues, reporting on changes over time.

The report is based on the international Driver-Pressure-State-Impact-Response (DPSIR) framework, which is used for most South African SoE Reports. Indicators used under this framework are representative of various environmental aspects or features.

It is important that these indicators be selected correctly in order to provide an accurate reflection of the state of the environment. Monitoring and reporting consistently will allow the Dube TradePort Corporation to compare the findings of report iterations and track trends.

Experience has shown that the DPSIR framework can easily be misinterpreted, resulting in under-reporting on particular components of the framework, or resources wasted on reporting on irrelevant or less useful indicators. To avoid such inefficiencies, the framework is described carefully upfront and conceived in a simpler format that can provide the necessary guidance to specialists (Note - the full framework is still used in the report). Accordingly, the descriptions within the table that follows are proposed for the framework components:

TABLE 2: EXAMPLE OF THE APPLICATION OF THE DPSIR FRAMEWORK

DPSIR FRAMEWORK	DESCRIPTION	EXAMPLE
Drivers	The primary agent driving change in the environment. Typically human population growth and a growing dependence on natural resources.	Human population
Pressures	The use of natural resources or pollution of the environment in the form of activities or processes.	Agricultural production
State	The current condition of environmental features and change over time.	Extent of cultivation
Impact	The effect of the environmental state, as manifested in components of sustainability.	Fragmentation of natural habitat
Responses	What correctional responses are being taken? Generally associated with legislation, policy, programmes, education, awareness and the like.	Improved monitoring and compliance within extension services

From the description above, it can be seen that the DPSIR framework lends itself to a three-tier reporting structure – where the Drivers and Pressures are grouped, as are the Impacts and Responses.

This configuration implies that strong focus should be placed on the identification of indicators that describe the 'State' of the environment. If 'State' indicators are identified, then it will ensure that only relevant 'Drivers/Pressures' and 'Impacts/Responses' are reported on. This will refine and streamline the reporting process, guaranteeing quality outcomes.

2 REPORTING FRAMEWORK

2.2 REPORT STRUCTURE

As described in Section 2.1, this SoER follows the commonly accepted DPSIR framework. Each of the following themes is reported on to provide a full perspective of Dube TradePort:

- Governance and Integrated Environmental Management (IEM);
- Natural and cultural heritage;
- Waste management;
- Air quality;
- Inland waters and wetlands; and
- Land and transformation.

Drivers and Pressures tend to be universal across the various themes, although they may rest in various States and Impacts for different elements. For this reason, the main driving forces of change are presented as a separate chapter. Each theme chapter focuses on issues relevant to them.

Emerging issues and trends are also elaborated upon in this report. This refers to any changes taking place that are of various spatial and temporal levels (e.g. international trends, norms and standards, or new technology, that may influence Dube TradePort).

Section 2.3: Summary of reporting indicators, details the themes, issues and indicators presented in this report. The structure of the 2011/12 report is also provided for comparative purposes.

2.3 SUMMARY OF REPORTING INDICATORS

Please note that only the indicators of 'State' are set in this report and the other aspects of Drivers, Pressures, Impacts and Responses support the information provided by these indicators to present a full perspective of the trends taking place.

The selection of appropriate indicators is an important step in ensuring that the SoER reflects a complete overview of Dube TradePort. These indicators should, therefore, be continuously revised. The indicators presented in this report are based on the 2011/12 report to ensure that the two reports can be compared, in an effort to identify trends. However, all the indicators were also reviewed to ensure appropriateness for the current report, as well as additional indicators suggested.

TABLE 3: COMPARISON OF THE THEMES, ISSUES AND INDICATORS FROM THE 2011/12 REPORT AND THE 2013/14 REPORT

2011/12 THEME	ISSUE	INDICATORS	2013/14 THEME	ISSUE	INDICATORS
Planning and built environment	Sustainable development	Percentage compliance with authorisations, licences and permits (%)	**Governance**	Integrated environmental management	Percentage compliance with authorisations, licences and permits (%)
		Percentage budget allocated to environmental management (%)			Percentage budget allocated to environmental management (%)
		Percentage of masterplan developed (%)			
Governance	Sustainable procurement	Percentage of locally sourced services and materials (%)		Sustainable procurement	Percentage of locally sourced services and materials (%)
		Percentage of tenants on green leases (%)		Sustainable development	Percentage of tenants on green leases (%)
					Percentage emissions off-set (%)
Community, economic development and employment	Staff development	Percentage investment in skills development of staff (%)			Percentage investment in skills development of staff (%)
	Local economic development and community upliftment	Percentage staff employed from surrounding communities (%)			Percentage staff employed from surrounding communities (%)
		Percentage of profit invested in Corporate Social Investment (CSI) projects (%)			

2 REPORTING FRAMEWORK

2011/12 THEME	ISSUE	INDICATORS	2013/14 THEME	ISSUE	INDICATORS
Ground transportation	Impact of transportation on energy efficiency	Percentage use of public transport (%)			
			Natural and cultural heritage	Existence of heritage resources on Dube TradePort land and how they are impacted upon	Number and type of natural heritage sites
					Number and type of cultural heritage sites
					Current use of heritage sites
					Access to heritage sites
Waste	Waste management	Waste generation by source (tonnes/annum or %)	**Waste management**	Waste generation and characterisation	Waste generation by source and type (tonnes/annum or %)
		Percentage of waste recycled (%)		Waste minimisation and disposal strategies	Percentage waste diverted from landfill, e.g. reduced, re-used, recycled (tonnes/annum or %)
		Waste disposal by type (various)			Percentage waste disposed (tonnes/annum or %)
Climate change, energy and aviation	Climate change	Carbon Dioxide by source (CO_2e/annum)	**Air quality**	Air pollution and climate change	Carbon Dioxide emissions by source (CO_2e/annum)
		Percentage energy from renewable sources (%)			
		Percentage Emissions Off-set (%)			Percentage Emissions Off-set (%)
			Biodiversity and ecology	Species and eco-system diversity	Increase/decrease in species diversity (no. of species)
					Increase/decrease in natural eco-systems (ha)
					Area of critical eco-systems rehabilitated (ha)
				Alien and invasive species	Increase/decrease in alien and invasive species (ha)

TABLE 3: COMPARISON OF THE THEMES, ISSUES AND INDICATORS FROM THE 2011/12 REPORT AND THE 2013/14 REPORT

2011/12 THEME	ISSUE	INDICATORS	2013/14 THEME	ISSUE	INDICATORS
Water	Change in water quality	Percentage water recycled (%)	**Inland water and wetlands**	Water quality of natural systems	Increase/decrease of treated water quality (various) – e.g. grey and black water treatment
					Increase / decrease of quality of storm-water run-off (various)
					Surrounding wetland health status (various)
					Surrounding river health status (various)
		Increase/ decrease of treated water quality (various)			
Land and ecology	Land use change	Loss/gain of agricultural land (ha)	**Land and transformation**	Land use and rate of change	Loss/gain of land use types (ha)
		Increase/decrease in export quantities (tonne/annum)			
	Habitat change and eco-system functioning	Area of critical eco-system rehabilitated (ha) Increase/decrease in alien and invasive species (ha)			Rate of change of land cover (%)

2.4 REPORTING GAPS AND LIMITATIONS

This type of reporting does not generate primary or new information. It is reliant on existing data and information, such as studies, reports, audits and other information already produced. Royal HaskoningDHV has assumed that all information with which it has been provided by Dube TradePort Corporation - both in writing, as well as through verbal communication - is correct and accurate. Royal HaskoningDHV has further assumed that all relevant documentation and information has been provided and, therefore, is a complete and accurate representation of the information available that can be found in this report. It should also be noted that SoE Reports do not always show 'good news'. Irrespective of the findings, it is important to ensure that the report is transparent and accurate to ensure that management and behaviour is influenced appropriately. The report is a useful tool to identify where changes need to be made or where greater management, or action, is required to ensure that Dube TradePort Corporation achieves its vision.

3 DRIVERS OF CHANGE

South Africa displays a typical economic growth pattern of a developing country. This is characterised by urban sprawl and the development of edge cities, or cities formed away from the central city core of a municipality. Such growth inevitably leads to the development of economic hubs, which are characterised by a specific dominant land-use and are often economically self-sufficient.

In the context of South Africa, it should be noted that the enhancement and expansion of the existing OR Tambo International Airport within the Ekurhuleni Metropolitan Municipality was the first aerotropolis, through modification of the existing development node (DTPC, 2013).

However, Dube TradePort enjoys the position of being the first purpose-built aerotropolis, with the intention of the TradePort forming a dominant portion of the overall development from inception.

The pressures faced by Dube TradePort Corporation are, subsequently, the provision of services which makes Dube TradePort a leading economic hub, as identified in the State of the Environment Report of KwaZulu-Natal. Furthermore, Dube TradePort Corporation faces the obligations of legal compliance and, therefore, developmental and operational compliance with the conditions set-out in various environmental authorisations (previously referred to as Record of Decisions (RoDs)) and hereafter referred to as Environmental Authorisations (EAs), linked permits, and licences.

3.1 GROWTH AND DEVELOPMENT

A growing human population results in an increased demand for goods and services to meet their needs, which will exert more pressure on biodiversity, comprising eco-systems, species and genes (Population Action International, 2012). The eThekwini municipal area has already, by estimation, been transformed by 53% and is likely to continue with the current projected growth of the human population. Urban, industrial and agricultural development takes place to provide for the increasing needs of the growing population.

In so doing, the natural environment becomes fragmented and the connectedness is lost, which makes it difficult for organisms and propagules to migrate between core areas (McNulty Consulting, 2014).

Dube TradePort growth is being shaped by: (1) firms providing air transportation services, (2) firms which are frequent consumers of air transportation, (3) businesses which cater to the ancillary needs of air travellers and employees of the previous two types of firms and (4) companies which may simply be searching for accommodating sites with good regional highway access. These various types of business activities result in accelerating airport area growth in a largely organic manner.

In addition, the rapid growth and development of the Dube TradePort is placing an ever-increasing pressure on the environment (DTPC, 2013). Loss of the natural resource base, increased demand on energy and water and waste generation all have the potential to impact the environment, if not managed correctly (DTPC, 2013).

Against this background, it is therefore important to balance economic and infrastructural growth with the limits of the natural resource base and ensure that all plans feature concepts of sustainability and corporate responsibility which recognise the 'triple bottom line'. The drivers identified include the development and execution (i.e. construction) of a masterplan which aims to realise the goal of a 'green', carbon-neutral aerotropolis (DTPC, 2011/12).

3.2 CONSUMER BEHAVIOUR

Consumerism is driven by a number of social and demographic factors. As the economy grows, the wealth filters down the various income levels and people have more disposable income to purchase items, such as food, clothing and electronics (Deloitte, 2013). Their spending is dictated and shaped through media and other influences. This creates a greater demand for consumer goods as the population increases.

This increased consumption rate places pressures on the environment and results in the increased use of natural resources, raw materials, an increased volume of waste generated and increased levels of pollution and degradation. Increased consumption, in the absence of significant re-use or recycling of waste materials implies that more waste will be sent to landfill sites, thus clearing more land and destroying natural habitats to make way for these new landfill sites. In addition, increased consumption would require the extraction of new resources to generate new products.

3.3 GROWING MIDDLE CLASS

During the past 30 years, the middle class in Africa has tripled in size, with one in three people considered to be living above the poverty line. The current trajectory suggests that the African middle class will grow to 1,1 billion (42%) in 2060 (Deloitte, 2013).

While this is a positive indication of a growing economy and consequently improving human well-being (in a socio-economic sense), this has consequences for waste generation. As consumption increases, so does the volume of waste.

Wealthier communities are the biggest generators of waste, because they are typically larger consumers of commercial products. In addition to an increasing population, more people are moving into the middle class financial bracket, associated with increased levels of consumption and, therefore, higher levels of waste generation.

3.4 LOSS OF BIODIVERSITY THROUGH URBANISATION

Biodiversity provides resources needed in social and economic development. Roberts, Manders and Boon (2001) commented on the rapid increase of the urban population and the associated needs of the people and the economy, specifically where it relates to clean air and water. Components of the biodiversity collectively make up and determine the stability of ecosystems (Hoogervorst, 2004).

Stable ecosystems are able to withstand the impact of occasional disturbance. South Africa has experienced a decline in biodiversity due to urbanisation, agricultural expansion, industrialisation and the infestation of alien invader plants, amongst others. With the decline in biodiversity, ecosystems are also lost and the ability of nature to purify water, produce clean air, prevent soil

erosion, provide natural resources to humans and animals has also declined.

This negative impact on other eco-systems occurs further along the continuum. Erosion of up-slope areas lead to sediment deposits in the wetlands below (Fuggle & Rabie, 2000). Wetlands covered in silt can no longer filter the water properly, leading to inferior water quality downstream. In the Dube TradePort area, the diverse natural vegetation was removed long ago and replaced with monoculture sugar cane fields.

All the species of insects, invertebrates, mammals and birds dependent on the natural vegetation were displaced. Adding to this transformation, there is the onslaught of alien invader plants on the remaining areas of natural vegetation, competing for natural resources and putting the indigenous vegetation under pressure.

Local communities use natural resources for fuel, handcraft, traditional medicine or cultural practices. With the loss of the natural resources close to their homes, the socio-economic environment becomes compromised as the resources they rely upon become scarce, making it difficult to maintain livelihoods. This shortage then puts pressure on other neighbouring environments, where such resources are still available (DTPC, 2014).

The most significant cause of the loss and degradation of biodiversity systems is the use of natural resources by humans for economic and social development (Govender, 2013). On a local scale, the current and predicted future pressures that lower ecosystem health include:

- The loss of natural habitat due to urbanisation and informal settlements, agriculture, mining (quarrying and river sand mining) and infrastructural development;
- Climate change;
- Invasion by alien species;
- Modification of rivers;
- Water abstraction;
- External inputs of nutrient-loading, due to inadequate management of sewage; and
- Over-exploitation and over-grazing.

3.5 CONSERVATION MANAGEMENT

Understanding of the interface of biodiversity with governance can be greatly enhanced by acknowledging and analysing biodiversity as part of a Social-Ecological System (SES) (Cox & Moore, 2000 in Lockwood, Mitchell, Moore, & Clement, 2014). Effective implementation of the Convention on Biological Diversity (CBD) at the city level can happen through good governance, but is dependent on Governmental and non-Governmental contributors, in collaboration with surrounding cities, other levels of Government and international organisations. The management and conservation of biodiversity in South Africa has not had a substantial institutional change environment during the past five years. This is the case for national and provincial departments, public entities, agencies, municipalities and active Non-Governmental Organisations (NGOs). Increased cross-sector collaboration has been catalysed between these various institutions by the Presidential Delivery Agreement (Molewa, 2014). The White Paper for the National Climate Change Response, published by the South African Government, has indicated that in South Africa risks to biodiversity will be monitored and researched to develop better projection models of impacts in order to prepare adaptation responses. This approach provides the direction in which conservation management is to develop.

To achieve more effective conservation management throughout the country, Dube TradePort Corporation aims:

- To encourage and facilitate partnerships to ensure proper management of sensitive areas not under formal protection and to invest in the expansion of key areas;
- To ensure that the expansion programme of protected area planning has an eco-system approach to provide protection for threatened biomes, landscapes and species and to minimise the risk to species;
- To ensure a biodiversity monitoring system is put into place;
- To facilitate the expansion of existing programmes, combating alien and invasive species infestations that destroy sensitive eco-systems;
- To promote the conservation and restoration of natural eco-systems, ensuring resilience to climate change impacts; and
- To maintain a gene bank of critically endangered species in the medium-term.

eThekwini Metropolitan Municipality, Ezemvelo KZN Wildlife and the iSimangaliso Wetland Park have had successes in using partnerships to achieve biodiversity conservation objectives (Roberts et al, 2001; & Hughes, 2001). Govender (2013) reports on interventions the eThekwini Municipality has implemented to achieve the objectives of adaptation to climate change. The eThekwini Environmental Planning and Climate Protection Department has done much to ensure that biodiversity is integrated with the plans of the eThekwini Municipality through mainstreaming (Roberts et al, 2007). Durban Metropolitan Open Space System, also known as D'MOSS, is a project aiming to protect open space linkages throughout the City of Durban. To achieve this, the Municipality has embarked upon a programme of Land Acquisition in which property is purchased or land is donated to the Municipality. Approximately 140,06 ha was acquired in 2012/13 for environmental conservation. The next process is Nature Reserve Proclamation, through which 11 eThekwini Metropolitan Municipal nature reserves are being proclaimed as nature reserves in terms of the National Environmental Management: Protected Areas Act. Another project is Non-User Conservation Servitudes (NUCS) that have been registered over private property within the eThekwini Municipal area, where sensitive habitat is present, where the land owner continues to own the land, but development rights are restricted.

eThekwini Metropolitan Municipality has introduced a Municipal Adaptation Plan: Health and Water. In this adaptation plan the City spells out what the City of Durban will be doing to prepare for projected climate change impacts. Plans are being made for water supply, infrastructure protection, coastal zone management and disaster management, as well as a shortlist of other impacts. The plan is refined through a multi-criteria assessment, with the aim of the Municipal Adaptation Plan project being to identify and select activities providing the greatest

benefit at least cost. These activities need to be carried out in line with engineering solutions, biological responses and socio-institutional responses (Constable & Cartwright, 2009). Policy and guidelines are used to direct activities in a particular direction in order to achieve the aims set out in the adaptation plan. Substantial progress has been made in South Africa with mainstreaming biodiversity. It embraces the eco-system approach by applying it during planning and it is implemented in many programmes (Mbengashe, 2009).

3.6 MANAGING SCARCE RESOURCES

To combat the growing demand for resources and the consequences of climate change, Dube TradePort Corporation has implemented a number of environmentally-efficient activities. These initiatives extend to all activities taking place on-site, as well as in the surrounding community.

In terms of water conservation, mitigation methods have been implemented, such as rainwater harvesting, balancing tanks for treated sewage water and storm-water structures that maintain the quality of the storm-water and the Reverse Osmosis Plant within Dube AgriZone. Additional water conservation and water demand management options are also being investigated.

Wherever feasible and possible, Dube TradePort Corporation is implementing energy-saving measures within its precincts. Natural ventilation is included in all greenhouses to maintain a stable climate, without the use of non-renewable energy sources. Photovoltaic systems were being installed on two of the packhouses, which consume the greatest amount of energy within the AgriZone.

Waste management options are being used to reduce the amount of waste going to landfill sites from Dube TradePort. Additional methods being explored include recycling and re-use options. Members of the public are also encouraged to make use of Dube TradePort recycling bins. Dube TradePort also operates a programme for school children, enabling the exchange of recyclables for fresh fruit and vegetables (see Section 3.7: Dube Corporate Social Initiatives).

3.6.1 ON-SITE REHABILITATION AND RESTORATION

Dube TradePort Corporation, as an environmentally-conscious corporation, has made provision to off-set the environmental impacts of both Dube TradePort and King Shaka International Airport developments. These plans have resulted in a 'Rehabilitation and Restoration' Project, which comprises the removal and rehabilitation of alien invasive species and indigenous species respectively.

The off-set plan has made provision for more than 700 ha of the Dube TradePort area to be rehabilitated and restored. These plans are illustrated in the map labelled Figure 6.

In addition to this, Dube TradePort Corporation aims to restore areas to become usable, public nodes with pathways, walkways and bicycle routes, as well as educational facilities.

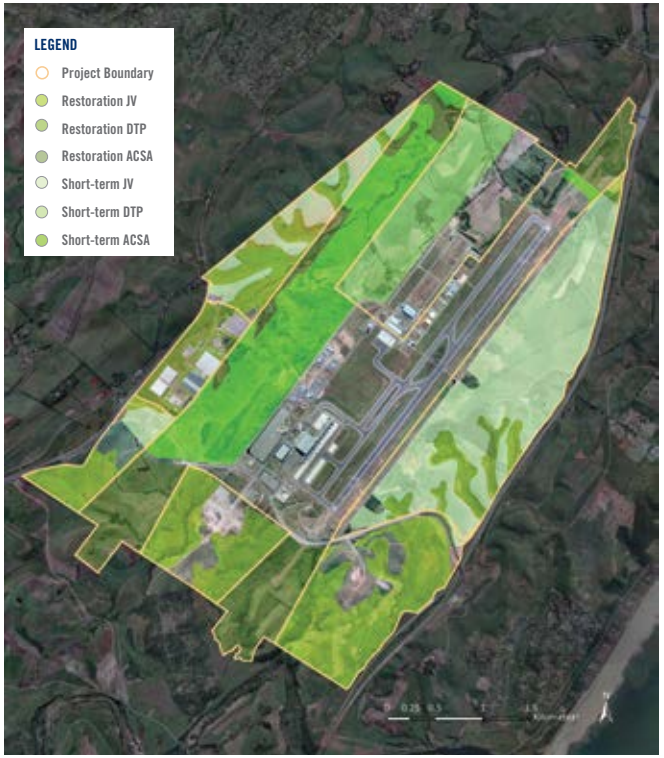


FIGURE 6: EXTENT OF RESTORATION OF DUBE TRADEPORT LAND

3.6.2 DUBE TRADEPORT'S GREEN INITIATIVES

Dube AiRoad's Euro 5 Emission Trucks

The Dube AiRoad connects the Cargo Terminal to major cities, such as East London, Port Elizabeth and Johannesburg. Its Euro 5 trucks are fuel-efficient and emit very low concentrations of greenhouse gases into the atmosphere.

Green Star Rating at 29° South

The 29° South building is the head office of Dube TradePort Corporation and is the first building in Dube City to have applied for a 4-star green rating. If successful, the certification will be the standard for the architecture for Dube City, ensuring that Dube TradePort is the first climate-resilient airport city in Africa.

While energy requirements have been reduced using optimal orientation and smart building operational systems, the roof garden helps in the absorption of carbon dioxide and air pollution, as well as enhancing the aesthetics of the building.

FIGURE 7: DUBE AIROAD FLEET

FIGURE 8: DUBE TRADEPORT CORPORATION HEAD OFFICE, 29° SOUTH, AND ITS ROOF-TOP GARDEN

3 DRIVERS OF CHANGE

3.7 DUBE CORPORATE SOCIAL INITIATIVES

Dube Corporate Social Initiative (CSI) projects are aimed at uplifting identified local communities to ensure that they can become self-sustaining. Projects are focused on renewable energy solutions, food security, skills development, education and job creation. One of the projects allows schools to reduce their carbon footprint through the provision of photovoltaic solar panel systems, while another offers a trading system that allows school children from surrounding schools to trade recyclables for fresh produce from Dube AgriZone, which happens every Friday.

Dube TradePort Corporation is continuously connecting with local communities to find ways to improve quality of life and investing in the future of as many individuals as possible. Some of these initiatives include (CSI Project Leader, pers:comm, 2013):

- Development of organic vegetable gardens at disadvantaged schools;
- Donations of water tanks to Mbonisweni Primary School for rainwater harvesting;
- Donations of school uniforms to Sontshenge School;
- Donation and installation of solar power units in four schools. This has allowed some schools to off-set their electricity accounts;
- The Arbour Day planting of a number of trees at the Mount Moreland and Lungisisa Indlela Village Orphanage in the Canelands area; and
- A partnership has been established with Mount Moreland Conservancy and Lungisisa Indlela Village (an orphanage located in the Canelands area) to continuously work towards the betterment of children's lives.

In addition to the above-mentioned initiatives, Dube TradePort Corporation encourages local school children to recycle by regularly trading recyclable material for fresh fruit and vegetables. The programme was a success in 2013, with two more schools joining the programme. A total of four schools participate in this progressive initiative.

FIGURE 9: LUNGISISA INDLELA VILLAGE ORPHANGE, WHERE DUBE TRADEPORT CORPORATION DONATED AND PLANTED TREES FOR ARBOUR DAY 2013

FIGURE 10: GRADE 4 LEARNERS OF SONTSHENGE SCHOOL THANK DUBE TRADEPORT CORPORATION FOR THE DONATION OF UNIFORMS

FIGURE 11: DUBE TRADEPORT TEAM PARTICIPATE IN THE SCHOOL FOOD FOR RECYCLABLES PROGRAMME

4 GOVERNANCE AND INTEGRATED ENVIRONMENTAL MANAGEMENT

The Dube TradePort Corporation performs as a custodian of the Dube TradePort development node, which is home to King Shaka International Airport. In this scenario, Dube TradePort Corporation is a full-fledged public entity. Integral to its role is the development of a system of governance, which is strengthened by the Dube TradePort Corporation Act (Act No. 2 of 2010) (DTPCA), and Corporation's environmental policy and strategy.

The Dube TradePort Corporation Policy and Strategy states the following as a commitment with direct reference to Governance:
Environmental Policy Commitment:
To continually assess the impact of our activities on the natural environment and annually reviewing objectives, targets and plans relating to significant environmental impacts associated with our operations.
To meet all legal requirements, and agreed upon environmental and public commitments.

Allied to this is legislative compliance with the principles of integrated environmental management (IEM). In achieving the overarching vision of being an environmentally-responsible organisation, Dube TradePort Corporation reports on governance as part of its annual reports and, specifically, in the case of the document at hand, the 2013/14 State of Environment Report (SoER).

Initially IEM in South Africa was associated with authorisations of controlled activities alone. As IEM has evolved, a broader perspective has emerged.

This views IEM as an underlying philosophy and suite of tools that can be infused into decision-making by all sectors of society, inclusive of Government, public sector, private sector and civil society (DEAT, 2004).

In terms of governance, Dube TradePort Corporation was established as a result of the enactment of the KwaZulu-Natal Dube TradePort Corporation Act (Act No. 2 of 2010). This Act established Dube TradePort Corporation as the entity responsible for the strategic planning, establishment, design, construction, operation, management and control of the Dube TradePort, with the mandate to act as a catalyst for Direct Foreign Investment (DFI) in the region.

In 2011, legislation was enacted to see the establishment of the Dube TradePort Corporation as a Schedule 3C Provincial Public Entity under the Public Finance Management Act (Act No. 1 of 1999, as amended) (PFMA).

In terms of the PFMA, the KwaZulu-Natal Provincial Government is allowed to be the sole shareholder of the strategic assets being developed through Dube TradePort Corporation, which is wholly-funded by the Province's Economic Development, Tourism and Environmental Affairs department (EDTEA).

This chapter aims to present the progress that Dube TradePort Corporation has made in the areas of Governance and IEM. Progress for the 2013/14 reporting period is compared against the baseline SoER (i.e. 2011/12) and the Phase 1 EIA process to determine if continuous improvement is taking place.

This chapter also attempts to discern where improvements can and should be made, as well as detailing emerging issues that Dube TradePort Corporation will need to consider in the near and far future. Overall, it should be noted that, Dube TradePort Corporation's governance and IEM strategies have added value both on-site and to surrounding communities.

4.1 PRESSURES

The Dube TradePort Corporation is working towards the goal of becoming Africa's first carbon neutral airport-related development and is also striving to be the first purpose-built aerotropolis in Africa, as well as the first 'green city' on the African continent. It is, therefore, imperative that the services of Dube TradePort Corporation are aligned with this goal and that of sustainable development (DTPC, 2012).

The pressures faced by the Dube TradePort are subsequently the provision of services which makes Dube TradePort a leading economic hub, as identified in the State of the Environment Report of KwaZulu-Natal. Furthermore, Dube TradePort Corporation faces the pressures of legal compliance, as well as compliance with the conditions set out in various environmental authorisations [previously referred to as 'Record of Decisions (RoDs)', hereafter referred to as Environmental Authorisations (EAs)], linked permits, statutory legislation and licences.

Further pressures include:
- Increased capital required for development;
- Transformation of land;
- Increases in resources required; and
- Increases in imports (both locally to the node and on a wider scale).

4.2 STATE

Environmental issues across Dube TradePort Corporation, as an entity, are managed through the organisation's Environmental Sub-programme. This sub-programme is housed within the broader Development Planning and Infrastructure Programme (DPIP). The DPIP Executive reports, via the Executive Committee, to the Dube TradePort Corporation's Board on all environmental and sustainability issues within Dube TradePort. It should be noted that currently no board-level sustainability-specific committee or representative exists.

The Environmental Sub-programme's annual objectives and targets, as well as reconciled performance against previous year's targets, are outlined in the Annual Performance Plan (APP). The mandate of the Environmental Sub-programme, according to the 2012/13 APP is to: 'Ensure that all development planning and practices are sustainable in nature through minimising and preventing environmental impacts by setting policy-related objectives and targets. It also recognises the benefits and importance of developing innovative measures to ensure the long-term protection of the environment'.

4 GOVERNANCE AND INTEGRATED ENVIRONMENTAL MANAGEMENT

The APP also sets about creating annual performance targets and annual Key Performance Indicators (KPIs) for the Environmental Sub-programme. At present, these targets and KPIs are largely focused on:

- Auditing and development of State of Environment Reporting;
- Compliance with Environmental Authorisations (EAs), based on independent audits;
- Rehabilitation of land as per rehabilitation plans (DTPC, 2013b); and
- Promoting development of sustainable green projects within all Dube TradePort precincts.

Striving towards ISO 14001 compliance, an Environmental Management System (EMS) is being developed as part of meeting the requirements for registration. This represents the core standard used by Dube TradePort Corporation for designing and implementing an effective standard.

As part of the EMS, an environmental policy and short statement has been developed, which drives the remainder of the EMS. The EMS, as developed, has been endorsed by top-level management (WSP, 2013b & 2013d). The policy sets out Dube TradePort Corporation's commitment, purpose and objectives, legal requirements and responsibilities.

With the intention and purpose of being a sustainably-developed precinct, Dube TradePort Corporation has ensured that development takes place in a sustainable manner. Key to such sustainable development is procurement and legal compliance.

Three themes have been employed to best depict Dube TradePort Corporation's performance in maintaining a state of environment which is in line with the organisation's strategy and policy, being (a) integrated environmental management, (b) sustainable procurement and (c) sustainable development, each with their respective indicators of state. These are discussed below.

4.2.1 INTEGRATED ENVIRONMENTAL MANAGEMENT

Approximately 30% of the overall Dube TradePort master plan (i.e. building footprint and related infrastructure) has been developed to date.

Authorisation in terms of the National Environmental Management Act (Act No. 107 of 1998, as amended) (NEMA) was granted to develop the Dube TradePort complex on the basis of three separate Environmental Impact Assessment (EIA) applications, being for (i) Dube TradeZone and Support Zone combined, (ii) Dube AgriZone and (iii) Dube TradeZone Watson Highway Link Road. Thus, the development and operation of the Dube TradePort complex is formally authorised through these separate Environmental Authorisations (EAs).

The original EA granted for Dube TradeZone, Support Zone and King Shaka International Airport (KSIA) (TradeZone/Support Zone) was initially appealed by stakeholders. The documentation was amended and updated, with the outcome being that the authorisation was, thereafter, granted as an Appeal Decision on the basis of additional conditions for authorisation, specific to the issues of concern. The authorisation conditions were specified in the EA and are to be managed and applied through the development of an Environmental Management Programme (EMPr) and an Operational Environmental Management Plan (OEMP) for the construction and operational phases respectively on an on-going basis. Proof of compliance with these conditions is required to be submitted to the National Department of Environmental Affairs (DEA, as the Competent Authority) and the activities on-site are regularly audited (DTPC, 2013b).

This process of auditing and monitoring of conditions imposed, forms an important part of an ISO 14001-type EMS framework, thus feeding into both the legislative and administrative compliance processes. It is noted that although not currently ISO 14001-accredited, Dube TradePort Corporation is, in fact, moving towards this goal and, thus, development of documents, such as the EMS along ISO standards, is deemed good practice.

Table 4 details the Environmental Authorisations granted to date.

TABLE 4: ENVIRONMENTAL AUTHORISATIONS (RECORDS OF DECISION) HELD BY DUBE TRADEPORT CORPORATION:

DEVELOPMENT	REFERENCE NUMBER OF ROD/EA
KSIA and DTP	12/12/20/686 (230/8/2007)
AgriZone	12/12/20/1761 (12/03/2010)
Electronic billboards	12/12/20/1709 (29/04/2010)
KSIA and Dube TradePort (Appealed)	12/12/20/686 (29/10/2008)
Watson Highway Link Road Environmental Authorisation	12/12/20/1887 (08/12/2011)
MRO Environmental Authorisation	12/12/20/2340 (01/08/2012)

On-going monitoring and external auditing of the developments are done as per specific Construction EMPs (CEMPs) for the majority of the greater site. For Dube AgriZone and King Shaka International Airport/Dube TradePort-specific Operational Environmental Management Plans (OEMPs), were prepared and approved by the competent authority. At present, the OEMPs are the main mechanisms through which legal compliance with the environmental authorisations are monitored for these specific zones. The monitoring is completed via both internal and external (i.e. independent) audits. Findings from the OEMP Audit of Dube TradeZone and Support Zone (2011) were reported in the 2011/12 SoER (WSP, 2013b). Dube TradePort Corporation is regarded as having a very high compliance rate with respect to the required (and obtained) authorisations, licences and permits, as well as compliance with construction and operational environmental management plans, through the commissioning of a panel of suitably qualified and certified Environmental Control Officers (ECOs) monitor and report on compliance. This panel of ECOs provides a competent list of consultants who may be called upon to tender for various appointments. The panel of ECOs has been active since April 2014. Prior to this date, independent ECOs were appointed as and when an EA was obtained. With regard to compliance with the conditions of its EAs, Dube TradePort Corporation is 98% compliant with environmental audits, based on the various forms of EMPs (both CEMPs and OEMPs). Audit scores were obtained from the Watson Highway Link Road construction, Special Zone 10 infill development and post-construction audits for four of the Dube TradePort Corporation's facilities (DTPC, 2013a). Dube TradePort Corporation's Annual Performance Plan reported expenditure of R6 979 207 on environmental controls for the 2011/12 time period (i.e. 28% of total expenditure of the total development planning and infrastructure allocations), and expenditure of R3 897 260 for 2012/13 (2,27% of total expenditure for development planning and infrastructure allocations).

4.2.2 SUSTAINABLE PROCUREMENT

Data on the percentage of locally sourced services and materials is not currently available from Dube TradePort Corporation, even though this has been identified as a key indicator to be reported on for the SoER. At this time, information on this theme is more qualitative than quantitative and is dominantly in the form of guiding principles. Dube TradePort Corporation has recognised the lack of quantitative data as an area which needs to be improved, e.g. through incorporation of green points in procurement processes.

4.2.3 SUSTAINABLE DEVELOPMENT

The concept of sustainability has been an integral part of development principles and controls since the late 1980s. Understanding of the concept of sustainability has evolved in the 25 years since the Brundtland Commission (Sustainable Cities International, 2012). One of Dube TradePort Corporation's key aims is to achieve sustainability. The organisation acknowledges that it utilises various natural and finite resources in its operations, including fossil fuel energy carriers. It recognises the need to conserve finite resources and the importance of minimising fossil fuel usage so as to mitigate the release of greenhouse gas (GHG) emissions, which contribute to climate change. To this end, a number of non-fossil-fuel energy systems form part of Dube TradePort Corporation. A solar energy system powers the two packhouses and tissue culture building, all of which form part of Dube AgriZone. To limit impacts on natural resources, rainwater harvesting and recycled irrigation water systems are integrated into Dube TradePort. In January 2014 alone, one of the operators saved R140 000 on electricity charges by using solar energy and green initiatives being considered for Dube AgriZone Phase Two, which will further assist farmers in resource usage minimisation (DTPC, 2014b).

Through this intervention, Dube TradePort Corporation will be able to supplement the majority of the energy requirements for these facilities, Dube Cargo Terminal and Dube AgriZone being the largest energy consumers within Dube TradePort precincts (excluding the airport). The PV systems constructed at Dube AgriZone include a 250 kWp system, supplied to the smaller packhouse and a 430 kWp system for the larger packhouse. These supply energy for the systems in the greenhouses and further allow for energy to be exported from the facilities during periods of low activity, thus supplementing other systems' needs (DTPC, 2014d). Dube TradePort Corporation acknowledges the need to minimise fossil fuel consumption and to mitigate GHG emissions through pursuing a strategy which includes the following elements:

- Review and, where feasible, develop renewable energy and energy efficiency projects; and
- Monitor and manage GHG emissions, with the ultimate aim of becoming 'carbon neutral' through the implementation of the Carbon Management Strategy (WSP, 2013d).

Dube TradePort Corporation is dedicated to reducing the use of non-renewable sources of energy and is implementing a number of systems to reduce energy use. This includes the use of natural ventilation in all the greenhouses to reduce the energy required to maintain a stable climate.

FIGURE 12: GRAPHICAL REPRESENTATION OF THE SITE WITH REGARD TO ELECTRICITY CONSUMPTION

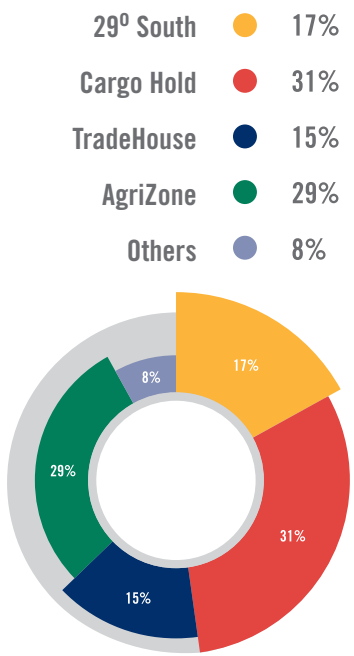


Figure 13 depicts total energy use as reported in 2013 for the packhouses. The energy quick scan investigation identified a total of 513,2 MWh/yr potential savings, which translates to a total of R1 489 350 saving per year. Therefore, energy savings potential at the site are significant, at 7,4% of the total energy usage across all energy carriers (WSP, 2013a).

This would be achievable at a net capital expenditure of some R1 657 200 and would yield a simple payback on investment of 13,5 months, assuming all measures are implemented and Eskom IDM funding is secured for the eligible projects (WSP, 2013a).

The percentage of energy obtained from renewable sources is presented in Figure 14 below. In terms thereof, it is noted that Greenhouse C came online in November 2011. The simulated (or expected) solar energy generated is noted as being similar to that actually generated.

4.2.4 PERCENTAGE INVESTMENT IN SKILLS DEVELOPMENT OF STAFF

The creation of employment opportunities is one of Dube TradePort Corporation's key delivery areas. Employment creation is monitored on a quarterly basis and the conclusion of the 2012/13 financial period saw about 1 300 jobs directly sustained throughout the Dube TradePort precinct, of which 409 were created in the 2012/13 period itself. This excludes jobs at the airport's passenger terminal, which is operated by Airports Company South Africa (ACSA). It should be noted that these figures do not include the cascade implications in terms of indirect job creation; that is, the numerous indirect and induced employment opportunities created by Dube TradePort as a result of linkages to other sectors of the economy (DTPC, 2014a).

The 2011/12 SoER reported that by the end of July 2009, R9 million had been spent on skills development during the construction of Dube TradePort, beating the target of R4 million by more than 100%. A total of 27 131 individuals were trained in core skills, which were identified at the start of the project. Of these, 21 113 were African males and 1 684 were African females (DTPC, 2012).

As at 10 April 2014, the number of direct employees of Dube TradePort Corporation totalled 178 permanent staff and 17 interns. All of these members of staff reside in the eThekwini municipal area. Of these, 64 are semi-skilled and

FIGURE 13: TOTAL ENERGY USAGE FOR PACKHOUSE FACILITIES

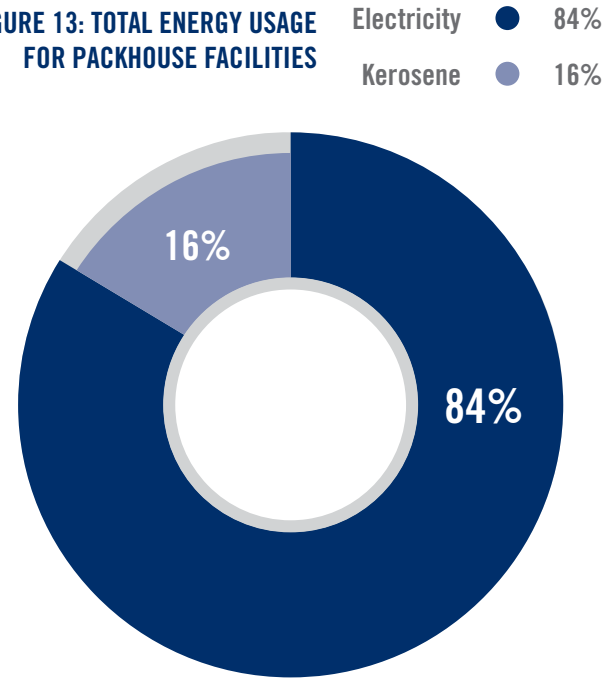
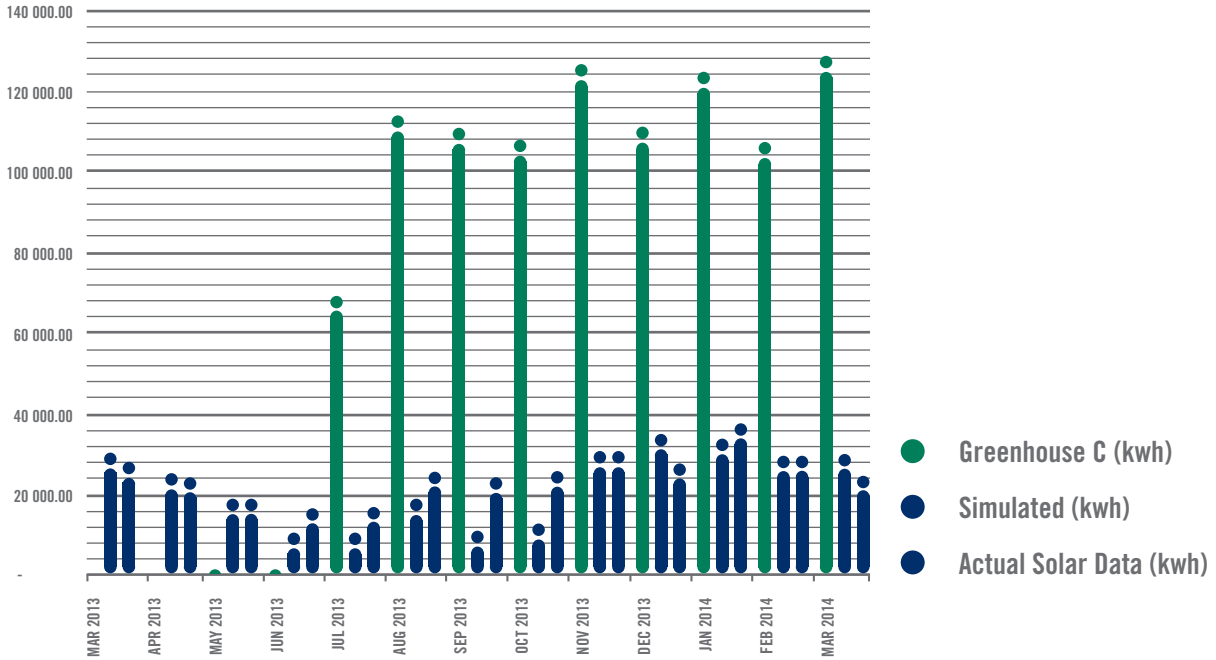


FIGURE 14: TREND IN SOLAR ENERGY EXPECTED VS. GENERATED ON-SITE VS. THE ENERGY REQUIREMENTS OF GREENHOUSE C (MARCH 2013 – MARCH 2014) (IN KWH)



21 are deemed to be unskilled. Dube TradePort Corporation does not currently have any employees with disabilities.

Current construction of the road linking Dube TradeZone to the uShukela Highway is creating a further 879 indirect and induced employment opportunities in KwaZulu-Natal (DTPC, 2014a). However, the Annual Performance Plan 2013/14 showed a planned employment target of 700, showing a significant shortfall.

Dube TradePort Corporation launched an Internship Programme, referred to above, in 2012. The programme trains graduates in a range of disciplines. Recruitment of interns is limited to those who have graduated, but are not yet employed. The programme currently focuses on students from KwaZulu-Natal. This recruitment programme started in October 2013 and by the end of 2013, more than 10 intern candidates had been placed within different divisions at Dube TradePort Corporation. A total of 30-plus candidates are expected to be on the programme by the end of 2014. This programme has received a tremendous response from the public to date. This is reflected in the close to 1 000 applications received. A total of R250 000 is expected to be spent on this programme in the 2013/14 financial year (DTPC, 2014c). The internship expenditure alone for 2014/15 is expected to be close to R1 million. The total Corporate Social Investment (CSI) expenditure in the current time-period (i.e. from March 2013 to March 2014) was R1,74 million, with some of the initiatives highlighted below.

The CSI Annual Report 2013/14 clearly illustrates that DTPC has effectively implemented investment within DTPC's key focus areas. These focus areas include education and skills development, environment and socio-economic development (job creation, business development and the like), with particular attention being paid to economic development and job creation, as well as the empowerment of women and the youth. These focus areas have been identified as areas with scope for further improvement (DTPC, 2014a).

A specific outcome of this programme was a donation towards a local school. Books to the value of R81 000 were donated to the Nkosibomvu Secondary School. Nkosibomvu Secondary School is one of the schools that Dube TradePort has officially 'adopted'. These books proved useful in improving resources within the school's library, with more than 1 400 learners at the school benefiting from the books donation.

A group of at least 100 students from each of five schools selected by the KwaZulu-Natal Department of Education (i.e. a total of 500 learners) received full school uniforms (i.e. trousers/dresses, shirts/blouses, socks and shoes).

The total value of the donated uniforms for the 500 learners amounted to R225 000, as shown in Figure 15 below. The images shown in Figure 16 depict further initiatives by Dube TradePort Corporation.

During the next financial year (2014/15), the value of such donations has been increased to a total of R450 000 with 10 schools to be covered.

FIGURE 15: LEARNERS FROM NKOSIBOMVU SECONDARY SCHOOL RECEIVING DONATED BOOKS

FIGURE 16: A WATER HARVESTING FACILITY - NKOSIBOMVU SECONDARY SCHOOL AND DONATION OF SOLAR PANELS - TRUBEL PRIMARY SCHOOL

For the first time in the history of Dube TradePort Corporation's CSI Programme, a bursary offering for engineering students was established and piloted during the 2013/14 review period. Following a short-listing process and interviews with potential candidates, four students were selected, one each from the following fields of study: electrical engineering, mechanical engineering, computer engineering and chemical engineering.

During 2014, an additional six candidates will benefit from the programme.

Candidates are sourced from three KwaZulu-Natal-based institutions of higher learning, namely the University of KwaZulu-Natal, Mangosuthu University of Technology and the Durban University of Technology. A total of R640 000 has already been spent on this programme to date.

Additional installations of solar power (photovoltaic) units were completed at four schools, being Nkosibomvu Secondary School, Hambanathi Primary School, Sarasvati Primary School and Umdloti Primary School.

The combined cost of the six installations to date exceeds R1 200 000.

4.2.5 PERCENTAGE STAFF USE OF PUBLIC TRANSPORT

Dube TradePort Corporation and ACSA undertook a study in order to determine the current on-site public transport demand, in order to inform a strategy as to how to deal with public transport dynamics, as well as to ascertain whether an internal shuttle service is required.

This was undertaken in order to gain an understanding of the number of users of public transport, both site-wide and within each individual precinct. In order to achieve the objective of the study, questionnaires were completed and there was a 100% participation rate within the precincts of Dube TradePort, facilitating a robust research process.

The study revealed that precinct-wide, roughly 1 920 people work in the various Dube TradePort precincts. Of these 1 920 people, it was found that 1 329 people rely on public transport to commute to and from work. This equates to roughly 70% of those working on-site. The figure below shows that the primary mode of transport used to reach Dube TradePort is taxi, with 38% of respondents indicating that this was their main mode of travel to work. Also notable was the use of private cars as a prime mode of travel (24%) and buses (21%). A total of 619 people were found to be working at Dube TradeZone.

Of this number, 370 people rely on public transport to reach work, equating to approximately 59% of all workers within this area. Overall, the analysis revealed that approximately 238 people work at Dube AgriZone, with 211 relying on public transport, equating to approximately 88% of all workers within the AgriZone precinct.

The majority of workers at the AgriZone travel via train (more than 40% of all workers) and then walk from the Inyaninga Station. Few workers travel from the train station to the site via taxi.

The study considered those walking from the train station to Dube AgriZone to be public transport users and, thus, a potential source of demand. For Dube City, the analysis revealed that a total of 126 people work in and around Dube City, of which number, 61 people (roughly half the total number of workers) are reliant on public transport. The dominant mode of transport in Dube City is undoubtedly the private car, with 56 people travelling via this mode every day.

This was followed by taxi (50 respondents). In addition, four people stated that they take the train and then walk to Dube City[1].

The study was conducted in-depth, analysing times of peak flow in order to gauge statistics which can be used to develop a strategy for public transportation for staff precinct-wide and is, therefore, regarded as a commendable initiative undertaken on the part of Dube TradePort Corporation and ACSA.

The study states that some sort of internal public transportation system is required, considering the number of workers dependent on such a service. Any internal shuttle system would need to look at servicing each node within Dube TradePort. The study makes recommendations for routes, operations, frequency and vehicle type.

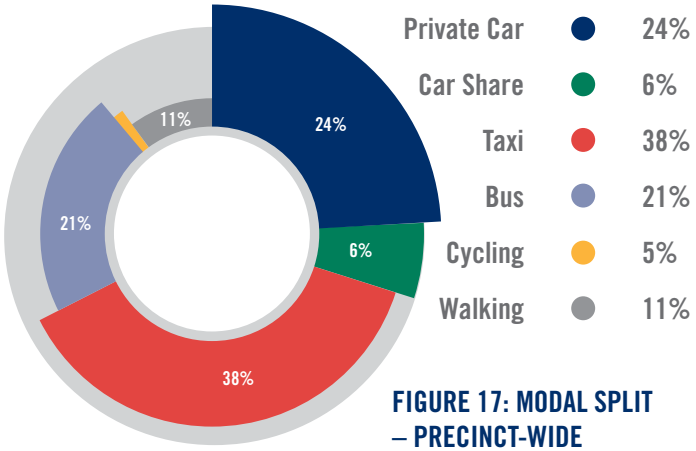


FIGURE 17: MODAL SPLIT – PRECINCT-WIDE

4.3 IMPACTS

Development of an 'edge city' or a self-sustaining aerotropolis creates downstream impacts, such as increased urban sprawl, extended transport networks and bulk infrastructure provision and isolation of elite communities. Further, cumulative impacts stretch beyond the boundary of the study area and beyond the control of Dube TradePort Corporation, but are obviously of concern, both from a negative and positive point of view. It should be

1 These figures represent Dube TradePort only and are not a representation of the ACSA figures. However it is imperative to note that the public transport strategy takes cognisance of Dube TradePort and ACSA figures.

noted that the impacts are not all negative.

The Dube TradePort region is on-track to becoming the purpose-built green aerotropolis it seeks to be. A growing tenant base, with a diverse range of operational activities is, however, acknowledged to increase risks for non-compliance in terms of environmental legislation and/or sustainability compliance.

The need for on-going monitoring and auditing and continual improvement of such systems (as per the Deming Cycle of Continual Improvement through revisiting the goals) is, thus, crucial. Should Dube TradePort Corporation's strategy and policy not be implemented, increased growth could easily result in decreased levels of legal compliance and governance over time.

A point of concern raised is that sustainability is not included at Board Committee level and is, thus, not granted the level of priority that it should be given to ensure that the path to sustainable development is focused upon. It is also noted that the risk assessment methodology employed by Dube TradePort Corporation is based on the traditional financial risk methodology, which may not be best-suited for environmental risk ratings (WSP, 2013d). It is recommended that this be revisited and, if necessary, the risk assessment process be revisited and enhanced to ensure meaningful input from an environmental perspective.

One of the positive impacts identified during the EIA phase included job creation. Thus far, jobs have been created for local people. It is important that Dube TradePort Corporation continues to source staff locally.

4.4 RESPONSES

The Dube TradePort Corporation is committed to being a responsible organisation from a sustainability point of view through minimising and reducing its environmental impact both now and in the future.

This relates to existing projects being rolled-out, approved - but not currently being developed - projects and proposed new or future projects being contemplated.

Dube TradePort Corporation recognises the requirement for sustainable development and, thus, aims to manage environmental issues on an on-going basis and seeks to improve its response to such issues. In order to ensure this, Dube TradePort Corporation has commissioned an environmental policy and strategy, along with a myriad of initiatives to achieve sustainability as listed in the box below.

The Dube TradePort Corporation policy and strategy is pertinent to Dube AgriZone, Dube TradeZone, incorporating Dube TradeHouse and Dube Cargo Terminal and Dube Support Zone (Dube City) only.

The Dube TradePort Corporation Annual Report, produced in terms of the PFMA, sets out the vision, mission, principles and objectives of Dube TradePort Corporation, as well as financial disclosures and annual performance across the range of operational programmes and objectives identified in the previous year's Annual Performance Plan.

The Annual Report also includes sections relating to Corporate Social Investment (CSI), corporate governance, human resources and environmental issues, as well as disclosures regarding environmental performance against annual objectives, as set out for the Planning and Infrastructure Development Programme.

A quick list of the various documents compiled by Dube TradePort Corporation includes:

- Quick Scan Assessment – Energy Risk and Opportunity Assessment – WSP;
- The Safety Health Environmental Quality – Implementation Management System (SHEQ – IMS);
- 'Green' Projects;
- Corporate Social Investment Strategy 2013 – 2016;
- Various CSI projects to the value of R2 752 722;
- Dube TradePort Corporation Development Framework Plan, 2008;
- Dube TradePort Corporation Annual Performance Plan, 2012/13;
- Annual Report, 2012/13;
- Dube TradePort Corporation SoER 2012;
- Operational Environmental Management Plans and Audit Reports;
- Frameworks and Management Plans;
- Environmental Impact Assessments and associated Specialist Studies;
- The Planning and Infrastructure Programme;
- Risk and Audit Committees;
- Advisory Forum (to stakeholder engagement);
- Environmental WG;
- Climate Resilient Committee – comprising Dube TradePort Corporation, ACSA, Tongaat Hulett and the eThekwini's Municipality's eThekwini Environmental Management and Climate Protection Department;
- Master Plan Review Panel – comprising Dube TradePort Corporation, ACSA and the eThekwini Planning Unit;
- Best Environmental Management Practice (BEMP) audit and development of an Aspects and Impacts Register to inform the development of a new OEMP;
- Commitment to Sustainability by 2018;
- Development of Carbon Management Strategy Framework – Strategy to achieve proposed carbon targets;
- Pilot lighting investigation – Dube Cargo Terminal investigating the feasibility of installing energy-efficient lighting, rated at 80 W, to replace the 400 W CFLs;
- Unit Load Device (ULD) Design Challenge – Dube TradePort Corporation is engaging with design professionals to develop a lighter ULD for cargo transfer, to ultimately reduce fuel requirements and, therefore, carbon emissions relating to transport;
- Dube TradePort Corporation Environmental Strategy 2013 – 2018 Action Plan;
- Carbon Calculation Audit; and
- Carbon Offset Certificate for the Fuel Switch at Corobrik's Driefontein Brick Factory in South Africa Project.

At present the requirement for Integrated Reporting under the King III Code of Governance is only applicable to listed South African companies. Non-listed private firms are subject to the Companies Act (Act No. 71 of 2008), which adopts many of the recommendations and policies contained in King III.

Further, there is currently no legal

requirement under the PFMA for public entities to report on environmental and/or social governance issues. The inclusion of Sustainability Performance Indicators (PI) in the PI Framework, as set out by the South African National Treasury (treasury.gov.za/performanceinformation) is, however, encouraged (DTPC, 2013b).

That is to say, such sustainability reporting is considered to be best practice and, although not currently required, is preferred.

Dube TradePort Corporation presents a unique opportunity to meaningfully stimulate the economies of eThekwini Metropolitan Municipality (i.e. the City) and the KwaZulu-Natal Province. Specific opportunities relate to the creation of sustainable employment opportunities through the promotion of Small, Medium and Micro Enterprises (SMMEs), with an explicit focus on Broad-Based Black Economic Empowerment (B-BBEE).

These interventions were identified by Dube TradePort Corporation in the development and subsequent assessment of the Socio-Economic Impact Approach (2009), which aimed to ensure maximum benefit to local communities and businesses. In line with this, the facilitation of participation by relevant stakeholders in the implementation of strategies was identified as, and remains, one of the core business principles of Dube TradePort Corporation (DTPC, 2013b).

It should be noted that stakeholder engagement has been included as a new strategic objective indicator for Dube TradePort Corporation from the 2012/13 APP onwards.

4.5 CONCLUSION

In a peer benchmarking exercise undertaken by Dube TradePort Corporation against various performance criteria and in comparison with similar corporations, Dube TradePort Corporation emerged as being strong in risk management, auditing and compliance, but poor in sustainability. It is recommended that Board-level oversight be prioritised, as this has been identified as a weakness in the current corporate structure of Dube TradePort Corporation (WSP, 2013b & 2013c).

The peer benchmarking exercise identified that if the Dube TradePort Corporation is to effectively incorporate environmental and sustainability issues into the day-to-day running of the organisation, it needs to be sure that its corporate governance structures, policies and strategies are suitably designed to encompass effective environment and sustainability management (WSP, 2013a). The numerous plans, strategy reports, quick scans, risk and opportunity assessments and action plans have laid down an excellent path to follow.

However, the number of periods completed is still relatively low in number, thereby making progress difficult to report on, as the trends are not easily noted.

The lack of information on locally-sourced material remains a challenge for Dube TradePort Corporation. It is recommended that initiatives, such as the inclusion of preference points for the use of local materials (note: some items must be locally sourced, such as T-shirts and some IT items), as linked to a more qualitative assessment of procurement controls, be added to tender documents and that surrounding communities be encouraged to produce products that can be used by Dube TradePort Corporation.

There is growing pressure on public and state-owned entities to utilise the integrated reporting approach and principles championed by King III, to more fully embrace stakeholder inclusivity and to fulfil the critical need to maintain social, economic and environmental sustainability.

KPMG (2012) and others have highlighted the alignment of the PI initiative, with a special focus on the sustainability PI, as an indication that Integrated Reporting is likely to be the future for public sector reporting in South Africa.

Although not listed on the stock exchange, reporting at the level required for King III requirements would be worth working towards. Consideration of the need for integrated reporting is reflected in the 2011/12 Dube TradePort Corporation Annual Report, which includes sections relating to CSI, Corporate Governance, Human Resources and Environmental issues (DTPC, 2013b). There is no formally authority-approved process in place to identify operational impacts and aspects associated with activities at the Dube TradePort for the entire site. It is highly recommended that this be set up. It is recommended that a Rudimentary Legal Register be maintained for the entire site and not limited to Dube AgriZone alone and that a monthly compliance audit and audit protocol of not only an EMP that audits EAs, but also day-to-day operations and best practice be established as well. It is noted that quarterly operational audits are undertaken and, currently, an external operation audit is being undertaken by an independent ECO. Impacts and Aspects Registers are in place and used for Dube AgriZone. The site, as a whole, is monitored via an internal protocol, as well as compliance registers.

While the poverty of the surrounding communities cannot be attributed to Dube TradePort Corporation, it is still essential for Dube TradePort Corporation to continue tackling surrounding poverty issues as part of its sustainability responsibility. To be committed to energising the decision-making processes through increased participatory democracy, Dube TradePort Corporation should work to:

- Further develop a commonly shared, long-term vision for a sustainable city, or aerotropolis;
- Build participation and sustainable development capacity in the local community;
- Invite all sectors of local society to participate effectively in decision-making;
- Make decisions open, accountable and transparent; and
- Co-operate effectively and in partnership with adjoining businesses, other cities and towns and other spheres of Government (Sustainable Cities International, 2012).

5 NATURAL AND CULTURAL HERITAGE

South Africa's heritage resources are both rich and widely diverse, encompassing sites from all periods of human history. Resources may be tangible, such as buildings and archaeological artefacts, or intangible, such as landscapes and living heritage.

Their significance is based upon their aesthetic, architectural, historical, scientific, social, spiritual, linguistic, economic or technological values. Heritage resources are also representatives of a particular period of history, rarity and sphere of influence.

Heritage resources found on Dube TradePort land generally dates to the pre-colonial era. Extensive Later Iron Age archaeological sites representing a millennium of coastal farming settlement are present on virtually every hilltop.

These sites include the remains of homesteads with artefacts, such as human burials, ceramic sherds and food remains, as well as iron smelting and smithing sites. Regrettably, site-levelling has obliterated some of these sites, while decades of ploughing for sugar cane farming purposes has dramatically reduced the scientific value of the remains.

More recent heritage resources include structures and buildings, such as colonial residences and traditional burial places.

The latter generally comprise the graves of Indian - and other indentured labourers - who worked on the cane plantations and whom are not located in formal cemeteries.

The indicators used to describe the state of cultural heritage are an assessment of heritage resource value and significance and an assessment of potential development impacts. Heritage resources are significant only to the extent that they have public value. In addition, this chapter highlights some of the heritage resources of conservation value found at Dube TradePort, as well as the potential impacts of developments.

5.1 PRESSURES

The integrity and significance of heritage resources can be jeopardised by natural processes (e.g. erosion) and human activities (e.g. development). In the case of human activities, a range of legislation exists to ensure the timely identification and effective management of heritage resources for present and future generations.

Heritage resources in the study area will continue to be threatened by new infrastructural developments and agricultural activities. However, the significance of these negative impacts is likely to remain low in the case of archaeological sites, given the low heritage value. If identified in a timely manner, impacts on traditional burial places are likely to remain positive, with management interventions favouring in situ preservation.

5.2 STATE

A number of heritage impact assessments have been undertaken to date to identify heritage resources and develop plans to manage sensitive sites (eThembeni, Strategic Environmental Focus and Umlando 2007, 2009, 2010, 2012 and 2013).

In addition, this provides the opportunity for Dube TradePort Corporation to identify land suitable for development. Three heritage sites have been noted, as well as areas of moderate paleontological sensitivity. Two archaeological sites are of low significance and do not require further mitigation.

One site requires the area to be re-assessed after bush clearance because of the possibility of human remains from settlements dating to the early part of the 20th century. A paleontological sensitive area was also identified where remains could occur at a level of two metres below the surface. Structures and archaeological site details are summarised in Table 5, which follows.

TABLE 5: STRUCTURES AND ARCHAEOLOGICAL SITES WITHIN DUBE TRADEPORT

DESCRIPTION	LOCATION	HERITAGE SIGNIFICANCE	CURRENT STATUS AND RECOMMENDATION
Inyaninga Ex-Residents' Memorial Garden	S 29° 36' 24" E 31° 05' 48"	Medium	Fenced and landscaped, with public access
Farmstead, cement block and brick ruins	S 29° 37' 23.0" E 31° 06' 54.0"	Low	Demolish with permit from Amafa
Compound, structures have been demolished	S 29° 37' 59.5" E 31° 06' 49.5"	Low	Remove with permit from Amafa
Nid residence, dating to 1968	S 29° 36' 36.8" E 31° 05' 49.2"	Low (possibly low to medium)	May not alter or demolish without permit from Amafa
LIA hilltop settlement, with slag, flattened for construction of modern structures (compound), also now in ruins	S 29° 37' 30.5" E 31° 06' 47.0"	Low	Demolish with permit from Amafa
LIA hilltop settlement, very few ceramic sherds and hammer stones.	S 29° 37' 17.0" E 31° 07' 04.5"	Low	
LIA hilltop settlement, ceramic sherds <5/10m² and very fragmented; one whetstone	S 29° 37' 37.0" E 31° 07' 18.5"	Low	
LIA hilltop settlement, ceramic sherds <5/10m² and very fragmented; smithing slag	S 29° 37' 55.0" E 31° 07' 04.0"	Low	
Deflated LIA iron working midden with bloomery/smithing slag; ceramic sherds >10m² on surface, no artefacts in profile. Located in saddle on high point	S 29° 37' 45.7" E 31° 06' 36.5"	Low	
LIA hilltop settlement, ceramic sherds only, <2/10m²	S 29° 37' 50.0" E 31° 06' 36.5"	Low	
LIA hilltop settlement, ceramic sherds only, <2/10m²	S 29° 37' 45.5" E 31° 06' 30.5"	Low	

5.3 IMPACTS

A heritage resource impact may be defined broadly as the net change, either beneficial or adverse, between the integrity of a heritage site with and without the proposed development. Beneficial impacts occur wherever a proposed development actively protects, preserves or enhances a heritage resource, by minimising natural site erosion or facilitating non-destructive public use, for example. More commonly, development impacts are of an adverse nature and can include:

- Destruction or alteration of all or part of a heritage site;
- Isolation of a site from its natural setting; and/or
- Introduction of physical, chemical or visual elements that are out of character with the heritage resource and its setting.

Beneficial and adverse impacts can be direct or indirect, as well as cumulative, as implied by the aforementioned examples. Although indirect impacts may be more difficult to foresee, assess and quantify, they must form part of the assessment process. In the study area, development impacts on archaeological sites generally entail their destruction (with a permit from Amafa), once basic recording is complete, since their nature and significance does not warrant detailed site sampling/excavation or incorporation into the development. However, it is advisable to manage traditional burial places in situ wherever possible (as in the case of the Inyaninga Ex-Residents' Memorial Garden), since relocation of human remains is time-consuming and carries a high emotional and financial cost.

5.4 RESPONSES

5.4.1 LEGISLATION

The South African Heritage Resources Agency (SAHRA) is the national administrative body responsible for the protection and management of South Africa's cultural heritage. SAHRA was established through the National Heritage Resources Act (NHRA) (Act 25 of 1999), and together with provincial heritage resources authorities, is one of the bodies that replaced the National Monuments Council.

Section 27 of the NHRA of South Africa provides for places of historic or cultural importance to be designated as national heritage sites. Both national and provincial heritage sites are protected under the terms of Section 27 of the NHRA and a permit is required to work on them. National heritage sites are declared and administered by the national heritage resources authority, SAHRA. Provincial heritage sites fall within the domain of the various provincial heritage resources authorities. In this instance, Amafa is the KwaZulu-Natal Heritage Resources authority.

Dube TradePort Corporation can refer to the set of assessment criteria commonly used to assess the impacts of a proposed development on identified heritage resources, particularly in non-surveyed landholdings and further development phases.

5.4.2 MEMORIAL GARDEN

During the second half of the 19th century, two broad categories of Indian immigrants arrived in the then Province of Natal. The first group of indentured labours began to arrive in November 1860 and were known as 'girmitiyas' or 'grimitkaran'. This was as a result of a decision taken the previous year by the Government of India to include Natal in the indenture system, which had been in operation in other parts of the British Empire since 1842 (Wright & Hamilton, 1989, found in SEF, 2012). The second group consisted of free immigrants who arrived as traders and were usually called 'passenger' Indians. The Indian community became established in Natal over the years, as only about 24% of the first phase of more than 150 000 men, women and children of the indentured group had returned to India by 1911. The second phase lasted from 1874 to 1911 (Wright & Hamilton, 1989, found in SEF, 2012). The majority of the Indians who did not return to India worked on sugar plantations as labourers.

As testimony to this history of agriculture and indentured labour, a grave site of residents of Inyaninga was uncovered within the Dube TradePort property in 2010 during vegetation clearing (SEF, 2012). These residents were indentured labourers, who once worked on sugarcane plantations in the area. Once the area was cleared, three headstones were discovered, suggesting that the first burials occurred around the 1940s.

The Indian tradition of cremation was not acceptable by the Government of the time. Yet, few people could afford tombstones, so iron rods were used as markers. The entrance to the burial ground had two iron rods on either side. This was 'The Gateway to Heaven' (Tamil – Harichandra Kovil). An offering would be made here before entering the site. To off-set the stench of decomposing bodies, salt, talcum powder and perfume were placed in the coffins. Trees were also planted on the graves. African labourers were also buried here. The presence of the plant, Sanseveria Trifasciata (mother-in-law's tongue), is significant in Africa, as this plant is believed to be a protective charm against evil.

Dube TradePort Corporation has worked closely with the public to restore the area and create a memorial garden to honour the ex-residents of Inyaninga. This memorial garden includes a beautiful contemplative space for the public to reflect and pay homage to those who paved the way before us. It is also used for educational purposes for the general public and, in particular, school children.

5.5 CONCLUSION

Heritage resource management in Dube TradePort has proceeded in a timely manner, systematically and in accordance with relevant legislation, including the NHRA and the KwaZulu-Natal Heritage Act 4 of 2008. The management authority should ensure that financial provision is made for on-going heritage requirements, including Heritage Impact Assessments (HIAs) of non-surveyed landholdings and the maintenance of the Inyaninga Ex-Residents' Memorial Garden.

In addition, to preserve as a heritage asset, Dube TradePort Corporation must lodge an application for permanent protection of the Inyaninga Memorial Site with the Provincial Amafa KwaZulu-Natal.

From an overall perspective, positive progress has been made in the conservation and protection of sensitive heritage sites.

Most importantly and in working with the public, Dube TradePort Corporation has forged a strong relationship, which will see continued progress of this nature.

6 WASTE MANAGEMENT

"We all have a responsibility to learn how to live and develop sustainably in a world of finite resources."
- Archbishop Emeritus Desmond Tutu, 2009

Waste is only considered waste if it no longer serves a purpose. Traditionally, waste has been seen as a by-product or end-of-use material that is to be disposed of. However, waste can play a role as a valuable resource to further economic growth in the manufacturing of second generation products, materials recovery and the recycling industry, generation of energy, up-cycling and art, amongst other things. This shift in the management approach to waste provides some relief to the pressure placed on finite resources, e.g. less virgin material used in manufacturing. It also results in less waste being land-filled, which can then be significantly reduced if waste can be used as a source of energy.

The primary law regulating waste management in South Africa is the National Environmental Management: Waste Act (Act 59 of 2008) which defines waste as 'any substance, whether or not that substance can be reduced, re-used, recycled and recovered'. Some of the objectives of this Act include (DST, 2012):

- Minimising the consumption of natural resources;
- Avoiding and minimising the generation of waste and reducing, re-using and recovering waste; and
- Promoting and ensuring the effective delivery of waste services.

Waste can be divided into two main categories, namely, general and hazardous waste. This is further sub-divided into recyclable and non-recyclable waste. General waste is defined as waste that does not pose an immediate hazard or threat to health or to the environment and includes domestic waste, building and demolition (rubble) waste, business waste and inert waste. This type of waste may be disposed of at any authorised waste disposal facility. Hazardous waste, on the other hand, is defined as any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment. Hazardous waste is rated according to its toxicity and has to be treated and disposed of in facilities appropriate for its rating (DEADP, 2004). Due to the nature of the operations at Dube TradePort, various waste streams are produced. This chapter, however, will focus specifically on the management of solid waste at the Support Zone, Dube AgriZone, Dube TradeHouse and Dube Cargo Terminal. Waste from these zones is managed by a private contractor, who collects waste from tenants and delivers such waste to a central waste sorting and storage facility at each site. At this facility, waste is separated into the various categories of recyclables and non-recyclables. The collection of waste is undertaken weekly, but sorting takes place daily.

Dube TradePort has three operational zones which it directly controls. Dube Support Zone, also known as Dube City, currently consists of the 29° South Head Office building, main access roads and pedestrian boulevards (DTPC, 2013b).

Dube AgriZone covers an area of about 20 hectares, with 16 hectares of greenhouses, office building, tissue culture building, distribution centre and packhouses for individual greenhouses, as well as the plant nursery building. This area is a high-tech agricultural cluster hosting the largest climate-controlled growing area under glass on the continent (DTPC, 2013b). Dube TradeZone currently encompasses three main facilities, being Dube TradeHouse, the FoodZone take-away facility and Dube Cargo Terminal.

The TradeHouse is a complex of individual warehousing units utilised by various tenants for freight forwarding and office facilities for airfreight and logistics-related businesses (DTPC, 2013b). Adjacent to Dube TradeHouse is a take-away facility operated by a third party. The waste from this facility is also collected, sorted and stored within the TradeHouse waste sorting facility. Dube Cargo Terminal links strategically to the TradeHouse, Valuable Cargo Building and the King Shaka International Airport (KSIA) apron, providing storage and handling capacity for, predominantly, airfreight-related activities.

Each of these areas undertakes activities that are related to the intended function or purpose of that zone. The waste generated, in terms of type and quantity, is directly dependant on these activities. This chapter will only include facilities which fall under the direct operational control of Dube TradePort Corporation. Waste generated from King Shaka International Airport (KSIA), which falls under the operational control of Airports Company South Africa (ACSA), will not be included in this chapter. The waste chapter will, thus, focus on the three existing zones of Dube TradePort Corporation:

- Dube Support Zone (Dube City);
- Dube AgriZone; and
- Dube TradeZone (which includes Dube TradeHouse, then FoodZone take-away and Dube Cargo Terminal).

The indicators of waste which were reported on in 2011/12 included waste generation by source, percentage waste recycled and waste disposal by type. For the period 2013/14, the indicators that will be reported on will change to some degree, as follows:

- Waste generation by source and by type;
- Percentage waste diverted from landfill (recycled and re-used); and
- Percentage waste disposed.

6.1 PRESSURES

Population growth and waste generation are largely influenced by economic prosperity. In addition, technology is constantly improving, driving a continual need for new technology. This creates a cycle where products become obsolete very quickly. This not only makes waste management challenging, but expensive. The subsequent sections look at the types of waste and activities which take place in each zone, as well as how Dube TradePort Corporation disposes of the waste it generates.

6.1.1 WASTE GENERATION SUPPORT ZONE

The Support Zone, also known as Dube City, is the first purpose-planned airport city and currently consists of the 29° South Green Star-rated Head Office building of Dube TradePort Corporation. Perpetuating environmental sensitivities, the Support Zone incorporates pedestrian-

friendly zones, tree-lined boulevards and dedicated cycle lanes (DTPC, 2013d). Currently in its first phase of development, the Support Zone follows sustainable development principles, with the aim of creating an ultra-modern urban 'green' hub (DTPC, 2013d). This includes commercial, hospitality and retail facilities. Even though this zone will be developed by the private sector through public-private partnerships, in response to market demand, Dube TradePort Corporation will retain ownership and control of common and administrative areas (DTPC, 2013b). The operational facilities available in the Support Zone are listed in Table 6, along with a description of what takes place at each facility:

TABLE 6: DESCRIPTION OF EACH FACILITY WITHIN THE SUPPORT ZONE (DTPC, 2013B)

FACILITY	DESCRIPTION
29° South	Head Office of Dube TradePort Corporation, with conference facility, restaurant and additional space for other tenants.
Southern Waste Water Treatment Works	A waste water treatment facility has been constructed by ACSA as part of bulk infrastructure for the treatment of effluent from the southern portion of the Dube TradePort site. This, however, is managed and operated by ACSA.
Roads and Infrastructure	Tarred roads and parking areas have been developed to service the future Dube City. Future developments include pedestrian-friendly zones, bus stops and cycle lanes.

Considering the nature of the zone, the majority of the waste generated from an office block is paper. However, other items of waste that are generated from this area include recyclable items, such as plastic, metal and glass. It should be noted that waste from public bins is also considered as waste being generated from this zone. In addition, the public and staff are encouraged to bring recyclable waste from home, including paper, glass, cans, as well as plastic and glass bottles.

DUBE AGRIZONE

The high-tech Dube AgriZone is a cluster within Dube TradePort, which hosts the largest integrated perishable supply chain climate-controlled growing area under glass in Africa (DTPC, 2013c; DTPC 2013d). Covering a total area of 20 hectares, Dube AgriZone has 16 hectares of greenhouses (DTPC, 2013c).

Dube AgriZone produces vegetables and cut flowers and, therefore, the majority of waste generated in this zone is green (compostable) waste. However, it should be taken into account that other operational facilities are also present in this zone. The second grade vegetables produced in the AgriZone, which are of an edible nature, are donated to local school initiatives and those that are damaged are composted or disposed of as green waste for composting. Other types of waste generated in this zone include (DTPC, 2013a):

- Hazardous fertiliser/pesticide packaging;
- General domestic waste from office buildings and administration facilities;
- Used hydroponic grow-pots;
- Contaminated cleaning rags and absorbent materials from hazardous liquid spill cleaning; and
- Hazardous waste (fluorescent light bulbs, batteries and the like) from office buildings.

It should be noted that the AgriZone also produces liquid effluent from its operational and domestic activities. However, this chapter will only cover the generation of solid waste. Green waste contains valuable nutrients which can be used to produce energy. Dube TradePort Corporation's Environmental Strategy (2013d) indicates that compostable waste or green waste is transported to a compostable site. However, a feasibility study was carried out for a 2MW waste to energy plant. Furthermore, the partnership between the University of KwaZulu-Natal and Dube TradePort Corporation is being investigated.

DUBE TRADEZONE

Dube TradeZone is the first resource of its kind in the world where all freight forwarders and shippers are located in one facility, with airside access and specialised industrial land for development (DTPC, 2013d). Many well-known freight-forwarders and shippers directly connected to the Cargo Terminal are housed within the Dube TradeHouse via an elevated conveyor system (DTPC, 2013d). Dube Cargo Terminal is a state-of-the-art secure facility, which is owned and operated by Dube TradePort Corporation. The Cargo Terminal provides storage and handling capacity for airfreight and related industries and is thus strategically linked to the TradeHouse, the Valuable Cargo Building and the King Shaka International Airport apron (DTPC, 2013d). The nature of the activities that take place in Dube TradeZone include cargo handling, chemical storage, equipment maintenance, fuel storage, vehicle staging and washing, as well as packing (DTPC, 2013a).

A summary of the operational facilities available at Dube TradeZone are listed in Table 7, along with a description of what takes place at each facility.

6 WASTE MANAGEMENT

TABLE 7: DESCRIPTION OF EACH FACILITY WITHIN THE TRADEZONE (DTPC, 2013C)

FACILITY	DESCRIPTION
Dube TradeHouse	A series of warehousing units for a variety of logistics applications. The warehouses are serviced by a fleet of gas-powered forklifts.
Fuel Storage Facilities	Lockable storage areas have been constructed for the storage of liquefied petroleum gas.
Roads and Infrastructure	Large outside loading areas, tarred road access between Dube Cargo Terminal and Dube TradeHouse.
Cargo Terminal	The Dube Cargo Terminal comprises domestic and international sections, with airline carriers having their own areas. Included in the Cargo Terminal is a transit shed and a warehouse where containers can be collected by the airfreight handling companies and despatched to their final destinations. A high security storage area for the transit of dangerous goods and a Valuable Cargo facility have also been incorporated into the Cargo Terminal. A perishables centre is also found within the Cargo Terminal, offering specialised cold storage, handling capacity, inspection and technical support.
Fuel Storage Facility	Above-ground storage tanks for the storage of diesel for back-up generators.

Overall, the waste arising from Dube TradeZone consists mostly of paper and plastic and includes other items such as:

- Wood from unserviceable pallets and unused packing cases;
- Cardboard;
- Discarded ropes;
- Computer parts;
- Steel;
- Glass (light bulbs);
- Packaging materials (tin, glass, plastic); and
- Contaminated cleaning rags and absorbent materials (from hydrocarbon and acid spill cleaning).

At Dube Cargo Terminal, a specific area is dedicated to the storage of hazardous cargo.

The hazardous materials storage area is designed according to SANS standards, with the necessary containment measures and spill kits in the event of a spill of hazardous materials during transit (DTPC, 2013a).

6.1.2 WASTE DISPOSAL

Waste from the Support Zone, Dube AgriZone and Dube TradeZone is managed by an appointed waste management contractor, who collects the waste from the Dube TradePort tenants and delivers such waste to a central waste sorting facility, i.e. a satellite storage facility at each site on a weekly basis (DTPC, 2013a). Here, the contractor sorts the waste into its various streams, such as recyclable and non-recyclable waste. The recyclable waste (such as glass, metal, plastic and paper) is recycled by an approved recycling contractor, while non-recyclable waste, such as general domestic waste, is delivered to landfill sites by an approved contractor. Hazardous waste, which is safely contained within the relevant zone is removed on a needs basis and safely disposed of at a hazardous waste facility.

Records of waste volumes are generated by the contractor for each of the zones. A spreadsheet displays the following information:

- Monthly volumes/mass of the different waste streams collected from each tenant;
- Monthly volumes/mass of the waste that is disposed of at a landfill site;
- Monthly volumes/mass of the waste that is recycled; and
- CO_2 emissions reduction as a result of recycling.

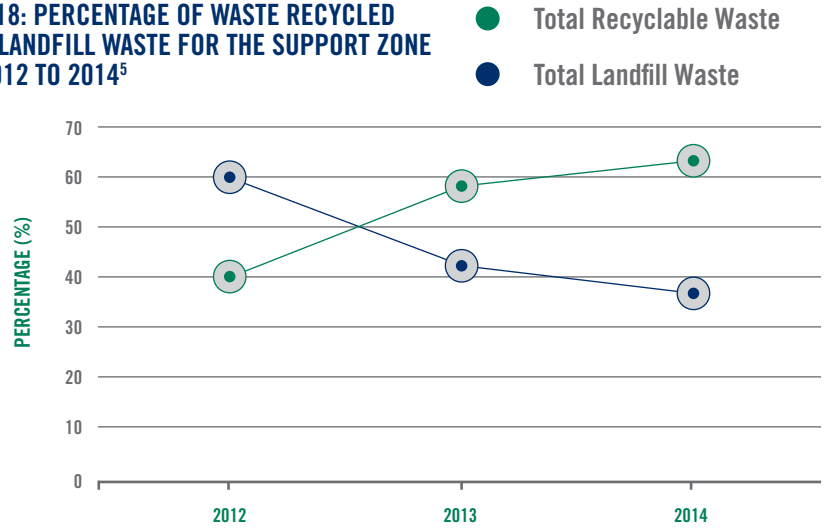
6.2 STATE

For the period January to March 2014, Dube TradePort Corporation has produced approximately 51,8[2] tonnes of solid waste across 29° South, Dube AgriZone, Dube TradeHouse and Dube Cargo Terminal. These waste types consist of paper, plastic, metal, glass, compost and general waste. Of this total, the Support Zone has managed to recycle 63% of waste, while the TradeHouse, recycled 57% of its waste. The AgriZone recycled 34% and 43%[3] of waste generated. It is interesting to note that the least amount of waste going to landfill comes from the Support Zone and TradeHouse. Furthermore, the general trend shows that waste going to landfill has increased over the three-year period. However, this is balanced by an increased amount of waste

2 Data for Dube AgriZone is only considered for the month of March and February 2014.

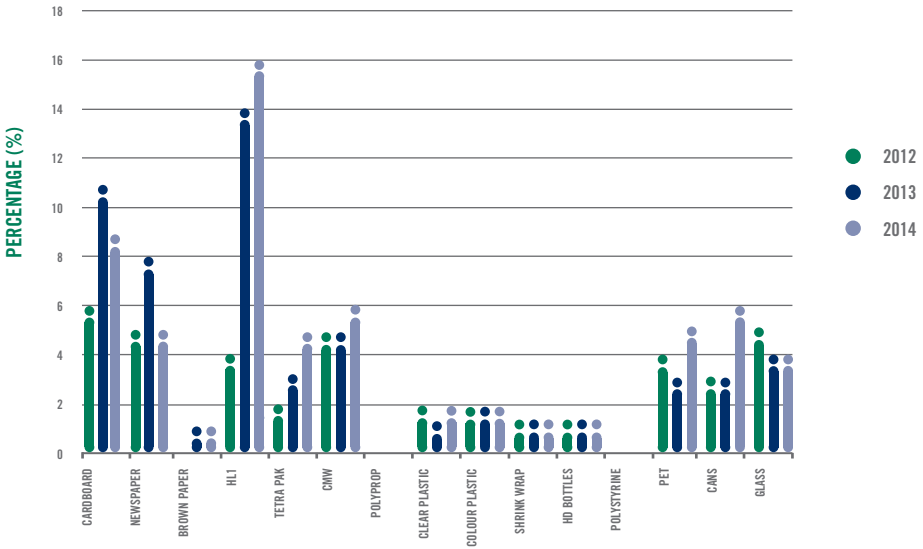
3 These values are not a true reflection of the amount of waste recycled.

FIGURE 18: PERCENTAGE OF WASTE RECYCLED VERSUS LANDFILL WASTE FOR THE SUPPORT ZONE FROM 2012 TO 2014[5]



	2012	2013	2014
TOTAL RECYCLABLE WASTE	40	57	63
TOTAL LANDFILL WASTE	60	43	37

FIGURE 19: PERCENTAGE RECYCLED WASTE BREAKDOWN FOR THE SUPPORT ZONE DURING 2012 TO 2014[6]



being recycled. This can be attributed to increased occupation capacity of Dube TradePort Corporation facilities, with new tenants. The sections below will unpack the amount of waste generated in each zone and briefly look at waste minimisation strategies and greening initiatives at Dube TradePort Corporation. Furthermore, the subsequent section will provide a summary of waste indicators and consider future projections of waste at Dube TradePort Corporation.

6.2.1 WASTE GENERATION SUPPORT ZONE

Waste is separated into recyclable and non-recyclable waste. In the Support Zone, non-recyclable items are those items which cannot be recycled and are, therefore, sent to landfill sites. Recyclables, on the other hand, are categorised into the following:

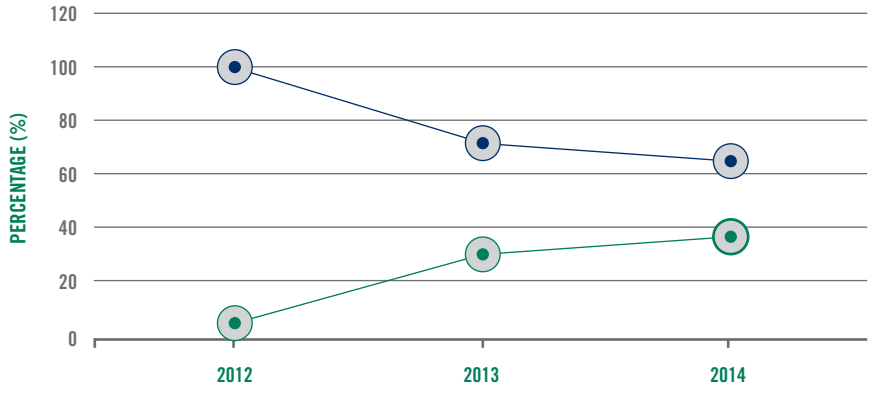
- Paper (e.g. cardboard, newspaper, brown paper, HL1, tetra pak[4] and CMW);
- Plastic (e.g. polyprop, clear and colour plastic, shrink-wrap, HD bottles, polystyrene and PET);
- Metal (e.g. cans); and
- Glass.

For the three-year period 2012 to 2014, the percentage of recyclable versus non-recyclable waste can be represented by Figure 18. It should be noted that for 2014, only data for three months, January to March, has been taken into account. The current year, 2014, (even though only three months were considered at the time of writing this report), showed that the amount of recyclable waste increased to 63% and the amount of non-recyclable waste decreased further to 37%. The previous year, 2013, showed that the amount of recyclable waste increased to 57%, with a reduction of 43% of waste going to landfill. During 2012, 40% of waste generated was recycled, while the remainder of 60% of waste was disposed of at landfill.

It appears that the amount of waste recycled versus the amount of waste going to landfill appears to be inversely proportional. From 2012 to date, the amount of waste going to landfill appears to decrease, whereas the amount of waste being recycled appears to increase. It is clear from Figure 19 that during 2014, the majority of waste generated in this zone is HL1 (Heavy Letter One), which consists of white printed or unprinted sheets of paper, shavings originating from printers or office records (16%); followed by cardboard (9%) and then cans (6%). The previous year, 2013, HL1 (14%), cardboard (11%) and newspaper (8%) produced the most recyclable waste. During 2012 far less waste was recycled. Nonetheless, cardboard amounted to 6% while newspaper, CMW and glass produced amounted to 5% each.

4 Noted: There is inconsistency in the management or monitoring of tetrapak between the AgriZone and the Support Zone. In the Support Zone tetra pak is grouped with paper. In the AgriZone it has its own category.
5 Note that 2014 consists of only three months (January to March 2014).
6 Please refer to footnote number 4.

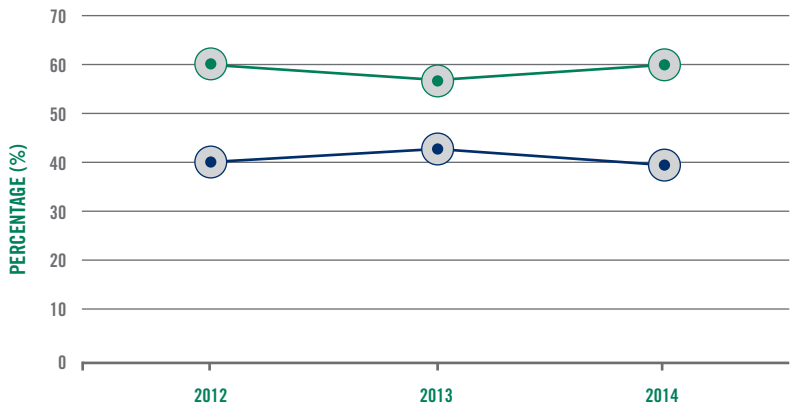
6 WASTE MANAGEMENT



	2012	2013	2014
TOTAL RECYCLABLE WASTE	1	30	34
TOTAL LANDFILL WASTE	99	70	66

FIGURE 20: PERCENTAGE OF WASTE RECYCLED VERSUS LANDFILL WASTE FOR DUBE AGRIZONE FROM 2012 TO 2014

Total Recyclable Waste
Total Landfill Waste



	2012	2013	2014
TOTAL RECYCLABLE WASTE	60	59	57
TOTAL LANDFILL WASTE	40	41	43

FIGURE 21: PERCENTAGE OF WASTE RECYCLED VERSUS LANDFILL WASTE FOR THE SUPPORT ZONE OVER A THREE-YEAR PERIOD[7]

Total Recyclable Waste
Total Landfill Waste

DUBE AGRIZONE

Waste produced in Dube AgriZone is largely as a result of the activities which take place on-site. Like the Support Zone, waste in the AgriZone is separated according to recyclable and non-recyclable items. However, the sub-sections differ somewhat. For instance, non-recyclable waste includes general waste and hazardous waste, which are further categorised into:

- Grease traps;
- Quanti trays with sample bottles;
- Reagents from lab test kits; and
- Washing from apparatus.

Recyclable waste items include:

- Paper (e.g. scrap cardboard, newspaper and office paper);
- Plastic (e.g. HD bottles, LD film, LD plastic, PP bag, PP pet and PVC);
- Compost (e.g. vegetable waste); and
- Tetrapak (e.g. tetra post-consumer).

The waste recycled from Dube AgriZone and waste sent to landfill can be represented by Figure 20. It should be noted that for 2014, only data for three months, i.e. January to March, has been taken into account.

For the three months of 2014, 34% of waste was recyclable and 66% of waste was sent to landfill. The amount of waste recycled increased from the previous year's 30%. Conversely, the amount of waste sent to landfill has reduced from 70% in 2012.

Please note that for 2012 the volume report has not been made available. As a result, only one month's data was available (September), hence the 1% of recycled waste and 99% of landfill waste. Should the volume report become available, the expected trend would be an inversely proportional relationship between the amount of waste recycled and the amount of waste going to landfill.

Dube TradeZone consists of two main facilities (including a small restaurant/take-away facility): Dube TradeHouse and Dube Cargo Terminal. Waste generated from the TradeHouse follows a similar structure to that of the Support Zone, where non-recyclable items include general waste and recyclable items include paper, plastic, metals, and cans.

Figure 21 represents the amount of waste from the

7 Note that 2014 consists of only three months (January to March 2014).

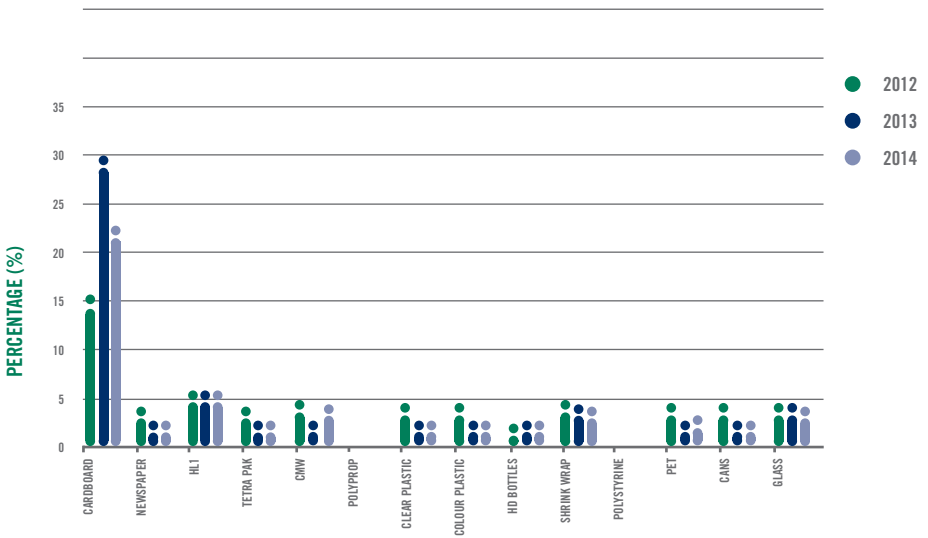


FIGURE 22: PERCENTAGE RECYCLED WASTE BREAKDOWN FOR 2012, 2013 AND 2014

	2013	2014
TOTAL RECYCLABLE WASTE	27	22
TOTAL LANDFILL WASTE	73	78

FIGURE 23: PERCENTAGE OF WASTE RECYCLED VERSUS LANDFILL WASTE FOR DUBE CARGO TERMINAL FOR 2013 AND 2014[8]

TradeZone which has been recycled and which has been sent to landfill.

The observed trend is that recycled waste and landfill waste produced from the TradeHouse mirror each other. Landfill waste appears to have increased somewhat from 2012 to 2014, whereas recycled waste has decreased.

About 57% of waste from the TradeHouse has been recycled for 2014. This amount has reduced when compared against the previous year's 59% and 60% in 2012. In terms of landfill waste, the amount of waste produced has increased from 2012 to 2014. For 2014, 43% of waste was sent to landfill. This amount increased from the previous year's 41%. During 2012, 40% of waste at the TradeHouse was sent to landfill.

A further breakdown of the waste recycled for 2014, 2013 and 2012 is illustrated by Figure 22. For 2014, cardboard, HL1 and CMW produced the most waste amounting to 23%, 7%, and 4% respectively. Cardboard (30%) and HL1 (7%) generated the most waste for the 2013 period. Not much waste was recycled during 2012. However, waste for this period included cardboard (16%) and HL1 (7%).

Recyclable versus non-recyclable waste for the Cargo Terminal is represented by Figure 23. Please note that a detailed analysis includes eight months of recorded volume data, available for 2013, and the remaining four months is an average of this amount. Unfortunately, there are no records of volume data for 2012.
Besides general waste, the non-recycled waste in this zone consists mainly of fluorescent tubes.

6.2.2 WASTE MINIMISATION

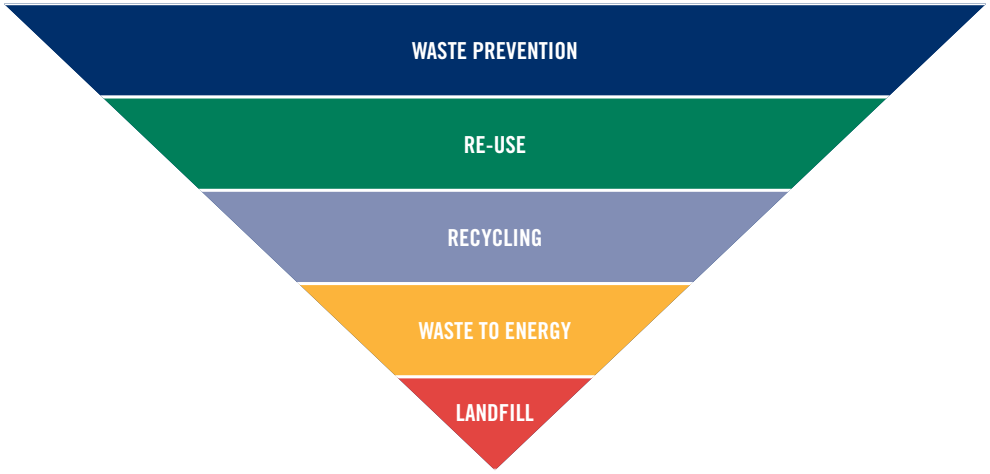
Waste minimisation is the process of reducing the amount of waste generated. When solid waste management services are planned for and implemented, the waste hierarchy should always be kept in mind (eThekwini District Municipality, 2004). This hierarchy is presented in Figure 24 and consists of five levels (UNEP, 2005):

- **Waste Prevention:** Prevention of the production of waste, or a reduction of the amount generated (UNEP, 2005). Reduce the negative impacts of waste that is generated (UNEP, 2005);
- **Re-Use:** Re-use materials in the current form recovered from the waste stream (UNEP, 2005);
- **Recycling:** Recycle, compost or recover materials for use as direct or indirect inputs to new products (UNEP, 2005);
- **Waste to Energy:** Recover energy by incineration, anaerobic digestion or similar processes; and
- **Landfill:** Reduce the volume of waste prior to disposal. Dispose of residual solid waste in an environmentally sound manner, generally in landfill (UNEP, 2005).

8 No 2012 Volume reports for the Cargo Terminal

6 WASTE MANAGEMENT

FIGURE 24: THE WASTE HIERARCHY (UNEP, 2010)



At Dube TradePort Corporation, waste generated from the Support Zone, Dube AgriZone and Dube TradeZone is managed by a private contractor. Waste is collected from the tenants and delivered to a central waste sorting facility (satellite storage and sorting facility at each site).

A total of 178,8 tonnes of waste is produced at Dube TradePort, across all three zones. Only 36% of this waste is recycled, while the remainder (64%) ends up at landfill sites. Further measures should be adopted to facilitate, co-ordinate and expand waste minimisation and recycling initiatives.

With Dube TradePort aspiring to be Africa's first green precinct, as well as a flagship for sustainable development, implementation of green initiatives aims to minimise the carbon footprint of travellers, service providers, developers, retailers and manufacturers.

Current initiatives involve mitigating greenhouse gas emissions and synthetic pollutants, while other initiatives look at protecting the ecosystem, running sustainable waste and water management systems, providing food security and boosting the economy. In addition, Dube TradePort Corporation launched a Green Office Campaign in 2012, which encouraged staff to work efficiently with resources such as water, paper and energy and to procure eco-friendly products (DTPC, 2013e). These green initiatives illustrate Dube TradePort Corporation's commitment to sustainable development.

As part of a five-year Environmental Management Plan Dube TradePort Corporation has conducted facility-wide waste management plans for the Support Zone, AgriZone, TradeZone and Cargo Terminal. In addition, site-wide waste separation and recycling programmes mean that waste management is centralised and managed by an external contractor.

The following Environmental Initiatives at Dube TradePort Corporation have contributed to the reduction of waste:

- Dube AiRoad's Euro 5 Emissions Truck fleet;
- Dube City: A 'green' Precinct;
- Dube AgriZone's Green Initiatives;
- Dube Cargo Terminal Paperless Trade;
- Dube Support Zone: Green Star Rating at 29° South;
- Dube TradePort Corporation Corporate Social Investment Projects;
- Dube Unit Load Device Design; and
- Dube AgriZone Reverse Osmosis Plant.

6.3 IMPACTS

When waste is not properly managed, it causes pollution, which is defined as any substance that cannot be used, absorbed or managed by the natural environment and is harmful to living organisms (CCT, 2011). The way in which waste is traditionally managed in South Africa is not sustainable. It is, therefore, important to consider the minimisation of waste generation and closed system management of waste at all times (CCT, 2011).

Currently, the patterns and rates at which waste is generated and disposed of are unsustainable and negatively affect the environment. These impacts fail to consider the needs of future generations, as stated in the Constitution, National Environmental Management Act and other environmental laws.

This section looks at the environmental impacts of waste on the environment, human health and the economy. However, it should be noted that these impacts are related to waste management as a whole and not necessarily incidents taking place at Dube TradePort.

6.3.1 ENVIRONMENT

Ecosystems and natural resources deliver essential environmental services that provide the foundation for human life and development (eThekwini District Municipality, 2013/2014). These resources are limited and, therefore, the protection and efficient use thereof is essential. Table 8 lists the respective environmental aspects which adversely affect the environment and provides a brief description of each.

TABLE 8: ENVIRONMENTAL ASPECTS AND DESCRIPTIONS OF IMPACT (GRID-ARENDAL, 2014)

ENVIRONMENTAL ASPECT	DESCRIPTION OF IMPACT
Surface Water Contamination	Surface water contamination changes the chemistry of water which affects all levels of an ecosystem, starting from organisms lower in the food chain. This affects the health of organisms, as well as the availability of food up the food chain.
Ground-water Contamination	Depending on the water table or geology of an area, water contaminated from man-made processes can adversely affect humans, animals and plants.
Air Contamination	Air pollution contaminants can harm animals and plants that rely on respiration for growth.
Soil Contamination	Contaminated soil can harm plants when nutrients are taken up from the roots of the plants. This may have a ripple effect if humans or animals ingest plants that are contaminated as a result of the soils being contaminated.
Leachate	Leachate is the liquid that forms as water trickles through contaminated areas, leaching out chemicals. If uncontrolled, landfill leachate can be responsible for contaminating ground-water and surface water.
Landfill Methane	Waste disposal facilities are one of the largest anthropogenic sources of methane (CH4). Landfill methane is produced when organic materials are decomposed by bacteria under anaerobic conditions (i.e. in the absence of oxygen). Methane is a powerful greenhouse gas, with approximately 72 times as much global warming potential than carbon dioxide over a 20-year period.
Illegal Dumping and Littering	Solid waste material that is illegally or incorrectly dumped, or even littered, is easily diffused in the natural or built-up environment. This has negative consequences for both the social and natural environments. Impacts include: • Marine pollution when discarded waste is transported via the storm-water drain system into the coastal marine environment. This necessitates beach clean-ups or interventions to deal with coastal water contamination; • Decline of aquatic health in the receiving water bodies; and • Decline of water quality of riparian environments, which results in higher treatment cost for potable water. Illegal dumping and littering is also often a major indicator of neighbourhood decline and disorder, alongside graffiti, vandalism and abandoned buildings. This leads to a decline in property values and a potential rise in crime, due to the perception of reduced authoritative control.

6 WASTE MANAGEMENT

6.3.2 HEALTH IMPACTS

If waste is not collected and managed appropriately, it can cause serious impacts on health and problems to the surrounding environment. Dube TradePort Corporation, with the support of its waste management service provider, has high standards of waste management. There are no reported health-related impacts of waste management. Some of the health impacts resulting from poor waste management arise from pathogens, such as viruses, bacteria and protozoans (Pirofski & Casadevall, 2012).

These pathogens are spread by vectors that are attracted by waste such as flies, rats, cockroaches and other creatures which spread infectious diseases. Waste that is not disposed of correctly will create breeding grounds for these vectors which will pass diseases onto human beings. Some of the health effects associated with pathogens, vectors and waste include (UNEP 1996; DEFRA, 2004; UNEP, 2007):

- Skin and blood infections from direct contact with waste and infected wounds;
- Eye and respiratory infections from exposure to infected dust;
- Diseases from bites from animals feeding on waste;
- Intestinal infections transmitted by flies feeding on waste;
- Bronchitis and flu-like disease;
- Fatigue and coughing;
- Birth defects associated with individuals living on or close to landfill sites; and
- Exposure to heavy metals, such as lead, mercury and cadmium, could lead to neurological development and neurotoxicity.

6.3.3 ECONOMIC IMPACTS

Managing waste is expensive and becomes both a burden and risk (CCT, 2011). Municipalities and cities within South Africa are faced with serious economic, social and environmental challenges related to solid waste management (DoR, 2012).

In addition, the collection and transportation of waste is becoming more expensive and municipalities can no longer afford this. The problem is compounded by the fact that available landfill space is becoming depleted and environmental impacts will only soar if new areas are cleared of vegetation and natural habitats destroyed to build new landfill sites (DoR, 2012).

To address the social, economic and environmental challenges, new and innovative mechanisms for financing solid waste management are needed. For one, there is economic opportunity in the waste sector that has the potential to create many 'green' job opportunities in areas of waste collection, transfer, separation, re-use and recycling. With National and Provincial Government's priority being job creation, waste management legislation supports this process (DST, 2012). As a result, Government's intention is to implement measures that strengthen and expand the waste economy, generate and sustain jobs and formalise existing jobs in the waste economy.

Waste is considered waste when the generator has no further use of it for the purposes of production, re-use or recycling.

Internationally, countries such as the United States of America, member states of the European Union and the United Kingdom, have benefited economically from recycling through Gross Value Add (GVA), tax revenue and job provision.

In 2006, South Africa's waste sector was shown to have contributed 0,56% to the country's Gross Domestic Product (GDP). This can only grow once Government phases-in full cost accounting for solid waste management.

6.4 RESPONSES

The National Environmental Management: Waste Act (Act 59 of 2008) has led to a number of requirements for both the public and private sector in terms of the management of waste in South Africa. The need to move waste management up the waste hierarchy, away from land-filling and towards reducing, re-using and recycling, calls for new ways of doing things and new forms of technologies (DST, 2012).

Land-filling, dumping and incineration of waste are essentially unsustainable waste management practices that have negative effects on the planet and on populations.

The disadvantages of waste, however, are mitigated by focusing on the management of waste from its point of source and less on its disposal. This realisation has led to a shift in the approach to waste management on an international, national, provincial and local scale.

The sections below identify the various institutions and agreements made with the various spheres of Government, as well as a summary of the legislative framework which supports good environmental practices. In addition, the management structures of Dube TradePort Corporation and a brief description of each environmental management framework is provided.

6.4.1 WASTE INSTITUTIONS AND THEIR ROLES

The White Paper on Integrated Pollution and Waste Management provides clear guidance on the roles and responsibilities of the different spheres of Government. Table 9 provides a list of these institutions and the spheres in which they belong.

TABLE 9: SPHERES OF GOVERNMENT AND THE INSTITUTIONS OR AGREEMENTS WITHIN

SPHERE OF GOVERNMENT	INSTITUTIONS AND AGREEMENTS
International	• Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter • Multilateral Agreement on the Control of Pollution of Water Resources in the South African Region • Convention on the Control of Transboundary Movements of Hazardous Wastes and their disposal • United Nations Framework Convention on Climate Change • Convention on the Ban of the Import and Control of Transboundary Movement of Hazardous Wastes within Africa • Convention of Prior Informed Consent • Millennium Development Goals
National Government	• Department of Trade and Industry (dti) • Department of Co-operative Governance and Traditional Affairs (CoGTA) • National Treasury • Department of Water Affairs (DWA) • Department of Mineral Resources (DMR) • Department of Health (DoH) • Department of Agriculture, Forestry and Fisheries (DAFF) • Department of Energy (DoE)
Provincial Government	• KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs • Green Economy
Local Government	• Integrated Waste Management Plans (IWMP) for Integrated Development Plans (IDP) • By-Laws • Spatial Development Framework (SDF)

6.4.2 LEGISLATIVE FRAMEWORKS

Dube TradePort Corporation is committed to reducing emissions to air, water and land. In order to protect the environment and ensure that Dube TradePort Corporation conducts its activities in an environmentally-responsible manner, there are a number of significant statutes that will need to be considered. The various forms of legislation applicable to waste are listed and summarised in Table 10 which follows.

6 WASTE MANAGEMENT

TABLE 10: LEGAL FRAMEWORKS APPLICABLE TO SOUTH AFRICA AND A DESCRIPTION OF THEIR FUNCTIONS

LEGISLATION	SECTION	DESCRIPTION
The Constitution (No. 108 of 1996)	Chapter 2	Bill of Rights
	Section 24	Environmental rights
National Environmental Management Act (No. 107 of 1998 [as amended])	Section 2	Defines the strategic environmental management goals and objectives of the Government. Applies throughout the Republic to the actions of all organs of State that may significantly affect the environment
	Section 24	Provides for the prohibition, restriction and control of activities which are likely to have a detrimental effect on the environment
	Section 28	The developer has a general duty to care for the environment and to institute such measures as may be needed to demonstrate such care
National Environmental Management: Waste Act (No. 59 of 2008)		Provides for specific waste management measures and the remediation of contaminated land
Environment Conservation Act (No. 73 of 1989) and regulations	Sections 19 and 19A	Prevention of littering by employees and sub-contractors during construction and the maintenance phases of the proposed project
National Environmental Management: Air Quality Act (No. 39 of 2004)	Section 32	Control of dust
	Section 34	Control of noise
	Section 35	Control of offensive odours
Occupational Health and Safety Act (No. 85 of 1993)	Section 8	General duties of employers to their employees
	Section 9	General duties of employers and self-employed persons to persons other than their employees
National Water Act (No. 36 of 1998) and regulations	Section 19	Prevention and remedying the effects of pollution
	Section 20	Control of emergency incidents
Hazardous Substances Act (No. 15 of 1973) and regulations		Provides for the definition, classification, use, operation, modification, disposal or dumping of hazardous substances
Asbestos Regulations (2001)	Section 19	Labelling, packaging, transportation and storage of asbestos
Municipal By-laws		Promulgated by-laws: • Waste • Litter
Municipals Structures Act (Act No. 117 of 1998)	Section 84 (1)	Establishment of infrastructure developments including solid waste disposal sites

6.4.3 ENVIRONMENTAL MANAGEMENT STRUCTURE

Dube TradePort Corporation Environmental Management Structure consists of six major elements, namely; Environmental Policy, Environmental Strategy and Action Plan, Master Plan, Environmental Management System and Operational Environmental Management Plan. A further description of these items can be found in Table 11.

TABLE 11: EXISTING ENVIRONMENTAL MANAGEMENT STRUCTURE OF DUBE TRADEPORT CORPORATION

MANAGEMENT STRUCTURE	DESCRIPTION
Environmental Policy	Guides the implementation of environmental and sustainability concepts at Dube TradePort Corporation
Environmental Strategy and Action Plan	The main planning tool to future development at Dube TradePort
Master Plan	The main planning tool for future development
Environmental Management System	System established to manage environmental issues at the site (ISO 14001)

Operational Environmental Management Plan
• Waste Management Plan
• Environmental Auditing
• Environmental Monitoring
• Environmental Reporting
  • Integrated and Sustainability Reporting
  • Global Reporting Initiative
• Green Procurement
• Lease Management/Green Leases
	Tool for ensuring regulatory compliance and monitoring requirements

STRATEGIC OBJECTIVES 2013-2018

As part of the Sustainability Framework, Dube TradePort Corporation recognises that the use of natural resources is required for any business and those sustainability criteria are applied in decision-making processes. With this in mind, Dube TradePort Corporation has set out waste management objectives for the next five years that aim to (DTPC, 2013d):

- Manage various solid waste streams that ensure efficient handling, separation and disposal of waste for the prevention of pollution and promotion of recycling and waste reduction;
- Minimise discharges to the environment, including air, water and land and meet the minimum standards, as set out in national environmental legislation; and
- Apply the waste hierarchy to all waste streams, which includes avoiding waste, reducing, re-using and recycling waste, where possible, with disposal being the last option.

Five year implementation plan

The five-year implementation period is from 2013 to 2018. For waste, three goals have been identified:

- Implement waste management plans for each operational zone;
- Reduce solid waste delivered to landfill across the Dube TradePort precinct; and
- Develop a sustainable procurement system for Dube TradePort Corporation.

Future environmental initiatives

Dube TradePort has a vision of becoming the first carbon-neutral TradePort in Africa. In so doing, Dube TradePort Corporation has developed a Carbon Management Strategy (CMS), which is the first step towards achieving this vision.

A selection of future green initiatives include:

- Ground transportation using bio-fuels as a renewable energy source;
- Investing in renewable sources of energy, such as solar, wind and water, and feed into the energy grid. This would serve the entire Dube TradePort Corporation;
- Development of a waste recycling system that will be able to convert recyclable products back to energy; and
- Promoting green office initiatives, whereby developers are encouraged to incorporate sustainable green

6 WASTE MANAGEMENT

building principles in their design and construction, encouraging paperless offices and providing assistance to tenants which will enable them to reduce their carbon footprint.

The current strategic partnerships with relevant airport and Dube TradePort stakeholders will see the need to change the manner in which stakeholders conduct their business in order to achieve a carbon-neutral TradePort.

6.5 CONCLUSION

The use of natural resources or pollution of the environment, in the form of activities and the manner in which waste is disposed of, creates pressure on the environment. In the case of Dube TradePort Corporation, activities in the respective zones impact on the environment even though measures of waste reduction are in place.

The current state of waste from the Support Zone, Dube AgriZone and Dube TradeZone were elaborated upon in the third section, with a focus on the current trends, waste prevention, minimisation and recycling. In addition, the status of the indicators is provided for, as well as a glimpse of what the future waste projections are for Dube TradePort Corporation. New and emerging waste streams were also highlighted, as were challenges inherent to policy issues. Impacts of waste, associated with the current state of waste at Dube TradePort Corporation, was considered, with a brief look at how waste generated may impact on the environment, human health, society and the economy. Furthermore, this section provided an overview of the state of future landfill sites. Lastly, environmental impacts are regulated through the various spheres of Government, from international agreements and institutional mandates to legislative frameworks.

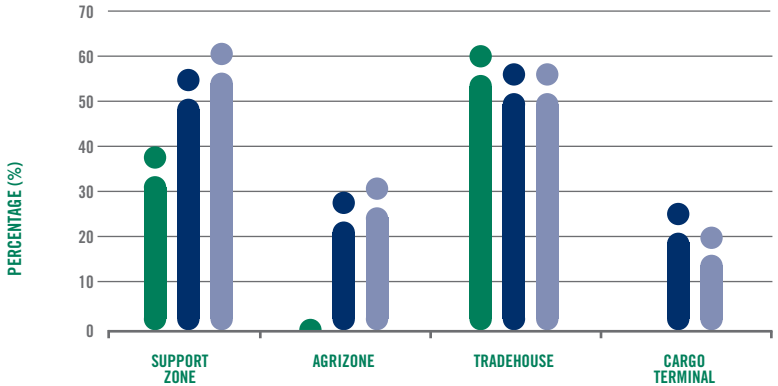
6.5.1 WASTE CHALLENGES

The state of waste management within Dube TradePort Corporation has improved, but at a slow pace. Waste will always pose a challenge as there is an increasing consumer demand, coupled with the rapid rate of improving technology.

Another challenge which Dube TradePort Corporation could be faced with includes enforcement difficulties associated with green initiatives. Innovative initiatives usually show a spike of interest and progress at first. However, this declines soon after. Any changes implemented will need to be continually reinforced to ensure long-lasting success.

Figure 25 represents the percentage of waste recycled across all zones over the 2012-2014 periods. It is clear that for 2014, the Support Zone and Dube TradeZone (i.e. TradeHouse), produce the most recyclable waste.

Landfill waste from all the TaradeZone is represented by Figure 26. It is interesting to note that the two zones (Support Zone and Dube TradeZone) that produce the most recyclable waste, show the least amount of waste going to landfill. Furthermore, it is interesting to see that although volumes of waste are missing for 2013 and 2014, the four months volume data received generates a large quantity of landfill waste, i.e. close to 100%.



	SUPPORT ZONE	AGRIZONE	TRADEHOUSE	CARGO TERMINAL
2012	40	1	60	0
2013	57	30	59	27
2014	63	34	57	22

FIGURE 25: COMPARISON OF RECYCLED WASTE OVER A THREE-YEAR PERIOD ACROSS ALL ZONES

2012
2013
2014

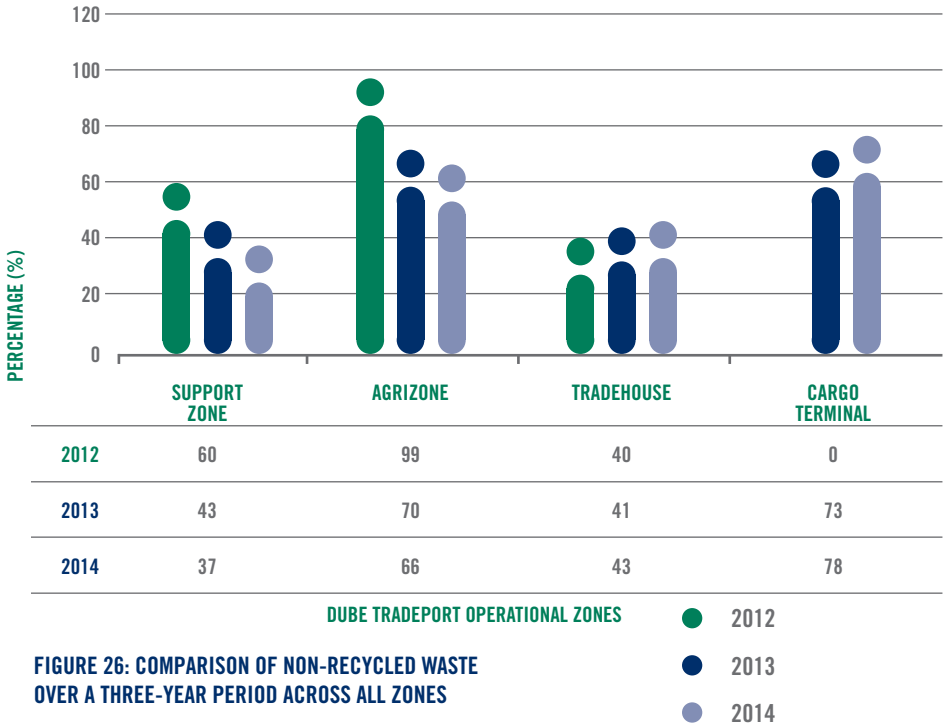


FIGURE 26: COMPARISON OF NON-RECYCLED WASTE OVER A THREE-YEAR PERIOD ACROSS ALL ZONES

TradePort Corporation, relate primarily to management and economics and include:

- Fast-growing quantities of e-waste occasioned by short product lifespan and rising purchasing power per capita in South Africa. As a result, in recent years, the quantity of e-waste in the country has increased significantly (DEAT, 2006);
- The absence of clear e-waste legislation or policies in the three tiers of South African Government is a definite obstacle in the long-term management of e-waste in the country (Dittke, 2007). Consequently, e-waste management has largely remained a voluntary initiative by organisations, small enterprises, NGOs and individuals. Therefore, coherent and more specific legislation and policies on e-waste appear to be critical in improving the management of this waste stream.

6.5.3 RECOMMENDATIONS FOR THE WAY FORWARD

Through continued improvement of reporting, enforced by the IWMP, the quality of waste management should improve.

It is recommended that Dube TradePort Corporation consider the following recommendations:

JOB CREATION

Dube TradePort Corporation should take advantage of the opportunities for job creation in the waste management sector by providing green jobs through labour-intensive service delivery.

In other words, make use of the expanded public works programme which supports job creation in relation to waste services and activities.

EMERGING TECHNOLOGIES

It is understood that Dube TradePort Corporation is considering a green initiative that looks at converting waste to energy.

However, it is further recommended that other waste treatment technologies be explored as well, such as anaerobic digestion, fermentation or composting, as well as giving consideration to thermal processes, such as plasma converters, gasification and pyrolysis (DST, 2012). A description of these alternatives is given in Table 12 which follows.

6.5.2 EMERGING WASTE STREAMS

Electronic waste has been identified as an emerging waste stream within the Dube TradePort precinct. The waste streams from the electronic industry are generically referred to as electronic waste (or e-waste). Most e-waste generated in developed countries is often exported to developing countries for recycling and disposal. Thus, e-waste management, in terms of recycling and disposal, is a rapidly growing problem globally and is mostly characterised by widespread inhalation-related illnesses in the populations of developing countries with poor and unsafe recycling practices (DEAT, 2010b). To contextualise the adverse effects of e-waste, it is imperative to examine the constituent elements in these waste streams in order to understand the threats they could pose to human health and the environment. The South African Environmental Outlook (SAEO) Report (DEAT, 2006) identified e-waste, among the rapidly emerging key environmental concerns in South Africa, as meriting urgent attention.

With fibre optic roll-out to support Dube iConnect, new waste streams have been identified within the Support Zone and Dube TradeZone precincts. At present, there are no facilities providing for the storage of e-waste because there are not enough e-waste recycling facilities in South Africa. The e-waste challenges facing South Africa, which mirror the challenges facing Dube

6 WASTE MANAGEMENT

TABLE 12: ALTERNATIVE TECHNOLOGY USED FOR WASTE MANAGEMENT

TECHNOLOGY	DESCRIPTION
BIOLOGICAL PROCESSES	
Anaerobic Digestion	Fermentation of organic waste to produce bio-gas, which is a mixture of methane and carbon dioxide in the ratio of ± 2:1. The result is stable sludge that can be used as manure. The bio-gas can be used for heat or in engines for transport or power generation.
Fermentation	Aerobic biological process uses yeast to produce ethanol or methanol from organic waste. The process releases carbon dioxide and sludge as a by-product.
Composting	Composting is the biological decomposition of biodegradable solid waste, under controlled aerobic conditions, to a state that is stable enough for storage and handling.
THERMAL PROCESSES	
Plasma Converters	This process decomposes waste to its constituents at very high temperatures. Plasma converters make use of plasma torches, which produces syngas, exhaust heat and slag. Syngas is a mixture of carbon monoxide and hydrogen which can be used to generate power, while slag can be converted to useful by-products, such as construction materials.
Incineration	This process involves the burning of combustible waste in air to produce energy and ash which releases carbon dioxide. The heat that is released can be used to generate power.
Waste to energy	Involves the breakdown of solid organic waste in a controlled supply of oxygen to make syngas. The gas can be used in engines, to process heat or as an industrial chemical feedstock.
Pyrolysis	Thermal decomposition of solid organic waste in the absence of oxygen to produce char, pyrolysis oil and syngas.

EXTENDER PRODUCER RESPONSIBILITY

Dube TradePort Corporation is in the position to facilitate Extender Producer Responsibility (EPR) initiatives, which is a concept in which the manufacturer's responsibility for a product extends beyond the sale of the product (CCT, 2011).

This concept yields impressive recycling results and is applicable to all waste streams (Dubois, 2013). This initiative will work hand-in-hand with Dube TradePort Corporation's current green office and recycling initiatives.

EPR initiatives include, product take-back programmes, such as printer cartridges (especially within the administration areas of Dube TradePort Corporation), deposit-refund systems, such as with glass bottles (applicable to canteen/restaurant areas of Dube TradePort), product fees and taxes and minimum recycle-content rules.

WASTE INNOVATION

The current waste generation, collection and disposal process requires complete reform, with a move away from disposal of waste to landfill (DST, 2012).

This ideology is about thinking differently about waste and recognising its potential as a renewable resource that provides opportunities for beneficiation, rather than as an unwanted product that requires treatment and disposal (DST, 2012).

INCENTIVES-BASED APPROACH

Another consideration could be an internal competition between the zones as to which zone generates the least annual/monthly disposable waste and recycles the most waste.

The winning zone will receive prestigious Platinum, Gold and Silver status, along with other incentives. This will not only generate camaraderie between employees, but will tap into innovative ideas as to how to reduce the amount of waste entering landfills.

MONITORING AND REPORTING

Consistency of monitoring and reporting during the 2013/14 period, and prior to this, has been poor. This hampers decision-making processes, risk management, performance objectives and waste management principles, as well as SoERs. It is therefore, strongly recommended that emphasis is placed on monitoring and reporting, and ensuring that contractors are compliant with this system.

Thus far, Dube TradePort Corporation has adopted a centralised, electronic reporting system, and attention has been paid to developing detailed Service Level Agreements (SLA) for contractors. This should yield great improvements in data availability for the next reporting period.

This affects State of Environment Reports, as well as risk management, performance objectives and waste management principles. It is, therefore, suggested that Dube TradePort Corporation creates a back-up plan for the period for which new contractors are procured so as to ensure information is not lost or allowed to go missing.

ELECTRONIC WASTE

Electronic waste, or e-waste, is an emerging issue (Herat, 2010) globally and Dube TradePort Corporation is no exception. Technology is constantly evolving, rapidly outdating products, especially in terms of items, such as computers, which contain hazardous components, including mercury, brominated flame retardants and cadmium (NWMS, 2010). It has been acknowledged that Dube TradePort Corporation caters for hazardous waste. However, this only considers liquid hazardous waste and not solid hazardous waste. There is considerable job creation potential in the recycling of e-waste and could be used in conjunction with any of the above-mentioned recommendations.

7 AIR QUALITY

The world's attention is focused on global warming and its implications for the environment, human health and the economy. Corporations, Governments, parastatals and individuals are taking an active interest in reducing the anthropogenic impacts of climate change. Against this background, it is, therefore, important that air quality within Dube TradePort is managed through a combination of instruments at different levels, from corporate policy down to different divisions. It is imperative that in managing air quality, divisions and staff recognise that their programmes and activities occur within a broader framework of management.

Thus, for many activities, appropriate management can be achieved at corporate strategy level through appropriate communication and consultation with employees, tenants and even third party developers.

Climate change is defined as the shift of weather conditions over time. It is a significant and lasting change which ranges from periods of decades to millions of years. Anthropogenic contributions to climate change are often referred to as global warming. Air quality is defined as the state of pollutants present in the surrounding ambient environment. The state of air quality is degraded by the release of pollutants into the earth's atmosphere, usually through the combustion of non-renewable resources. Climate change and air quality are closely correlated and often influence one another.

Air quality and climate change policies can be mutually beneficial, such that measures and actions taken to reduce air pollution can, in turn, reduce greenhouse gas emissions, thereby reducing global warming. Increasing concentrations of greenhouse gases alters the earth's energy balance between its surface and the atmosphere, which, in turn, can lead to temperature changes that affect the chemical composition of the atmosphere (EC, 2010). An example of this relationship is the emission of air pollutants, such as ozone and sulphate, which influences this energy balance. Thus, climate change and air quality management have consequences for one another.

South Africa is carbon-intensive and is ranked amongst the top 20 countries for absolute carbon dioxide emissions. It has an emission per capita of 10 metric tonnes per annum and is highly dependent on its non-renewable energy sources for power generation. As a result of the carbon implications on global warming and climate change, the need to explore renewable energy sources is imperative. The National Environmental Management: Air Quality Act (No. 39 of 2004) (AQA) tasks national, provincial and local authorities with the management of air quality.

Ambient air quality standards and emission limits are set at a national level and a national framework sets national norms and standards for various air quality management components, including air quality monitoring, management planning and information management. Dube TradePort, therefore, strives to develop the necessary capabilities and infrastructure to adequately manage air quality within the precinct.

Dube TradePort aims to become the first green aerotropolis and carbon-neutral TradePort in Africa. The indicators identified as a priority issue within the aerotropolis include the emission of carbon dioxide by source (CO_2e/an), the percentage of energy from renewable sources and the percentage of emissions off-set. Based on the findings recorded in the 2011 SoER, it was noted that the highest contributor of carbon emissions was attributed to aviation, specifically aircraft landing and taking off, while the second highest contributor of greenhouse gas emissions was from the use of electricity to power buildings. Indicators which are deemed relevant for the 2014 SoER are as follows:

- Carbon dioxide emission by source;
- Ambient air quality results (concentration of ambient pollutants, such as particulate matter and nuisance dust fall-out);
- Percentage of emissions off-set (%); and
- Activities (transportation and biomass burning).

7.1 PRESSURES

7.1.1 TRANSPORTATION SECTOR

VEHICLE EMISSIONS

Vehicle exhaust emissions are a major source of hazardous and criteria pollutants, such as particulate matter (PM), carbon monoxide (CO), carbon dioxide (CO_2), oxides of nitrogen (NOx), hydrocarbons, lead (Pb) and sulphur dioxide (SO_2). Secondary pollutants are nitrogen dioxide (NO_2), ozone (photochemical smog), sulphate, nitric acid and nitrate aerosols.

Emissions are related to the use of an engine, the fuel type and the temperature of combustion, such that if an engine is 100% efficient, the products of combustion will be CO_2 and water. Emissions from petrol-driven vehicles have been dramatically reduced by the use of catalytic converters which function to oxidise pollutants, such as CO to less harmful gases, such as CO_2. Diesel-driven vehicles contain more energy per litre and are more efficient than petrol-driven vehicles. However, diesel vehicles emit a higher concentration of NOx and PM than petrol-driven vehicles.

AVIATION

Emissions released from aircraft combustion engines are carbon dioxide (CO_2), nitrogen oxides (NOx), carbon monoxide (CO), particulates (PM), oxides of sulphur (SOx), volatile organic compounds (VOC) and trace compounds. These emissions are emitted at various rates and stages of operation, such as taxing, idling, take-off, climbing and landing.

NOx emissions are higher during high power operations, such as take-off, when combustion temperatures are high. CO emissions are highest during low power operations, such as taxing and idling, when combustion temperatures are low and less efficient. Studies have indicated that per minute emissions of CO and NOx is highest when the aircraft engine is idling than at any other stage of flight (USEPA, 1992).

A number of aircraft emissions can affect the climate, some directly, such as CO_2 and water vapour (H_2O) while other effects, such as the production of ozone in the troposphere, alteration of methane lifetime and the formation of cirrus cloudiness, are indirect effects from aircraft emissions. Emissions such as NOx, PM and H_2O affects the stratospheric ozone by modifying the chemical balance within the stratosphere (IPCC, 1999).

7.1.2 BIOMASS BURNING

The Dube TradePort precinct is surrounded by sugar cane plantations owned by Tongaat Hulett. Biomass

burning is usually carried out before the harvesting of cane as it reduces physical labour and allows for easier harvesting. Once a fire commences, the dry combustible materials are consumed first, with 25% of the cane stalk being burned off (Cardoso and Da Rocha, 2004). The burning process allows for the elimination of micro-organisms and for the enhancement of soil. Pollutants emitted from sugar cane burning, due to its less than ideal combustion condition, produces soot and particulate matter (PM) which are visible as a smoke plume.

Other emissions, such as carbon monoxide (CO), methane (CH4), hydrocarbons, volatile organic compounds (VOC), including benzene and semi-volatile organic compounds (SVOCs), such as polycyclic aromatic hydrocarbons (PAHs), are also emitted (Lemieux et al, 2003).

7.2 STATE

7.2.1 CARBON EMISSIONS

Carbon dioxide is the primary greenhouse gas emitted through human activities. It is constantly being exchanged between the atmosphere, ocean and land surface, as it is both produced and absorbed by many micro-organisms, plants and animals.

Human activities are altering the carbon cycle, both by the addition of CO_2 to the atmosphere and by influencing the ability of natural sinks, such as forests, to remove CO_2 from the atmosphere. While CO_2 emissions come from a variety of natural sources, human-related emissions are responsible for the increase that has occurred in the atmosphere since the industrial revolution.

The main human activity that emits CO_2 is the combustion of fossil fuels (coal, natural gas and oil) for energy and transportation. However, certain industrial processes and land-use changes also emit CO_2. Dube TradePort Corporation has calculated its carbon emissions based on the Greenhouse Gas Protocol (GHGP). The GHGP is based on the following principles:

- Relevance: Ensuring the inventory reflects on the greenhouse gas emissions of the company;
- Completeness: Account for and report on all greenhouse gas emission sources and activities within the chosen inventory boundary;
- Consistency: Use of consistent methodology to allow for meaningful comparison over time;
- Transparency: Address all relevant issues in a factual and coherent manner, based on a clear audit trial; and
- Accuracy: Ensure that the quantification of greenhouse gas emissions is systematically neither over, nor under the actual emissions as far as can be judged.

The data presented in the figure below represents the carbon emission calculated for Dube TradePort. The highest contributors to the carbon footprint are the airport landing and take-off cycle emissions from aircraft engines, which contributes 64,1% to the total carbon emission, followed by buildings' energy, which contributes 26,6% of carbon emissions.

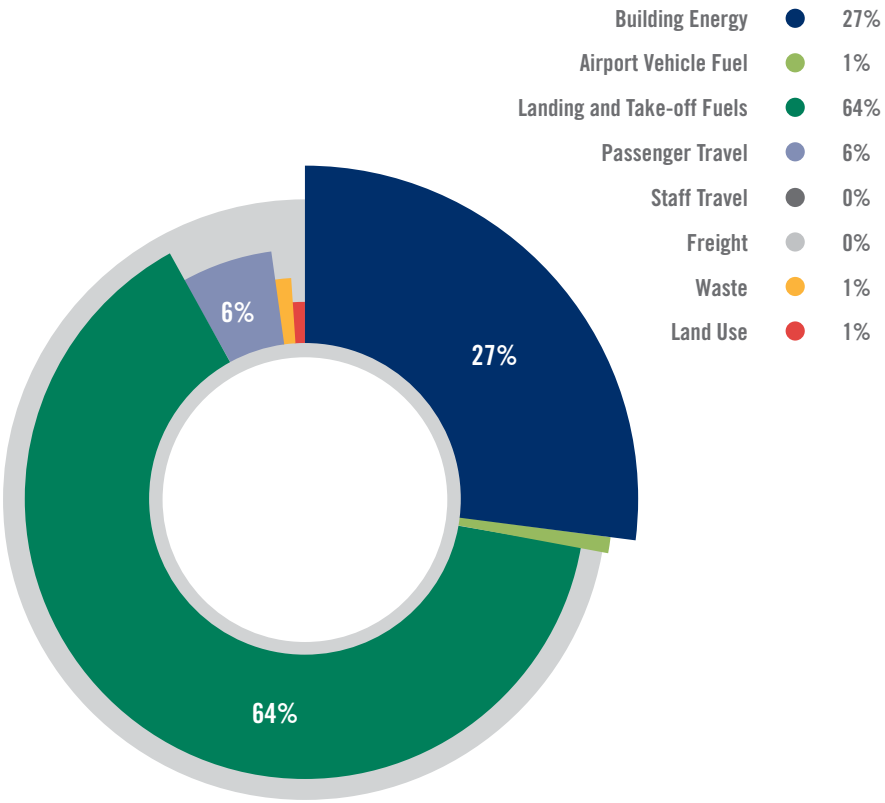


FIGURE 27: CARBON EMISSIONS CALCULATED FOR DUBE TRADEPORT (TRICORONA CLIMATE PARTNER, 2011)

7 AIR QUALITY

The data displayed in Figure 27 contains the most recent air quality data recorded for Dube TradePort. There are currently plans in place to begin a carbon foot-printing exercise, to commence in 2015, that will see more focus placed on air quality and GHG emissions.

The table below illustrates carbon emissions calculated, based on each category or scope. The differentiation of each scope is based on the following GHGP:

- Scope 1: Direct emissions from the sources that are owned or controlled by the company;
- Scope 2: Indirect emissions through the use of purchased electricity or heating; and
- Scope 3: Other indirect greenhouse gas emissions.

The majority of the sources operating within the Dube TradePort fall within Scope 3. This can be seen in carbon emissions displayed, per scope, in Table 13:

TABLE 13: CARBON EMISSIONS CALCULATED BASED ON PER SCOPE

CATEGORY	SCOPE 1	SCOPE 2	SCOPE 3	TOTAL
Building energy	24	42 632	5 720	48 376
Airport vehicle fuel	875	0	459	1 334
Landing and take-off fuels	0	0	116 683	116 683
Passenger travel	0	0	11 452	11 452
Staff travel	1	0	1,2	2,2
Freight	0	0	573	573
Waste	0	0	1 059	1 059
Land use	0	0	2 490	2 490
Total	900	42 632	138 437	181 969

7.2.2 PARTICULATE MATTER

Particulate Matter is the collective term for solid and liquid particles added to the atmosphere by processes on the earth's surface and includes smoke, dust, soot, soil particles and pollen. Particulate Matter is classified as a criteria pollutant, thus, national air quality standards under the auspices of NEM:AQA have been developed in order to protect the public from exposure to the inhalable fractions. Ambient monitoring was carried out at seven locations within King Shaka International Airport and in accordance with the NIOSH 0600 methodology to ensure data validity and to ensure an authorised standard was followed, allowing for any further studies to be carried out in a similar manner to allow for comparisons between the data sets.

Figure 28, which follows illustrates the PM10 results for each monitored site, with comparisons made to the daily South African Standard of 120 µg/m³. All monitored results were below the South African standard. The highest concentration was recorded at the highway monitoring station with 106 µg/m³.

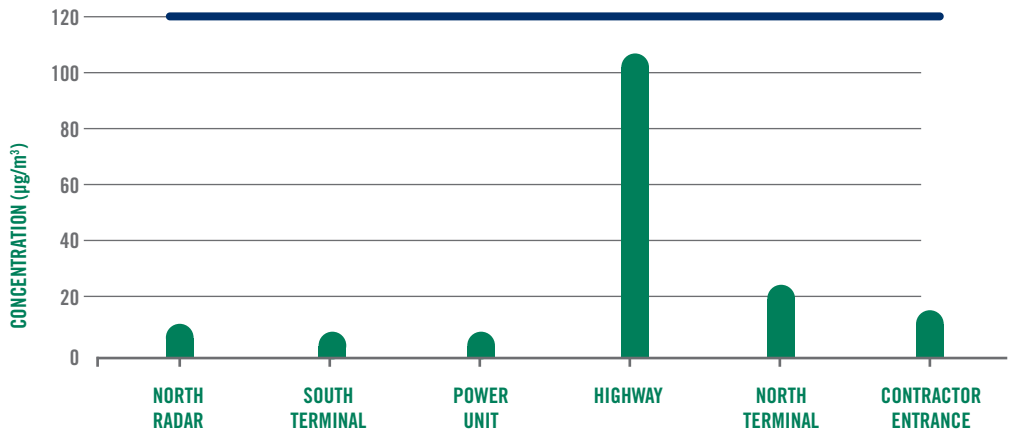


FIGURE 28: DAILY TRENDS IN PARTICULATE MATTER (PM10) CONCENTRATION (µG/M³) FOR 2010-2011 MONITORING PERIOD

7.3 IMPACTS

7.3.1 HEALTH EFFECTS

Climate change can impact human health either directly or indirectly. Direct exposure includes excessive heat stress and rainfall, while indirect exposure arises through its impact on agriculture and by optimising the environment for the prevalence of diseases. The vulnerability of the general public to the impacts of climate change can be defined as the degree to which the public health system is susceptible to the effects of climate change (DEA, 2013).

Climate change impacts on human health are expected to be highest in developing countries, due to poor adaptive capacity. Changes in climate leads to changes in the frequency, intensity, duration and timing of extreme weather and climatic events and can result in unprecedented extreme weather conditions.

A rise in temperature can lead to reduced air quality by the increased formation of ground-level ozone. Ground-level ozone is formed when certain pollutants, such as oxides of nitrogen, carbon monoxide and volatile organic compounds are exposed and bind to each other in the presence of sunlight. Ground-level ozone has been known to damage lung tissue, reduce lung function and inflame airways.

Malaria was identified as the disease most likely to be impacted by climate change, as its transmission is sensitive to rainfall and temperature. The proposed risk of malaria is governed by a variety of environmental factors, such as seasonal shifts, which affects the transmission and the duration of the high-risk season (Turpie et al, 2002).

TABLE 14: IMPACTS OF CLIMATE CHANGE ON HUMAN HEALTH

CLIMATE CHANGE IMPACTS	PATHWAY FOR CLIMATE CHANGE	OUTCOMES
DIRECT IMPACTS		
Increased frequency and intensity of heat stress	Heat stress	Cardio-vascular disease Respiratory disease
Increased temperatures and reduced rainfall	Higher ground-level of ozone and other air pollutants	Cardio-vascular disease Respiratory disease (asthma)
Changes in Stratospheric ozone and in precipitation and cloud cover	Increased exposure to solar Ultra Violet Radiation (UVR)	Autoimmune disease
Extreme weather events (fire, floods and storms)	Structural damage	Injuries
INDIRECT IMPACTS		
Drought, flooding	Impaired agriculture, reduced food yield and nutrition insecurity	Declining health
Extreme weather conditions (fires, floods and storms)	Trauma	Mental health (post-traumatic stress disorder)
Extreme weather conditions (fires, floods and storms)	Impaired livelihood Impoverishment	Mental health (anxiety/ depression)

7.3.2 IMPACTS ON BIODIVERSITY

South Africa consists of nine biomes which are defined as geographical areas comprising a number of ecosystems with related plant and animal groups. Each biome consists of a number of biodiversity's which are specifically adapted to existing climatic conditions. With the exception of climate change, biodiversity and ecosystems are already under pressure from land use changes, related processes causing degradation and alien invasive species (SANBI, DEA & GIZ, 2013). A rise in temperature, changing rainfall patterns and increasing concentration of CO_2 exacerbates these existing pressures.

Climate change is expected to cause significant changes within the grassland biomes. This could lead to significant habitat loss because of susceptibility to warming effects, as well as the increase of tree coverage (which out-compete the grass species).

Acid deposition, a by-product of sulphur and nitrogen oxide emissions, which interact with atmospheric moisture to fall as acid rain, also threatens the local fauna and flora. Acid rain changes the soil and water pH, and nutrient concentrations in polluted areas, threatening sensitive species. Further research also indicates a possible impact on agriculture (Embersen et al., 2001).

The Savannah biome is projected to expand within its geographical range, thereby replacing the grassland biome. However, this projection also provides an opportunity for the prevalence of alien invasive species into the grassland biome, which has adverse implications for ecosystem goods and water delivery from high catchments and grazing.

Figure 29, which follows indicates the projected implications of climate change on the South African biodiversity at various risk levels.

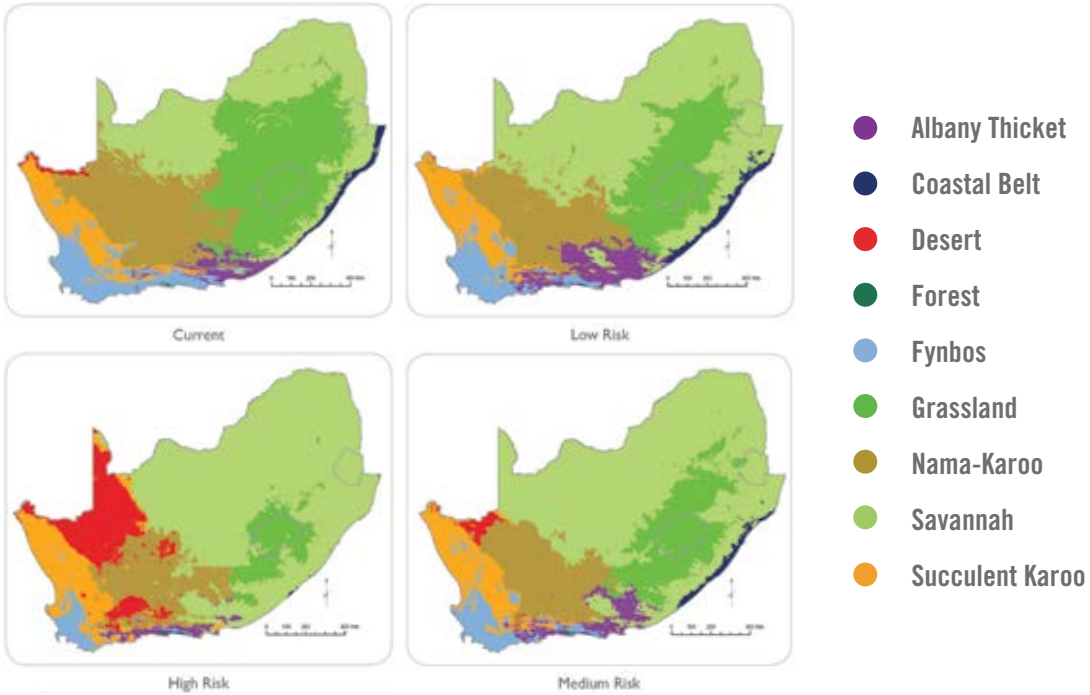


FIGURE 29: PROJECTED IMPLICATIONS OF CLIMATE CHANGE ON SOUTH AFRICAN BIODIVERSITY (SANBI, DEA & GIZ, 2013)

7.3.3 ECONOMIC IMPACTS

The impacts of climate change not only influence human health and the environment, but impacts local and global economies. Changes which affect the economic output of a particular sector and which cause an increase in expenditure will negatively impact the overall Gross Domestic Product (GDP) of the country.

A change in climate poses a significant risk to increased crop failure, loss of livestock and impacts local food security. Most of South Africa and Africa's agriculture is dependent on precipitation. As a result of anticipated seasonal shifts, rainfall patterns and climate variability, the agricultural sector is highly vulnerable to the implications of climate change (Van Jaarsveld & Chown, 2001).

Agriculture is a dominant sector within rural areas. The effects of climate change on agriculture will directly affect rural communities, through reduced income and employment. The resultant strain will then be placed on rural and local Governments, which are essentially responsible for providing services and promoting development at a local level. Appropriate adaptation plans are required for local municipalities in order to cope with the negative impacts of climate change. As the impact of climate change is localised, local institutions and governance will become the most important drivers of adaptation and coping mechanisms. Taking active measures to reduce atmospheric pollutants and greenhouse gases reaps economic benefits, such as reduced human health risk and welfare. For example the economic cost of an increased malaria risk was estimated at R1,03 billion in 2010, which represents approximately 0,1% of the GDP (Turpie et al, 2002).

7 AIR QUALITY

7.4 RESPONSES

7.4.1 GREEN INITIATIVES

Dube TradePort Corporation has initiated the following green initiatives in order to counter and off-set the carbon footprint emanating from the aerotropolis:

- Development of a carbon footprint calculator in order to off-set the carbon footprint of the business. The carbon footprint calculator was developed in the early stages of development of the King Shaka International Airport and Dube TradePort;
- Plans are in place to introduce green leases for all Dube TradePort tenants, whereby tenants are required to incorporate a clause in their lease to voluntarily disclose data regarding their energy and water consumption, waste and carbon footprint;
- The use of a fleet of Euro 5 emission trucks, running on a low sulphur diesel fuel with additives that reduce toxic exhaust emissions;
- The installation of solar panels on rooftops at Dube AgriZone. The solar panel generates 220 kilowatts at peak and reduces carbon emissions by 294 tonnes per year; and
- Green star rating for the design of Dube TradePort Corporation's office building in Dube City, showing innovative technology for reducing energy requirements, such as light sensors, building orientation to maximise natural light, a roof garden for absorption of carbon emissions and air pollution, as well as smart metering.

The following green initiatives are still to be developed by Dube TradePort Corporation, or through collaboration with its strategic partners:

- Feasibility for initiating green flights for airlines;
- Research into the development of bio-fuels from ethanol for public transport;
- A Memorandum of Understanding with eThekwini Municipality, Tongaat Hulett and Airports Company South Africa to develop a Climate Resilient Plan for the Dube TradePort precinct;
- Collaboration with the University of KwaZulu-Natal's School of Environmental Engineering on green ecological infrastructure engineering for Dube TradeZone Phase Two; and
- Collaboration with key stakeholders in research and feasibility studies on alternative fuels and Mass Rapid Transport.

7.4.2 CARBON MANAGEMENT STRATEGY

The management plan is based on a four-step model on how to achieve a carbon neutral airport in South Africa (Figure 30).

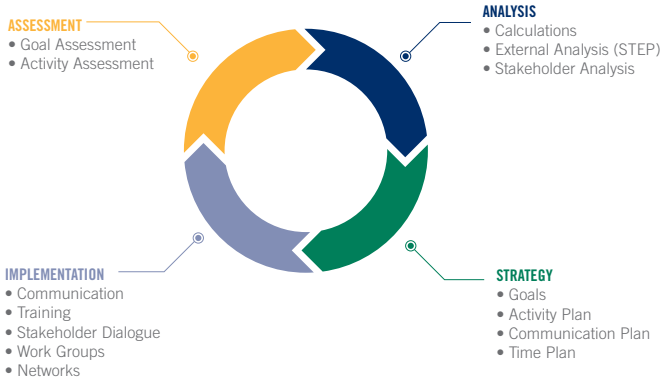


FIGURE 30: CARBON MANAGEMENT STRATEGY FOR DUBE TRADEPORT

The ultimate goal for the development of the carbon management plan is to ensure that all energy use for in-house and incoming activities is minimised, most energy sources are renewable and emissions are kept as low as possible.

7.4.3 DUBE TRADEPORT ENVIRONMENTAL POLICY

The Dube TradePort Corporation's Board of Directors has approved an environmental policy and charter for the purpose of managing environmental issues at Dube TradePort Corporation. The policy extends across all divisions and the main objective of the policy is to:

- Promote development in a way that is sensitive to our natural ecosystems and the goods and services they provide;
- Create a working environment which allows for the efficient use of natural resources, such as water and fossil fuel energy;
- Monitor and manage our carbon emissions with a view to becoming carbon-neutral;
- Minimise our emissions to air, water and land;
- Balance the needs of the environment against other Dube TradePort Corporation sustainability mandates;
- Promote development according to the 60-year Master Plan; and
- Promote recognition and awareness among Dube TradePort Corporation management, staff and third parties regarding the values and responsibilities of maintaining a healthy environment.

Dube TradePort Corporation intends to mitigate its GHG emissions through the following elements:

- Review and, where feasible, develop renewable energy and energy efficiency projects; and
- Monitor and manage GHG emissions, with the ultimate aim of becoming 'carbon-neutral' through the implementation of the Carbon Management Strategy.

7.4.4 POLICY, TOOLS AND LEGISLATION

Responses, in the form of policies, tools and legislation, across all scales applicable to this theme are listed in the summary table which follows.

TABLE 15: SUMMARY OF POLICY, TOOLS AND LEGISLATION

	INTERNATIONAL RESPONSES
1998	Air Pollution Information Network Africa
2002	Kyoto Protocol (Ratified by South Africa in March 2002)
	NATIONAL RESPONSES
2004	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
2005	National Energy Efficiency Strategy
2007	National Framework for Air Quality Management
2011	National Climate Change Response White Paper
2013	Carbon Tax Policy Paper
	PROVINCIAL RESPONSES
2010	KwaZulu-Natal Dube TradePort Corporation Act (Act 02 of 2010)
	LOCAL AUTHORITY RESPONSES
2011	Towards a Low Carbon City: Focus on Durban
2011	Dube TradePort State of Environment Report
2012	Dube TradePort Carbon Management Strategy
2014	Dube TradePort Corporation Environmental Policy

7.5 CONCLUSION

The Air Quality chapter is focused on the state of air quality and provides an overview on the current trends in air quality, as well as the drivers and pressure acting upon it. The main aim of this chapter is to identify point sources, priority areas, information gaps and ways in which negative impacts can be remediated. Sources which were identified as being key contributors of criteria pollutants include the transportation sector (vehicles exhaust emissions and aviation) and biomass burning.

Carbon emission by source was calculated by Dube TradePort Corporation for the period 2011. The calculated results reflected the following:

- Carbon emission was calculated at 181 969 tCO_2e/ year;
- The highest contributor of carbon emission was from the airport landing and take-off (LTO aircraft engines) at 64%, while buildings energy contributed 27% to the carbon emission; and
- No visible trend was noted, as updated data on the carbon emissions were not provided.

As a result of the high carbon emissions emitted by the airport, Dube TradePort Corporation has taken certain steps and initiatives to reduce its carbon footprint. The table which follows lists the various initiatives and responses carried out by Dube TradePort Corporation.

7 AIR QUALITY

TABLE 16: DUBE TRADEPORT INITIATIVES AND RESPONSES IN REDUCING ITS CARBON EMISSIONS

INITIATIVES	PERIOD CONDUCTED
Towards a low carbon city: Focus on Durban	2011
Dube TradePort State of Environment Report	2011
Carbon calculation audit – Dube TradePort	2011
Action plan for a carbon management strategy: Dube TradePort	2011
Carbon management strategy – Dube TradePort	2012
Towards a low carbon economy development: KwaDukuza Local Municipality	2013

Aviation is responsible for the majority of the carbon emissions emanating from Dube TradePort. Emissions should be measured on a yearly basis and compared to previous years in order to determine trends and compliance. All monitoring and reporting should adhere to the greenhouse gas protocol. Continuous monitoring and management should be carried out with the goal of becoming 'carbon-neutral'. Off-setting of all emissions that cannot be reduced or avoided in the interim should be carried out according to the United Nations Framework.

Due to the high energy demand at the Dube TradePort, energy efficiency campaigns should be carried out regularly, with tenants and partners on emission and energy-saving activities. Renewable energy projects are needed to provide sustainable power generation, such as wind and the use of bio-fuels. Alternative fuel sources should also be evaluated, such as a switch from petrol and diesel fuel to renewable fuels (bio-fuels) in both vehicles and aviation.

A summary of the key aspects and points discussed in this report is provided in the following section. For a more detailed understanding of each key point for Dube TradePort, refer to the sections above.

TABLE 17: SUMMARY OF ASPECTS AND KEY POINTS

ASPECTS	KEY POINTS
Pressures	Transportation (Aviation and vehicle exhaust emissions)
	Biomass burning (Sugar cane burning)
Impacts	Health effects
	Impacts on biodiversity
	Economic impacts
Challenges	Continuous monitoring of results
	Yearly monitoring of carbon emissions
	Carbon off-set measured
	Measurement of dust particles
Progress	Development of a carbon management strategy
	Compilation of the 2011 State of Environment Outlook Report
	Development and implementation of an environmental policy
	Use of the Dube AiRoad's Euro 5 trucks
	Dube AgriZone Green Initiatives
	4-star green rating for the 29° South building, located in Dube City
Critical areas for action	Continuous (yearly) monitoring of all emissions

There are a few aspects that should be noted from the air quality findings that may be influential for future SoERs. The majority of the data presented as indicators of air quality was collected during COP17, and therefore focus more heavily on road and air traffic than future reports are likely to. It is recommended that future reports focus on the emissions and off-set projects directly related to Dube TradePort activities. The carbon footprinting exercise, currently underway, will also be beneficial for reporting on these aspects.

8 BIODIVERSITY AND ECOLOGY

Biodiversity, as defined by the National Environmental Management: Biodiversity Act 2004 (Act 10 of 2004), is the variety of life-forms present due to the reigning environmental conditions. This includes terrestrial and marine life-forms, for example microbes, fungi, algae, ferns, vascular plants, insects, invertebrates, amphibian, reptiles, mammals and birds. The high degree of biogeographic zonation has its origin due to the diverse geology and climate present which, in turn, leads to the variability of types of habitats (Mbengashe, 2009).

It is reported in the 5th National Report to the Convention on Biological Diversity that South Africa is one of the top three countries in the world with the greatest biological diversity. Such biological diversity is due to the diversity of species, the level of endemism and the diversity of ecosystems (Molewa, 2014).

Environments that have great diversity of species and have more stable ecosystems have better chances to spring back during environmental upsets and can endure an onslaught of pressure for longer than weak environments (Croucamp, 2009). Dube TradePort is located in a globally-recognised biodiversity hotspot, namely the Maputoland-Pondoland-Albany region. This is one of only three hotspots in South Africa and one of 34 in the world (Roberts, 2007, Yawitch, 2010, P22, Molewa, 2014. P1).

In spite of the recognition of the biodiversity hotspot, the land on which Dube TradePort is located was formerly sugar cane plantations and, in part, still is. There are also remaining bulk earthworks for an airport which were constructed in the 1970's. King Shaka International Airport has taken up a large part of this land in the Phase 1 portion of the development, with land reserved for the development extent to double. In addition to the airport, in the first phase of development, Dube City, Dube AgriZone, Dube TradeZone and Dube Cargo Terminal have been developed. The remainder of the site is either being developed or rehabilitated with indigenous vegetation.

Different environmental processes have been used to authorise the components of Dube TradePort and the realisation of the 2060 Master Plan. Dube TradeZone and Support Zone 1 were scoped as part of the Phase 1 development within Special Zone 10, with supporting bulk infrastructure included for the entire site. The AgriZone 1 development, MRO, electronic billboards and the Watson Highway Link Road were authorised under a separate Basic Assessment and EIA process. AgriZone 2, Support Zone 2 and TradeZone 2 are currently being assessed as part of separate EIA processes as well. Each of these environmental authorisations is subject to and associated with the formal development of Dube TradePort, its landscaping, rehabilitation and restoration process. There is on-going monitoring and measurement to determine the performance of the mitigation measures to ensure that it satisfies the expectations of the authorities and interested and affected parties.

This chapter, as part of the 2013/14 SoER, aims to define the baseline biodiversity conditions, as well as the progress made in terms of maintaining biodiversity and ecosystem rehabilitation on-site. It also attempts to define the pressures, which are currently driving change in these natural systems, as evident in selected environmental indicators and how this may continue to manifest in the future.

8.1 PRESSURES

8.1.1 LAND TRANSFORMATION AND DEGRADATION

Habitat destruction occurs mostly through land transformation. Land transformation occurs through almost every form of anthropocentric activity associated with urbanisation, agriculture, infrastructure development, transport routes or industry. Natural areas become fragmented into small unsustainable areas where the pressures are so intense that the resilience of stable ecosystems is lost and the decline in biodiversity is inevitable. In the history of the Dube TradePort site, agricultural activity has been the dominant driver of land transformation. Before the 1970's the natural veld was destroyed with the establishment of sugar cane fields. Following this, the first attempt was made to establish an airport and earthworks were undertaken to establish the platforms for the airport runway and natural veld, secondary veld and sugar cane fields were transformed. In the time after the initial earthworks were undertaken, the platformed area was left to become re-vegetated.

When King Shaka International Airport was developed, further destruction of this secondary (although degraded) habitat took place. This, unfortunately, led to the disruption of the only known Black Coucal (Centropus grillii) breeding site in Durban and was also the southern-most known breeding locality of the species in Africa. This bird has not been seen since (Croucamp, 2009).

The disturbances to the natural ecosystem led to the establishment of alien invader plants in drainage lines, wetland and forest edges. Bush encroachment transformed the remaining natural grassland. Wetlands were drained with herringbone drains and with ridges and furrows and then planted with sugar cane.

Since this time, Dube TradePort Corporation has made a concerted effort to remove alien vegetation and rehabilitate large areas of grassland and wetland habitat, through a comprehensive rehabilitation programme. This has allowed for the re-establishment of indigenous vegetation. These efforts have laid the foundation for flourishing, healthy natural ecosystems, which will soon be of great benefit to the region.

8.1.2 INTRODUCTION OF ALIEN SPECIES

Alien species are plants, animals and micro-organisms that are transported beyond their natural range and become established in a new area.

The distribution of alien species is dependent on the vector of transport. Species dispersed by wind or carried by birds are difficult to restrict. In addition, the frequent transportation of goods and people from the airport could easily act as a dispersal agent of plants and animals, both from South Africa and into the local environment.

Smuggling and even unintentional passenger dispersal of seeds, plants or animals could result in the establishment of alien invaders in the area. King Shaka International Airport has a process to prevent such organisms from entering the country, but such introductory events could still take place.

Should such an organism be able to adapt to the local environment, it could become a new alien invader. The impact of the introduction of alien species is temporary and of moderate significance.

8.1.3 CLIMATE CHANGE

It is predicted that climate change is the greatest long-term threat to biodiversity as a consequence of changes in air temperature, rainfall patterns and extreme weather events, such droughts and floods. The complexities and multiple components of climate change affect all levels of biodiversity, from organisms through to biomes and landscape processes. Climate change is likely to cause a shift in species distribution in response to habitat changes and shifts in food resources. Some animal and plant species are already undergoing related change in terms of timing of life stages and growth (phenology). This often leads to a breakdown in species interaction with consequences for ecosystem functioning (e.g. plants flowering too early for their seasonal pollinators) (WCG, 2013), resulting (potentially) in large-scale biodiversity losses (WCG, 2013).

Human induced disturbances, such as habitat fragmentation, pollution, over-exploitation and biological invasions, will exacerbate the effects of climate change on biodiversity and may increase the likelihood of extinctions, if adequate natural habitat is not preserved.

Estimations of species loss point to a 30% loss in diversity, globally (WCG, 2013).

8.2 STATE

8.2.1 BIOMES, BIODIVERSITY AND ECOLOGY

Biomes are considered to be units of vegetation that represent large, natural, reasonably homogenous areas (Rutherford and Westfall, 1994. P1). It can also be called a large-scale ecosystem (Cox & Moore, 2000). The biomes are characterised by the emergent properties of the structure of vegetation present, the reigning climate patterns and other macro-environmental factors (Mucina & Rutherford, 2006. P32).

Dube TradePort falls within the Savannah biome (Mucina and Rutherford, 2006), as illustrated in Figure 31.

FIGURE 31: BIOMES OF THE ETHEKWINI MUNICIPALITY (SANBI, 2014)

8 BIODIVERSITY AND ECOLOGY

The Savannah Biome comprises a herbaceous layer, dominated by grasses and an upper woody layer. Where the woody layer covers up to 75% of the veld, this is described as woodland. The Savannah Biome is limited to the summer rainfall region of the country, where rainfall is above 235 mm per annum and has an Aridity Index of less than 4,0.

Low and Rebelo (1996) considered much of this bio-region, that had shallow-soil sourvelds and secondary grasslands, to form part of the grassland biome. Mucina and Rutherford (2006, P33) describe the biome present along the KwaZulu-Natal coast as the Indian Ocean Coastal Belt. This biome extends from the northern KwaZulu-Natal boundary with Mozambique, to the Albany area, north of East London and extends up to 50km inland. Scientists have been oscillating between the true characters of forest and grassland of the Indian Ocean Coastal Belt because so much of it has been transformed through agriculture and forestation, that there is no clear distinction between the two. Burgess et al. (2004) describes the region as Tropical Broadleaved Moist Forest and this is, until recently reviewed, the most supported view.

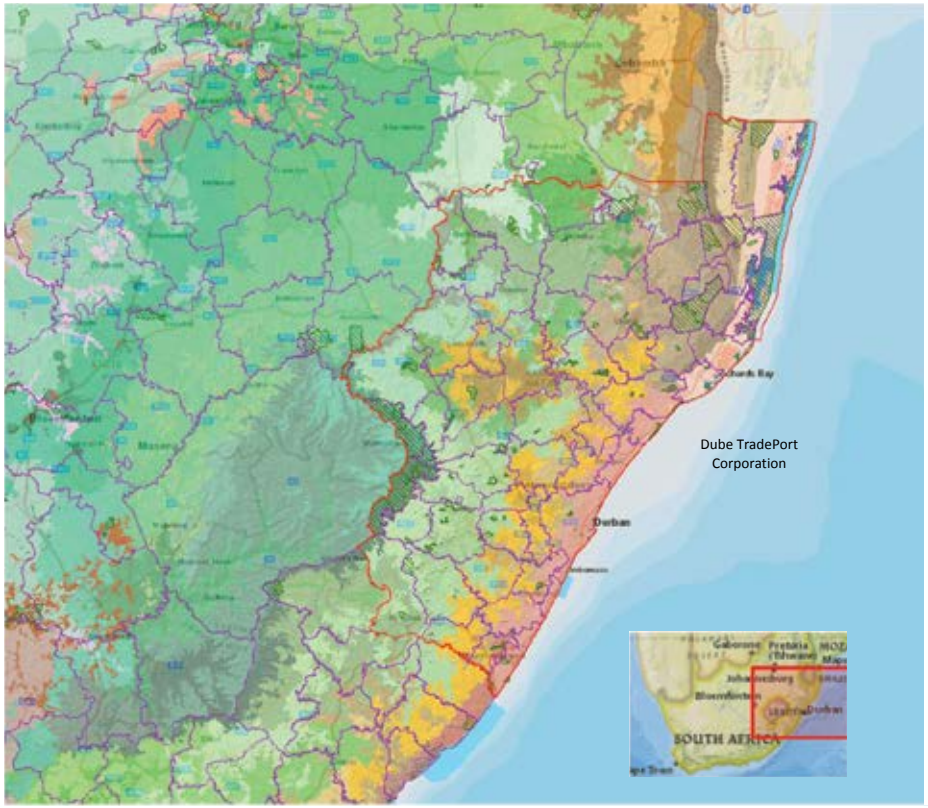
Scott-Shaw and Escott (2011) has identified a new vegetation type within the Indian Ocean Coastal Belt, which describes the vegetation in the study area, as being KwaZulu-Natal Coastal Belt Thornveld (CB 6). This vegetation is found on steep valley sides and landscape with hills. It is associated with river valleys that are drier and larger and found in the rain shadow of the frontal weather systems, bearing rain from the east coast. The vegetation is dominated by bushed grassland, bushland, bushland thicket and open woodland. The newly described subset of the Indian Ocean Coastal Belt has more savannah or grassland components than broadleaf forest. Details of the conservation significance of the vegetation type have not yet been described, other than the only statutorily conserved area being in the Harold Johnson Nature Reserve.

eThekwini Municipality's region has a number of protected species, of which the current status is unknown. These include the Natal Brachystelma, Burrowing Skink, Black-headed Dwarf Chameleon and the Pickersgill's Reed Frog.

They are rare, threatened and with limited distribution. Of the 14 vegetation types found in Durban, four (KZN Sandstone Sourveld, North and South Coast Grasslands and Swamp Forest) are endangered or critically endangered (i.e. they have an extremely high risk of extinction in the wild). There is an element of North Coast Grassland present on the Dube TradePort site.

Species diversity is best described as the ability of an area to support a suite of species comprising a wide range of taxa in which populations of threatened species (Red-data species) do not decline (LAB, 2007. P23).

FIGURE 32: VEGETATION TYPES OF ETHEKWINI MUNICIPALITY (SANBI, 2014)



8.2.2 REHABILITATION OF SENSITIVE ENVIRONMENTS

Historical agricultural activities have impacted heavily on the drainage lines, riparian and wetland areas on-site. Although a limited amount of wetland-dependent vegetation still exists, secondary grassland, alien vegetation and a few indigenous trees make-up the riverine assemblage. It is uncertain what the assemblage consisted of prior to disturbance.

The soft rehabilitation of the primary and secondary grasslands, the wetlands, the woodlands and the scarp forest has commenced. As an initial phase, the primary focus has been on removing and controlling the alien invader plants and the planting of wetland plants. Some planting of trees is also continuing on-site. Seed for grassland rehabilitation is being collected and plants have been collected and propagated for the restoration of the primary grasslands and wetlands.

A rehabilitation process, specific for each identified type of wetland, has been developed. The rehabilitation planting is divided into groups, where each type of wetland condition is being treated differently from the next section. Plants appropriate to the saturated portion are prescribed for that area. Likewise, plants are prescribed for the seasonal wetland areas, the seasonal-temporary and dry areas, where hygrophilous grass will thrive. In the planting strategy, the density of planting is prescribed and also the timing of planting (Smith, pers. comm, 2014).

Alien plant control is a primary objective in restoring and rehabilitating the natural habitat. In clearing alien invader plants, the control teams have to ensure they do not harm the indigenous plants that are present in the wetland areas, the scarp forest and the wooded grassland areas. Although not alien invaders, there are indigenous plants that exhibit invasive characteristics and encroach and infest areas in the absence of natural control elements, such as bulk grazers (e.g. cattle) or fire. Dichrostachys cinerea and Chrysanthemoides monilifera are two plants that behave so and do need to be brought under control.

In achieving the objective of controlling alien invaders, a professional team was appointed to undertake the initial clearing of 300 ha. Subsequent to this clearing, staff of Dube AgriZone have cleared and rehabilitated the AgriZone wetlands, as well as the area used as an off-set for the link road. This team of staff has also cleared areas within TradeZone 2 and AgriZone 2.

FIGURE 33: AREAS WHERE ALIEN PLANT CLEARING IS TAKING PLACE

8 BIODIVERSITY AND ECOLOGY

WETLANDS

Riparian planting has taken place in Portion 1 and Portion 2 in area P6 and in the JV North-West area (De Villiers, pers. comm, 2014). Over several months, seed from sites, such as Amatikulu, Nyoni, Treasure Beach, Mzamba, Tugela Mouth, Inanda Farm, iFafa Beach and Cato Ridge, has been collected for the rehabilitation process. Herbaceous plants and geophytes were also propagated from material collected from Dube TradePort and other above-mentioned sites.

In executing the plan described above, 30,04 ha have been prepared for sowing and 6 484,75 kg of seed has been harvested and cleaned. The required quantity of seed has not yet been obtained and harvesting will resume again later in spring of 2014, as it has become too late in the season to continue (Styles, pers: comm, 2014).

GRASSLANDS

The grasslands had been transformed by the past land-use, leaving highly degraded veld (Smith, pers. comm, 2014). It has subsequently been found that at least 10 plant species of conservation importance, in terms of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004), have the potential to occur in the Quarter Degree Square (QDGC) (Raimondo et al, 2009; POSA, 2011). A total of 68 species of the 171 Red Data list for rare or threatened plants occurring in the eThekwini Municipal Area have the potential to have occurred within the study area prior to original transformation to sugar cane production and are, therefore, considered suitable for planting at Dube TradePort. A further subset of this vegetation type present along this part of the coast, namely dry scarp forest, is also considered to be very sensitive. All the wetlands within the study area are considered sensitive.

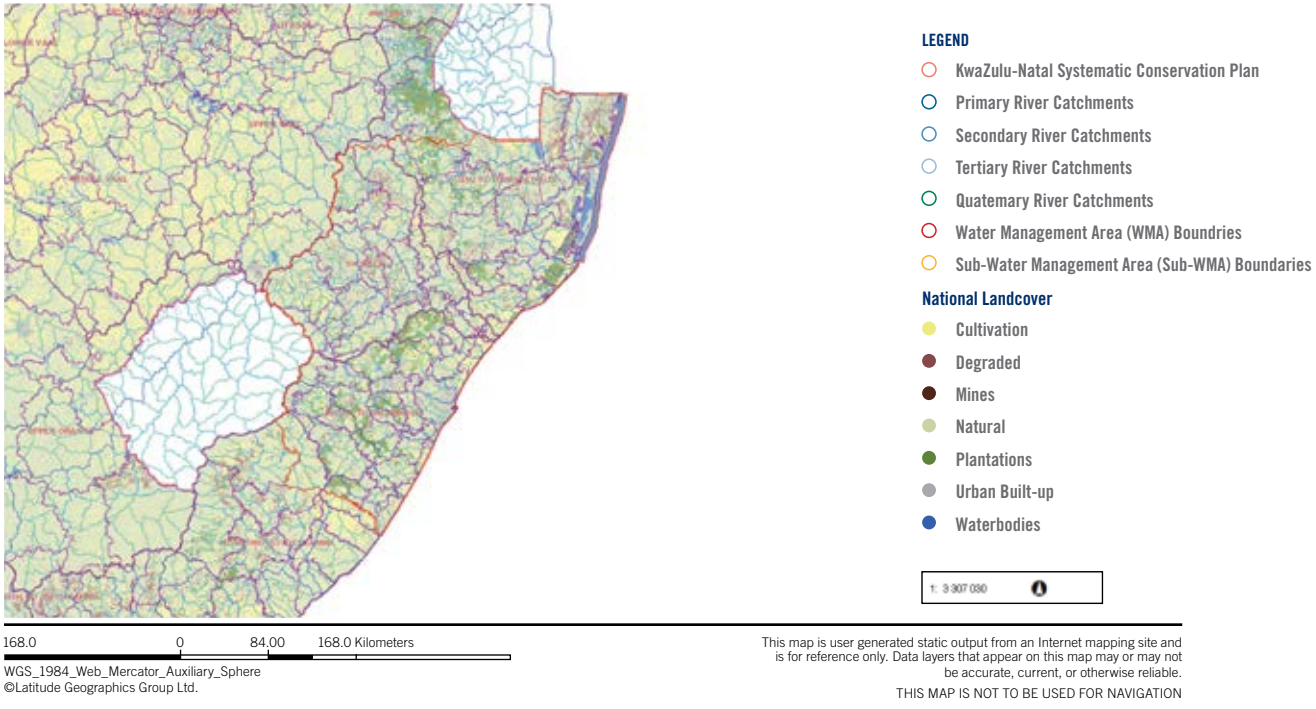


FIGURE 34: RIPARIAN AREAS WITHIN THE ETHEKWINI MUNICIPALITY, ACCORDING TO NFEPA CLASSIFICATIONS (SANBI, 2014)

To maintain the integrity of grasslands, it requires periodic burning or mowing. In managing grasslands, it is wise not to burn all of the grass at one time. Grasslands should always be broken up into management blocks, where not more than 50% of the grass be burnt at any stage. Where areas were burnt this year, they should be rested the following year. Burning grassland is not automatic, but is dependent on the season and rainfall. Grasslands should be scientifically evaluated to determine the fuel load before deciding to burn. If the fuel load is inadequate, it is not necessary to burn. The burning of grasslands is regulated by the Veld and Forest Fire Act (Act 101 of 1998). In terms of the Act, firebreaks are burnt in May/June, where burning is scheduled between 1 July and 15 September after the first spring rain. Fire breaks are burnt to prevent unplanned fires and to limit the spread of unplanned fires. Should mowing be used as a management option, it should also occur between these dates (KSEM, 2010). The alien plant removal and weed control contractor team has already burnt 87,57 ha of Portion 2, Portion 10/P6, JV North-west and Portion 1 (De Villiers, pers. comm, 2014).

WOODED GRASSLANDS

There is an area of wooded grassland consisting of free-standing, grouped indigenous trees, along with alien tree species, where there is also secondary grassland with some indigenous forbs and geophytes. Openings are often infested with Chromolaena odorata and Lantana camara. The trees found there are usually associated with the drier hillsides in the eThekwini Municipal Area. The dominant trees are local Acacia species Scented Thorn (Acacia nilotica). Sickle Bush (Dichrostachys cinerea) is also present and also forms thickets, but has a tendency to be a bush-encroacher and when alien thickets are cleared this tree could also be reduced. There are dominant alien trees, including Syringa (Melia azedarach) and Brazilian pepper trees (Schinus terebinthifolius). The character of this woody grassland is becoming woodier than it should be, through the infestation of alien invaders, bush encroachment and the absence of fire (KSEM, 2010).

8.3 IMPACTS

8.3.1 HABITAT DESTRUCTION

When development occurs, habitat is lost and many

organisms are displaced. Unfortunately, habitat destruction is a frequent and sometimes unavoidable consequence of development. Any alterations of the environment result in shifts in the natural equilibrium of ecosystems, communities and species. This shift in conditions tends to be more favourable to certain organisms, whilst being less favourable to others. This results in a decline or disappearance of some species from the area. Any decline in the biodiversity of an area is of moderate significance and the duration is long-term.

8.3.2 REHABILITATION

As a water-stressed country, the water resources in South Africa are under increasing pressure through over-abstraction and modification of natural water-courses. Many of the river systems in South Africa have been dramatically - and some irreversibly - altered (See the Inland Waters and Wetlands Chapter for more information). This is often accompanied by, but not limited to, the establishment of alien invasive plant species. These plants often lead to a reduction of water quality. Alien species also generally absorb greater quantities of water than local species. The consequences for local biodiversity are largely negative, as altered flow regimes and water quality have significant implications for migration, breeding and the survival of fauna and flora during seasonal dry periods and the availability of essential aquatic habitats and food resources.

The alien invader plants are being removed and, in their place, indigenous flora are being established. Until the indigenous substitutes are flourishing, there will be a deficit of species diversity. The decline will, shortly after rehabilitation or restoration, swing to growth in biodiversity and ecosystem health. It will take only a short while before insects, invertebrates, amphibians, reptiles, mammals and birds begin to colonise the restored and rehabilitated habitats.

8.3.3 CLIMATE CHANGE

In the Durban region, increases in temperature of 1,5 – 2,5˚C is expected to occur between 2045 and 2065 and 3 – 5˚C by 2081 – 2100. The projected increase in erratic rainfall events in Durban is potentially up to an additional 500 mm by 2081 – 2100. Added to the erratic rainfall will be more frequent floods and droughts. Floods displace people from their homes and during droughts people often have to migrate to where water is available, so becoming environmental refugees. Erratic rainfall and either floods or droughts will play havoc with the agricultural sector, leading to reduced food and water security.

A community with poor water resources and poor food security will increasingly experience negative health impacts. Crop losses and flood damage leads to an increase in insurance losses and greater demands on disaster relief resources. The level of the sea along the Durban coastline is expected to rise by 2,7 cm every decade and this rate is likely to accelerate in the future. Bio-climatic envelopes in which fauna and flora exist in Durban could shift due to the changes that are expected (Lewis, 2011; Govender, 2013. P26). Added to the main impacts listed above, there are a number of secondary impacts. Vulnerable groups comprising mainly the poor, homeless, children and the elderly, will suffer from the increase in heat stress. There is likely to be an increase in disease cases, such as cholera and malaria. Near-surface ozone (O3) concentrations could increase, impacting negatively on respiratory health.

Food security is affected negatively as staple food crop yields decline. Additional storage for crops that yield better under future climatic conditions will be required. Changes in the choice of crops and cultivar choices will have to be adapted as research indicates how seasonal shifts have taken place to adapt harvesting dates and crop yields. Biodiversity declines as species find it increasingly difficult to adapt to a rapidly changing climate and find it difficult to compete against alien invader species, benefited by the changing climatic conditions (Lewis, 2011). The impact of climate change is of great significance and the duration thereof is long-term.

8.3.4 URBANISATION

Urban development utilises land where habitat occurred and transforms it permanently. The impact significance of urban development is severe. Urban development causes areas to be covered with roofs, roads and hard pan paving, which prevent natural vegetation growth to support biodiversity. Urban areas are often landscaped with exotic plant material that do not support the diversity of species as natural vegetation would have done. The rise in urban population leads to a rise in the demand for food consumption. Urban sprawl is converting agricultural land permanently, reducing the ability to produce food. The impact of a rising population and a declining agricultural sector is an impact of high significance of long-term duration. Both the need to increase infrastructure for housing and economic activities and the need to preserve agricultural potential, place increasing strain on remaining natural habitats, through the transformation of land (i.e. loss of habitat) and increasing fragmentation, leading to the loss of biodiversity and the collapse of ecosystems.

8.3.5 HEAT STRESS

Transforming the natural environment to developed areas increases the potential for heat stress. The increasing conversion of natural habitat to concrete buildings, roofs and tar roads leads to heat absorption and radiation when the environment is supposed to cool. This is often referred to as the island effect, as it results in micro-climates around, particularly, built-up environments, such as cities.

8.4 RESPONSES

8.4.1 LEGISLATION, POLICY AND TOOLS

South Africa has a reputation for valuing its biodiversity resources and responding effectively to some of the challenges. Yet, the threats of urbanisation, agricultural activities and demands of a growing population still exist and must be managed appropriately. In this regard, many areas for improvement still exist. Some progress has been made with the establishment of a suite of bio-regional programmes that have a strong focus on the ecosystem approach and on mainstreaming conservation. Examples include the development of tools for mainstreaming biodiversity in land-use planning and environmental assessment, business and biodiversity initiatives with key production sectors, the establishment of stewardship programmes to secure

8 BIODIVERSITY AND ECOLOGY

protected area expansion on private land and, most recently, the implementation of fiscal incentives to support conservation on private land (DEAT, 2009).

However, there are also indications that the status of threatened species is worsening and biodiversity and ecosystem health continues to decline as key drivers of change (land-use change, climate change and alien invasive species) show no sign of decreasing (DEAT, 2009). Human capacity is listed as a constraint and shortfalls in financial resources present a significant challenge (DEAT, 2009).

The provincial-level Biodiversity Conservation Plan builds on national biodiversity plans, including the National Spatial Biodiversity Assessment of 2004 and the National Biodiversity Assessment 2012, as well as numerous regional and fine-scale biodiversity plans in the Western Cape, and develops a specific systematic biodiversity plan for the Province. It is intended to be used by all who are involved in land-use and development planning. The plan provides a basis for the Western Cape to review its biodiversity conservation policy and to focus its attention on high value areas for future protection initiatives. The plan and its land-use guidelines are intended to supplement other spatial planning tools, such as municipal Integrated Development Plans and Spatial Development Frameworks. One of the ways in which biodiversity planning can be applied in practice is through biodiversity off-set arrangements. The Province has produced a Guideline on Biodiversity Offsets, which ties into a National Policy Framework. This prepares a local framework for the introduction of off-set agreements, as a mechanism through which to secure priority or valued biodiversity areas and in rehabilitating degraded areas or as conditions of environmental authorisations.

Responses in the form of policies, tools and legislation applicable to this theme are listed in the summary table below:

TABLE 18: SUMMARY OF POLICY, TOOLS AND LEGISLATION

INTERNATIONAL	
1975	Convention on Wetlands of International Importance (RAMSAR)
1975	Convention on International Trade in Endangered Species of Fauna and Flora (CITES)
1983	Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
1999	World Heritage Conservation Act 49 of 1999
NATIONAL	
1998	National Environmental Management Act 107 of 1998 (NEMA)
2003	National Environmental Management Protected Areas Act 57 of 2003 • Listed critical biodiversity areas • Lists of protected fauna and flora
2005	National Environmental Management Biodiversity Act 10 of 2005
PROVINCIAL	
	Provincial Conservation Plan

8.4.2 REHABILITATION OF NATURAL HABITATS

A positive impact from alien plant control in the sugar cane fields is that land is regained, where indigenous plants that support the local species can be re-established. Natural water flow is restored, where aliens have interfered with the local water source.

Species diversity increases as insects, invertebrates, amphibians, reptiles, birds and mammals find refuge in the rehabilitated area. In spite of good efforts in rehabilitating an area, there will still be short-term negative impacts of the rehabilitation and restoration process as there are still a large number of alien invaders present, due to re-growth.

This is to be expected for a period following the initial clearing, as there is a seed bank in the soil which needs to be removed. Root stumps not treated with herbicide correctly will coppice and, if not treated, will become a bigger problem later in the season.

Alien species dispersed through natural means need to be controlled as there will be cross contamination from surrounding properties.

Areas, where sugar cane was treated with herbicide where the cane has died and where the grass seed has not yet germinated, will remain exposed to the elements during the winter months. There will be a higher risk of soil erosion during rain events, whilst the soil is exposed. Topsoil could be lost, making later rehabilitation and restoration work more difficult. The primary grass cover not being in place yet prevents the herbaceous and geophyte planting from taking place.

Re-forestation is taking place in areas that were disturbed by alien invader plants. Watercourses that support a community of riverine trees are being planted with appropriate indigenous trees to help regulate the stream flow, bind the soil and also to aid the sequestration of carbon. The trees also provide food and shelter to insects, invertebrates, reptiles and birds.

Conservation areas have been identified and set aside from the development area. Of particular importance are the primary grassland areas and secondary grassland areas. The grassland areas have been analysed and short-comings identified. The planting of herbaceous plants, bulbous plants and suffrutices are being conducted by contractors to aid the grassland in reaching the biodiversity status equal to pristine grassland.

The grassland conservation project facilitates a natural vegetation mass that supports a variety of organisms, including insects, invertebrates, reptiles, birds and mammals. Grasslands have been underrated for their capacity to sequestrate atmospheric carbon.

The biodiversity core area created by the re-introduction of certain critically endangered endemic plant species and vegetation types through the restoration process will be very valuable for D'MOSS. The improved environment is also able to sequester more carbon, making the climate more moderate, and able to release more clean air into the atmosphere. The improved veld is able to minimise erosion and help prevent flooding. The improved environment is able to host a greater variety of species of organisms and the improved environment is better able to deal with pollutants. Every alien plant controlled and prevented from seeding this year prevents a future generation of alien invader plants from germinating. The source of the seed bank has been removed and every alien plant controlled after this diminishes the seed bank.

Having cut down the alien invader plants, the area is opened, making it more accessible for the teams that follow to rehabilitate or restore the veld. Trees planted in the riparian zone are already contributing to the ecological goods and services of the area. The impact of restoring agricultural land back to natural ecosystems is very significant, is local in extent and is permanent in duration.

The rehabilitation of wetlands is being undertaken to remove, firstly, all alien invader plants. Areas where erosion has taken place are to be rehabilitated. Herringbone and other agricultural drains installed when the land was under sugar cane production, are being removed and the habitat restored to natural ground levels. Where there are exposed areas, the appropriate indigenous wetland plants are to be planted to not only cover the soil, but also to improve the diversity of species. This restoration process will have great benefit for the biodiversity of the wetlands.

8.5 CONCLUSION

There is no doubt that the state of the biodiversity will soon improve. All the right steps are being taken to ensure the improved health of the ecosystem and indigenous species. The alien invader plants are being removed and, in their place, indigenous flora is being established. Until the indigenous substitutes are flourishing, there will be a deficit of species diversity. The decline will, shortly after rehabilitation or restoration, show a swing to growth in biodiversity and ecosystem health. It will take only a short while before insects, invertebrates, amphibians, reptiles, mammals and birds begin to colonise the restored and rehabilitated habitats.

The conditions of the Environmental Authorisation and the Environmental Policy of Dube TradePort Corporation are the main drivers directing decision-making behind the rehabilitation and restoration process. Dube TradePort Corporation should continually assess and evaluate progress made in upgrading the environment by setting new goals and objectives to ensure continuous improvement and sustainability.

Biodiversity plays such an important role in climate change resilience and adaptation. The area of land not forming part of the hard development of Dube TradePort creates an ideal opportunity to make a meaningful contribution to an improved environment, increased biodiversity and adaption to climate change.

The implementation of the conservation plan is being undertaken and should continue for the foreseeable future until the veld is self-sustaining. Some recommendations are included in Table 19 which follows:

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TABLE 19: RECOMMENDATIONS FOR CONSIDERATION IN REHABILITATION PROGRAMMES AND CONSERVATION PLANS

ACTIVITY	RECOMMENDATIONS
Alien invasive clearing	• There are numerous species on the alien species watchlist which are not limited to plants. It is recommended that Dube TradePort Corporation take cognisance of this list; • Continued effort is required to prevent all alien species from establishing themselves and spreading; • Co-operative governance is required with surrounding land-owners to also adopt a management programme to ensure the adjacent buffer area is also cleared of alien invader species, which will assist with minimising the re-introduction of invader species; and • Wider cleared buffer strips reduce the chances of the re-introduction of alien invaders from occurring.
Rehabilitation of riparian areas	• It is suggested that the riparian areas are not planted uniformly with indigenous trees; • Alien woody vegetation that is removed should be replaced with indigenous trees at a density of one tree per $2m^2$; • The current process of wetland rehabilitation should continue, as it will take a few seasons to get the wetland to near-pristine or pristine status. Lessons learned in the process should be recorded and implemented in the remaining area to reduce the time it takes to rehabilitate the wetlands; and • Periodic monitoring assessments are required to observe the insect and bird populations as indicators of the increase in biodiversity.
Conservation	• The management of the conservation areas should be improved to ensure that conservation areas become so diverse and near-pristine, if not pristine, in order that they qualify to be registered as formal conservation areas in terms of the NEM:PAA and NEM:BA.
Agriculture	• Selling sub-standard export produce locally will go a long way towards ensuring the demand for fresh produce in the city is satisfied; • Responsible abstraction of water resources and use of the municipal supply should be practiced at all times to preserve this precious resource; and • Organic products (e.g. fertilisers) and methods (e.g. permaculture) should be practiced as much as possible to reduce impacts on biodiversity, water resources and soil health.
Re-introduction of game	• Large game animals have not been introduced as the veld is not yet restored and rehabilitated sufficiently; • This option is to be stalled for another three to five seasons, until adequate land is well-restored and rehabilitated to ensure the veld will be able to support large game; and • The small game present will thrive in the mean time and will provide some element of interest to the occasional visitor. These animals are unlikely to be a main attraction in the long-term, but are important from a conservation and biodiversity perspective.
Development	• Preserve areas of high ecological significance; • Maintain ecological corridors; • Ensure permeable surfaces are included in all designs; • To reduce the 'island effect' and/or heat stress, promote the conservation of natural areas and, where necessary, between developments, greenery and indigenous landscaping should be encouraged; and • Roof gardens (such as on the 29° South building) and green walls or green curtains on building exteriors are also recommended.
Public access	• Plans to provide walk-ways and access points for public enjoyment should be extended wherever possible (in a controlled manner); and • This access not only adds aesthetic and social benefits, but enhances public awareness and education with regard to the natural environment.
Monitoring and reporting	• Monitoring of existing species and the increase of local species should continuously be monitored and reported upon; • Successes and failures should be documented as a learning experience for Dube TradePort Corporation and others, as well as institutional memory retention; • Clear records of areas cleared of alien plants and conservation areas should be made for reporting purposes, as well as proof of continuous improvement and investment in eThekwini; and • Continuous monitoring and reporting ensure identification of trends and improved biodiversity and eco-system health.

9 INLAND WATERS AND WETLANDS

Water resources provide important benefits to humankind in the form of ecosystem goods and services, such as the provision of food and drinkable water and, by enhancing human well-being, in many other ways.

South Africa's socio-economic growth and productivity are heavily dependent on its water resources. Over and above the country's natural scarcity of water, its limited supply is under ever-increasing pressure for use by various sectors. This is further exacerbated by the ongoing degradation and pollution of rivers, wetlands and ground-water resources. More importantly, water is fundamental for sustaining healthy and functioning ecosystems and, thus, the long-term sustainability of natural water resources (King & Pienaar, 2011; DEA 2012).

Dube TradePort Corporation's development approach is founded on the principles of environmental sensitivity and sustainability, balancing corporate gain with environmental conservation. The Environmental Sub-programme is aimed at ensuring that all development planning and practices are sustainable in nature, by minimising and preventing environmental impacts and degradation.

It also recognises the benefits and importance of developing innovative measures to ensure the long-term protection of the environment (DTPC, 2013a). Furthermore, Dube TradePort Corporation is committed to creating a working environment which allows for the efficient use of natural resources, particularly water, in order to reduce the demand on water resources and has, therefore, implemented numerous green initiatives to supplement potable water demand.

9.1 PRESSURES

Through its mission to create a globally competitive multi-modal trade gateway for Southern Africa, Dube TradePort Corporation, with its numerous future-planned expansions and new developments, will continue to place increasing pressure on local water resources and the already stretched regional potable water supply through its growing water requirements.

According to its Report Card 2013/14, Dube TradePort's 2060 Master Plan may be 'realised sooner than originally anticipated'. This is evident in multiple project areas, but particularly in terms of the 'phenomenal speed in the uptake of land' in Dube TradeZone. Approximately 100 ha of the 2 840 ha footprint has been developed since commencement of construction of the King Shaka International Airport in 2007, including bulk service infrastructure. Dube TradeZone, currently at 26 ha in extent, is set to increase by an additional 77 ha with the completion of Phase 2, which is to be launched in 2015 (DTPC, 2013b).

The escalated progress in terms of future development planning and the demand for industrial land are likely to have significant implications for the future management of water resources. With key developments, such as Dube TradeZone Phase 2 and Dube AgriZone Phase 2 already in an advanced stage of planning, as well as the rapid uptake of development stands in Dube City, sufficient water must be sourced and provided to support this economic development, ensuring unhindered operations. In addition, an aquaculture production enterprise, including the harvesting and packaging of fish for export, is one of the options being considered for Dube AgriZone Phase 2 to enhance local economic development and create employment opportunities for surrounding communities (Report Card 2013/14).

It is evident from the above that the development of Dube TradePort is progressing at an unprecedented rate. This implies, however, that the shortfall in water availability predicted post-2020 (BKS, 2012) may also be realised much sooner than expected, unless strategies to improve water demand management, conservation and efficiency are enhanced in parallel with development progress.

In addition to limited water resources, there are several pressures being exerted on both the quantity and quality of water. Ground-water resources in the BPDM are depleted due to the reduction of surface stream recharge and extraction and abstraction for irrigation and agricultural use. Impacts on the environment are also expected to change, with the potential increase in storm-water flow from hardened surfaces into natural water courses, while degradation of water resources also had a marked impact on aquatic ecosystems.

In keeping with Dube TradePort Corporation's commitment to reducing its impact on the environment, it is critical that changes in water quantity (consumed and recovered) and water quality (entering the receiving environment and within aquatic habitats) are monitored and documented in order to identify key pressures and areas of concern and to initiate effective and appropriate response measures.

9.2 STATE

9.2.1 WATER DEMAND

According to the Dube TradePort Corporation Environmental Strategy 2013 – 2018, the estimated daily water requirement for Dube TradePort is 1,3 million litres[9] (1,3 MgL).

In terms of municipal water consumption, in 2012, Dube AgriZone and the Support Zone each accounted for almost 45% of the total water consumption for Dube TradePort (Figure 35). In 2013, however, there was a visibly significant decline in the amount of municipal water consumed at the AgriZone and a slight decline at the Support Zone.

This is possibly attributable to successful supplementation by way of rigorous rainwater harvesting in combination with the use of treated effluent from the Southern Waste Water Treatment Works for irrigation. Overall, daily municipal water consumption across Dube TradePort was halved from 524 m^3/day in 2012, to 294 m^3/day in 2013.

9 The total ROD daily limit is 3.5 MgL. The remainder is used for airport related activities such as the cooling system for the passenger terminal, and the like.

9 INLAND WATERS AND WETLANDS

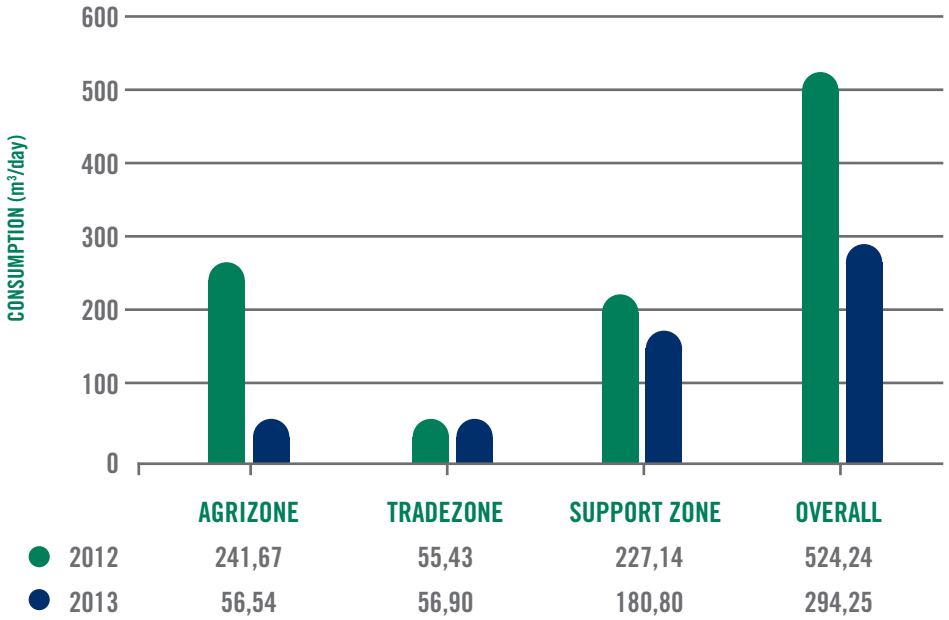


FIGURE 35: MUNICIPAL WATER CONSUMPTION VOLUMES (M³/DAY) ACCORDING TO EACH DUBE TRADEPORT ZONE FOR 2012 AND 2013

In spite of these results, securing sustainable access to water supply remains a strategic concern for the future expansion of Dube TradePort, since without additional water resources (rainwater harvesting, treated effluent, borehole water), Dube TradePort Corporation will remain at risk from future water supply shortfalls, particularly in light of the current rapid growth and investment in various zones, such as Dube TradeZone.

9.2.2 TREATED WASTE-WATER QUALITY

It is evident from the water demand data that Dube AgriZone used to be the largest consumer of municipal water, prior to 2013. As part of the AgriZone's irrigation strategy, water requirements are now augmented by treated effluent from the ACSA-owned Southern Waste Water Treatment Works (SWWTW) (WSP, 2013), on condition that the effluent meets specified General Limit Values (GLVs). The water quality of effluent received is first monitored prior to use. If the GLVs are not satisfied and the effluent is found unfit for irrigation, it is then transferred to the flush water ponds (WSP, 2013).

Table 20 depicts treated waste-water quality readings from August 2013 to March 2014 at the SWWTW. It is important to note that ammonia is the main parameter that is exceeded in terms of GLVs, therefore preventing the usage of treated effluent for irrigation. However, this occurrence is limited, where only 5% and 2% of the daily records in 2013 and 2014 were above the GLVs, respectively. Apart from chemical oxygen demand levels, all other parameters are within the limit. This is a positive outcome, indicating the general effective treatment of incoming effluent to acceptable standards in compliance with GLVs. The Special Limit Values (SLVs), being those values that must be met in order for treated waste-water to be discharged to the natural environment, are more difficult to achieve.

In 2013, almost 100% of the daily nitrate recordings exceeded the SLVs, with other parameters frequently exceeded. However, in 2014 both the number of parameters and the frequency that parameters were exceeded decreased, indicating more effective removal of contaminants.

TABLE 20: PERCENTAGE OF DAYS WHEN SELECTED WATER QUALITY PARAMETERS MEASURED AT THE SWWTW EXCEEDED GLVS AND SLVS

PARAMETER	AVERAGE	GLV	2013 (%)	2014 (%)	SLV	2013 (%)	2014 (%)
pH	6,11	5,5 - 9,5	.	.	5,5 - 7,5	1,4	.
Conductivity (mS/cm)	63,98	70 - 150	.	.	50 - 100	4,3	.
Total Suspended Solids (mg/l)	4,29	25	.	1,0	10	10,9	1,9
Soluble Reactive Phosphate (mg P/l)	2,15	10	.	.	1 - 2,5	42,0	12,6
Nitrate (mg N/l)	3,20	15	.	.	1,5	97,8	47,6
Soluble COD (mg/l)	22,53	75	0,7	1,0	30	29,0	30,1
Ammonia (mg N/l)	0,89	6	5,1	2,2	2	10,1	2,2
Nitrite (mg N/l)	0,57	15	.	.	1,5	22,5	.

Dube AgriZone water demand and, thus Dube TradePort overall, has the potential to increase substantially and increase the risk of shortfalls in water supply if the required water quality standards for irrigation effluent are not met. It is, therefore, imperative to ensure effective treatment of the effluent received by the Southern Waste Water Treatment Works, enabled through ongoing maintenance of the plant and stringent water quality monitoring.

9.2.3 STORM-WATER RUN-OFF

Environmental monitoring is a valuable tool for the detection of negative impacts of a given activity and to evaluate the quality of the environment in response to that activity. To this end, a precinct-wide water quality monitoring programme was developed and implemented to assess the impacts of water use, particularly the discharge of treated waste water and storm-water run-off emanating from the Dube TradePort and King Shaka International Airport complex, on the surrounding natural environment. Monitoring stations are located at various drainage lines, storm-water channels and river courses (the Umdloti and Hlawe Rivers) within and adjacent to Dube TradeZone, Dube City and Dube AgriZone.

The programme was designed to monitor existing water bodies, discharge from water treatment works and flow into the Mount Moreland Wetlands (DTPC 2013b). Table 21 depicts the water quality results from the site-wide monitoring surveys conducted on a quarterly basis between October 2011 and September 2012 (ERM, 2012). Exceedences were noted for several parameters, particularly chlorine, copper and faecal bacteria, E.coli, which were consistently above the special limit values at all stations, with copper and zinc levels generally higher than the general standards. These two parameters were particularly high at stations 11 and 13, reaching 6 and 3 times the general limit values, respectively. Conductivity, pH, cadium, and cyanide were often above special limit values. While there are no stipulated standards for turbidity and soluble nitrate (NO_3), values highlighted in blue suggest relatively high values that appear to be above the expected levels and may be cause for concern. This is evident in the high nitrate concentrations in Dube AgriZone (stations A2 and A3), while high turbidity levels coincided with elevated suspended solids concentrations. All of the above-mentioned parameters should be closely monitored going forward.

The values for chlorine at sites 12 - 14 and A1 - 3 are considered incorrect, as they exceed the general limit values by two to three orders of magnitude and given that there are no industries or activities within Dube TradePort that would produce excessive amounts of chlorine, are considered to be laboratory errors.

During the 2013 water quality survey (Jeffares & Green, 2014) (Table 21), E. coli, grease, oil and suspended solids exceeded the special limit values at all sites for the most part. Faecal bacteria counts were particularly high at station 5, reaching more than 200 000 counts/100ml. Elevated grease and oil concentrations were recorded at stations 1, 2 and 16, which reflect points of accumulation from upstream activities.

Suspended solids measurements at stations 7, 12 and 17 were well in excess of GLVs and coincided with high turbidity levels, high chemical oxygen demand and organic carbon inputs. These results indicate the presence of point source pollution inputs into the respective drainage lines.

WHEN COMPARING 2012 AND 2013 WATER QUALITY RESULTS, IT IS EVIDENT THAT FEW WATER QUALITY PARAMETERS WERE EXCEEDED IN 2013. FOR EXAMPLE, FREE CHLORINE, COPPER, IRON, MANGANESE AND ZINC WERE PROBLEMATIC DURING 2012, YET GENERALLY WITHIN LIMIT OR BELOW DETECTION LIMITS IN 2013. OIL AND GREASE CONCENTRATIONS WERE, HOWEVER, HIGHER IN 2013.

Figure 36 highlights where most water quality parameters exceeded the given standards for 2012 and 2013, collectively. Dube TradePort operations are most likely to contribute to current water quality conditions, directly, indirectly or in concert with King Shaka International Airport, at stations 4 - 7 and A1 - A3 (Dube AgriZone), which are all located within the catchment of the Hlawe River. Stations 4 and 5, and A2 and A3 reflect high copper and nitrate levels, while stations 6 and 7 are associated with high levels of various metals, including cyanide, iron, manganese, copper and zinc. In terms of minimising negative impacts on local water resources, it is evident that these areas require closer investigation to determine the source inputs and, where possible, methods to refine treatment processes prior to discharge in order to prevent further contamination.

TABLE 21: AVERAGE WATER QUALITY RESULTS RECORDED BETWEEN 2011/2012[10]

			2012-01	2012-02	2012-03	2012-04	2012-05	2012-06	2012-07	2012-08	2012-09	2012-10
PARAMETER	**GLV**	**SLV**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Conductivity (ms/m)	70-150	50-100	90.5	97.4	44.1	95.7	118.5	127.7	98.3	76.2	125.2	145.3
pH	5.5 - 9.5	5.5-7.5	7.8	7.8	7.4	7.6	7.6	7.3	7.7	8.5	8.1	8.2
Turbidity (NTU)			20.6	16.5	3.7	16.3	16.4	49.7	20.5	7.0	11.0	13.3
Suspended Solids (mg/l)	25	10	16.5	14.1	<4	12.7	22.1	40.4	24.9	5.1	10.6	11.4
Nitrate (mg NO_3/l)			3.39	3.44	5.78	3.79	6.66	1.66	<0.1	3.61	5.16	3.51
Nitrite (mg N/l)			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.13	<0.1
Nitrate (mg N/l)	15	1.5	0.76	0.76	1.32	0.89	1.53	0.40	<0.1	0.81	1.16	0.81
Ammonia (mg N/l)	3	2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Free Chlorine (mg Cl_2/l)	0.25	0	0.09	0.09	0.10	0.09	0.11	0.11	0.09	0.11	0.09	0.09
Soluble Reactive Phosphate (mg P/l)	10	1-2.5	<0.12	0.15	<0.12	0.17	0.19	0.15	<0.12	<0.12	<0.12	<0.12
Fluoride (mg F/l)	1	1	0.23	0.28	0.13	0.28	0.38	0.29	0.33	0.23	0.33	0.38
Dissolved Arsenic (mg As/l)	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Selenium (mg Se/l)	0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.020
Dissolved Cadmium (mg Ca/l)	0.005	0.001	0.0014	0.0013	<0.001	<0.001	0.0016	<0.001	0.0010	0.0010	0.0020	0.0013
Dissolved Hexavalent Chromium	0.05	0.02	<0.02	<0.02	<0.02	0.024	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dissolved Copper (mg Cu/l)	0.01	0.002	0.0175	0.0175	0.0120	0.0200	0.0265	0.0180	0.0178	0.0195	0.0213	0.0238
Dissolved Cyanide (mg CN/l)	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.011	0.016	0.013	0.01	<0.01
Dissolved Iron (mg Fe/l)	0.3	0.3	0.29	0.22	0.12	0.27	0.23	1.02	0.19	0.11	0.11	0.21
Dissolved Lead (mg Pb/l)	0.01	0.006	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

10 RED VALUES EXCEED THE SPECIAL LIMIT VALUE (SLV), BUT ARE BELOW THE GENERAL LIMIT VALUE (GLV) AND BLUE VALUES ARE THOSE WHICH EXCEED THE GLV (ERM, 2012). GREEN INDICATES VALUES OF CONCERN.

TABLE 21: AVERAGE WATER QUALITY RESULTS RECORDED BETWEEN 2011/2012

			2012-01	2012-02	2012-03	2012-04	2012-05	2012-06	2012-07	2012-08	2012-09	2012-10
PARAMETER	**GLV**	**SLV**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Dissolved Manganese (mg Mn/l)	0.1	0.1	0.002	0.001	0.001	<0.001	0.072	0.042	0.031	0.046	0.004	0.005
Dissolved Zinc (mg Zn/l)	0.1	0.04	0.056	0.172	0.076	0.059	0.067	0.057	0.132	0.271	0.132	0.254
Mercury (mg Hg/l)	0.005	0.001	<0.001	<0.001	0.0027	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Organic Carbon (mg C/l)			7.55	6.71	4.53	8.40	7.15	11.16	7.33	10.97	10.35	9.62
Oil and Grease (mg /l)	2.5	0	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
E. coli (counts/100ml)	1 000	0	888.3	567.8	20.7	478.8	750.5	790.3	1,664.5	87.3	1,701.0	2,735.0

			2012-11	2012-12	2012-13	2012-14	2012-15	2012-16	2012-17	2012-A1	2012-A2	2012-A3	OVERALL
PARAMETER	**GLV**	**SLV**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**A1**	**A2**	**A3**	
Conductivity (ms/m)	70-150	50-100	78.2	104.5	47.5	60.7	74.5	48.6	59.8	100.4	68.1	122.6	88.9
pH	5.5 - 9.5	5.5-7.5	7.9	7.3	7.3	6.9	7.4	7.2	7.4	7.9	7.7	7.8	7.6
Turbidity (NTU)			17.5	334.4	23.5	68.2	29.2	20.0	105.5	23.4	25.0	16.5	40.1
Suspended Solids (mg/l)	25	10	16.3	686.2	17.5	70.1	21.0	29.8	133.5	19.8	21.6	15.6	55.0
Nitrate (mg NO_3/l)			10.65	<0.1	0.61	0.11	0.25	0.51	8.11	0.53	17.10	39.60	4.70
Nitrite (mg N/l)			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.12	<0.1	<0.1	<0.1
Nitrate (mg N/l)	15	1.5	2.38	<0.1	0.14	<0.1	<0.1	0.14	1.84	0.13	3.88	8.93	1.07
Ammonia (mg N/l)	3	2	<0.1	<0.1	<0.1	<0.1	<0.1	0.10	<0.1	<0.1	<0.1	<0.1	<0.1
Free Chlorine (mg Cl_2/l)	0.25	0	0.09	42.72	14.59	16.31	0.09	0.11	0.09	73.55	69.05	68.55	9.43
Soluble Reactive Phosphate (mg P/l)	10	1-2.5	0.94	1.03	<0.12	<0.12	<0.12	<0.12	<0.12	0.12	1.43	1.99	0.28
Fluoride (mg F/l)	1	1	0.18	0.57	0.18	0.26	0.24	0.20	0.28	0.30	0.15	0.20	0.27

			2012-11	2012-12	2012-13	2012-14	2012-15	2012-16	2012-17	2012-A1	2012-A2	2012-A3	OVERALL
PARAMETER	GLV	SLV	11	12	13	14	15	16	17	A1	A2	A3	
Dissolved Arsenic (mg As/l)	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.030	<0.01	<0.01
Dissolved Selenium (mg Se/l)	0.02	0.02	<0.02	0.022	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dissolved Cadmium (mg Ca/l)	0.005	0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.0025	0.001
Dissolved Hexavalent Chromium	0.05	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.530	<0.02	<0.02
Dissolved Copper (mg Cu/l)	0.01	0.002	0.0628	0.0137	0.0095	0.0143	0.0225	0.0110	0.0095	0.0250	0.0200	0.0300	0.0204
Dissolved Cyanide (mg CN/l)	0.02	0.01	0.011	0.015	<0.01	<0.01	<0.01	0.059	<0.01	<0.01	<0.01	<0.01	0.012
Dissolved Iron (mg Fe/l)	0.3	0.3	0.45	6.52	0.79	10.03	2.37	0.47	2.18	0.15	0.14	0.05	1.34
Dissolved Lead (mg Pb/l)	0.01	0.006	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0.1	0.01	<0.01
Dissolved Manganese (mg Mn/l)	0.1	0.1	0.006	1.121	0.251	0.456	0.189	0.002	0.210	0.001	0.001	0.005	0.120
Dissolved Zinc (mg Zn/l)	0.1	0.04	0.176	0.205	0.289	0.256	0.124	0.164	0.159	<0.005	<0.005	<0.005	0.144
Mercury (mg Hg/l)	0.005	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Organic Carbon (mg C/l)			10.46	17.63	6.54	11.35	7.97	6.77	6.08	19.40	9.48	9.27	9.12
Oil and Grease (mg /l)	2.5	0	<1.2	2.3	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
E. coli (counts/100ml)	1 000	0	412.5	272,192.3	834.0	402.3	359.3	303.8	1,415.5	261.0	551.0	1,606.5	12,153.3

TABLE 22: AVERAGE WATER QUALITY RESULTS RECORDED IN 2013[11]

			2013-01	2013-02	2013-03	2013-04	2013-05	2013-06	2013-07	2013-08	2013-09	2013-10
PARAMETER	**GLV**	**SLV**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Conductivity (ms/m)	70-150	50-100	71.3	100.5	58.8	79.8	51.3	82.5	268.8	70.3	116.5	155.3
pH	5.5 - 9.5	5.5-7.5	7.9	7.9	7.3	7.8	7.4	7.1	7.1	8.2	8.0	7.9
Turbidity (NTU)			26.5	22.2	16.0	42.1	18.1	204.6	6 291.2	19.4	9.7	14.9
Suspended Solids (mg/l)	25	10	19.0	15.3	<10	36.8	10.5	510.8	10 184.8	16.0	<10	12.8
Nitrite (mg N/l)			0.02	0.02	0.02	0.01	0.05	0.10	0.02	0.02	0.02	0.01
Nitrate (mg N/l)	15	1.5	1.72	1.83	1.20	3.09	2.11	<0.1	<0.1	1.06	0.32	0.53
Ammonia (mg N/l)	3	2	0.08	0.09	0.08	<0.08	0.16	0.25	0.31	0.09	<0.08	<0.08
Free Chlorine (mg Cl_2/l)	0.25	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Soluble Reactive Phosphate (mg P/l)	10	1-2.5	0.009	0.010	0.002	0.003	0.002	0.002	0.020	0.009	0.021	0.016
Fluoride (mg F/l)	1	1	0.39	0.35	0.27	0.34	0.37	0.48	0.71	0.40	0.51	0.55
Dissolved Arsenic (mg As/l)	0.02	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0011	<0.001	<0.001	<0.001
Dissolved Selenium (mg Se/l)	0.02	0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0015	<0.001	<0.001	<0.001
Dissolved Cadmium (mg Ca/l)	0.005	0.001	0.0029	0.0029	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Hexavalent Chromium	0.05	0.02	0.0012	0.0008	<0.0008	0.0015	<0.0008	<0.0008	0.0008	<0.0008	0.0011	<0.0008
Dissolved Copper (mg Cu/l)	0.01	0.002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Cyanide (mg CN/l)	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.015	<0.01	<0.01	<0.01	<0.01
Dissolved Iron (mg Fe/l)	0.3	0.3	0.18	0.18	0.25	0.20	0.36	1.47	1.08	0.23	0.05	0.06
Dissolved Lead (mg Pb/l)	0.01	0.006	<0.05	<0.05	0.028	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.025
Dissolved Manganese (mg Mn/l)	0.1	0.1	0.09	0.16	0.10	0.01	0.07	0.98	1.79	0.02	0.01	0.01
Dissolved Zinc (mg Zn/l)	0.1	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.014	<0.01	<0.01
Mercury (mg Hg/l)	0.005	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

11 RED VALUES EXCEED THE SPECIAL LIMIT VALUE (SLV), BUT ARE BELOW THE GENERAL LIMIT VALUE (GLV) AND BLUE VALUES ARE THOSE WHICH EXCEED THE GLV (J&G, 2013). GREEN INDICATES VALUES OF CONCERN.

			2013-01	2013-02	2013-03	2013-04	2013-05	2013-06	2013-07	2013-08	2013-09	2013-10
PARAMETER	**GLV**	**SLV**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Total Organic Carbon (mg C/l)			9.35	9.30	7.54	8.36	8.86	10.53	39.55	8.25	8.76	8.78
Oil and Grease (mg /l)	2.5	0	12.9	16.0	3.0	5.5	1.5	9.0	5.6	1.5	4.0	6.0
E. coli (counts/100ml)	1 000	0	380.0	385.0	414.0	592.5	200,037.5	2,123.5	5,588.5	56.5	410.0	22,255.0
Chemical Oxygen Demand (mg O_2/l)	75	30	33.5	28.0	21.8	39.5	23.5	176.0	425.0	440.3	28.8	169.8

			2013-11	2013-12	2013-13	2013-14	2013-15	2013-16	2013-17	2013-A1	2013-A2	2013-A3	OVERALL
PARAMETER	**GLV**	**SLV**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**A1**	**A2**	**A3**	
Conductivity (ms/m)	70-150	50-100	72.3	119.8	41.8	44.5	92.3	53.0	58.5	115.0	110.8	109.8	93.6
pH	5.5 - 9.5	5.5-7.5	7.6	7.2	7.4	7.1	7.7	7.4	7.2	7.5	7.5	7.4	7.5
Turbidity (NTU)			46.1	3134.7	8596.0	40.5	31.2	20.4	4 658.6	22.8	23.1	9.9	1 162.4
Suspended Solids (mg/l)	25	10	66.8	23409.8	16.8	31.3	37.0	19.0	15 690.3	59.3	33.0	23.0	2 510.4
Nitrite (mg N/l)			0.02	0.01	0.04	0.01	0.02	0.02	0.03	0.01	0.04	0.04	<0.01
Nitrate (mg N/l)	15	1.5	1.68	<0.1	0.48	<0.1	0.38	0.45	1.87	0.19	5.13	15.96	1.91
Ammonia (mg N/l)	3	2	<0.08	0.79	0.09	<0.08	<0.08	<0.08	0.71	<0.08	0.09	<0.08	0.16
Free Chlorine (mg Cl_2/l)	0.25	0	<0.1	<0.1	<0.1	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Soluble Reactive Phosphate (mg P/l)	10	1-2.5	1.159	0.019	0.009	0.003	0.014	0.014	0.009	0.046	0.774	0.142	0.114
Fluoride (mg F/l)	1	1	0.47	0.79	0.22	0.33	0.55	0.23	0.66	0.45	0.56	0.40	0.45
Dissolved Arsenic (mg As/l)	0.02	0.01	0.0013	0.0031	<0.001	<0.001	<0.001	<0.001	0.0023	0.0011	0.0032	<0.001	0.0010
Dissolved Selenium (mg Se/l)	0.02	0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Cadmium (mg Ca/l)	0.005	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0029	<0.001	0.0029	0.0029	0.0042
Dissolved Hexavalent Chromium	0.05	0.02	0.0012	<0.0008	0.0011	<0.0008	<0.0008	0.0011	<0.0008	<0.0008	0.0009	<0.0008	0.001

			2013-11	2013-12	2013-13	2013-14	2013-15	2013-16	2013-17	2013-A1	2013-A2	2013-A3	OVERALL
PARAMETER	GLV	SLV	11	12	13	14	15	16	17	A1	A2	A3	
Dissolved Copper (mg Cu/l)	0.01	0.002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Cyanide (mg CN/l)	0.02	0.01	<0.01	<0.01	0.011	<0.01	<0.01	<0.01	<0.01	0.012	0.012	0.011	<0.01
Dissolved Iron (mg Fe/l)	0.3	0.3	0.20	2.01	0.12	0.38	0.52	0.08	4.25	0.03	0.18	0.09	0.59
Dissolved Lead (mg Pb/l)	0.01	0.006	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.035	0.020
Dissolved Manganese (mg Mn/l)	0.1	0.1	0.02	3.11	0.02	0.07	0.01	0.03	0.84	0.01	0.02	0.03	0.37
Dissolved Zinc (mg Zn/l)	0.1	0.04	0.011	<0.01	<0.01	<0.01	0.010	<0.01	0.014	<0.01	<0.01	<0.01	<0.01
Mercury (mg Hg/l)	0.005	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Total Organic Carbon (mg C/l)			10.06	52.69	6.27	10.77	6.15	6.26	40.16	8.66	8.31	8.92	13.87
Oil and Grease (mg /l)	2.5	0	4.1	7.8	2.1	3.5	3.3	18.0	8.0	7.6	8.6	6.8	6.7
E. coli (counts/100ml)	1 000	0	950.0	1,978.0	3,635.0	164.0	374.0	615.8	2,060.0	1,197.0	477.5	321.5	12,200.8
Chemical Oxygen Demand (mg O2/l)	75	30	43.0	1,316.5	29.3	50.5	33.5	23.0	914.3	34.0	27.3	80.8	196.9

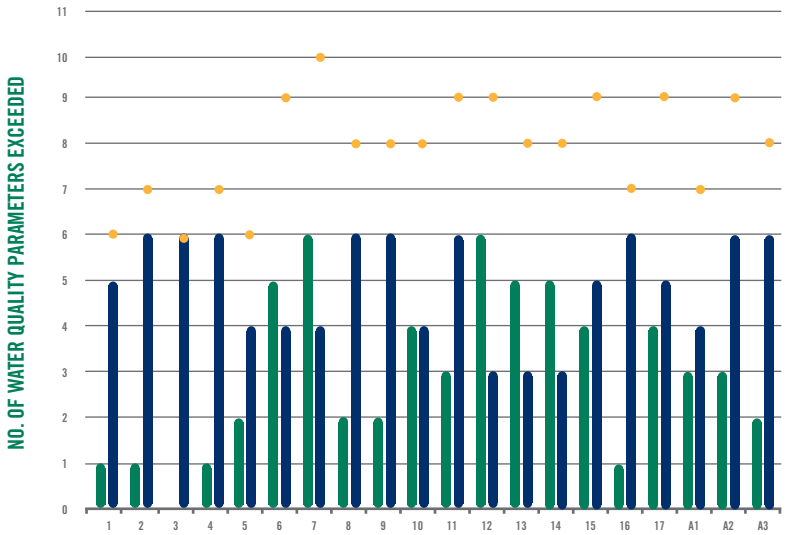


FIGURE 36: TOTAL NUMBER OF WATER QUALITY PARAMETERS EXCEEDED BETWEEN OCT 2011 AND NOV 2013 PER STATION RELATIVE TO THE GENERAL AND SPECIAL LIMIT VALUES

9.2.4 SURFACE WATER RESOURCES

The integrity of fresh water resources surrounding Dube TradePort has been severely affected by a history of agricultural, river sand mining activities and industrial activities, increasing urban human settlements and poor land-use management within the catchments, leading to the pollution and degradation of the river and wetland ecosystems. Consequently, these systems have been transformed from their natural pristine state, yet continue to maintain a level of ecosystem function.

Maintaining the health of river and wetland ecosystems is of critical importance, as these environments, which not only host a diversity of aquatic flora and fauna, also constitute a critical component of the region's ecological infrastructure, i.e. the functional natural eco-systems which provide valuable free eco-system services that are of high value to society. This highlights the need for the ongoing monitoring of these resources, as well as Dube TradePort activities, to ensure that negative and cumulative impacts are averted or minimised, wherever possible.

RIVER HEALTH

No recent comprehensive surveys have been carried out on the health of the three perennial river systems surrounding Dube TradePort, namely the Umdloti, Tongati and Hlawe Rivers, since the 2007 Environmental Impact Assessment.

However, past specialist reports do provide some indication of the state of the river catchments and river ecological condition (Groundtruth 2007; INR 2007). It is also important to note that stations 1, 2, A2 and A3, and station 13 and 16, in terms of the storm-water quality monitoring programme, do capture the water quality of the Hlawe and Umdloti Rivers, respectively.

The Hlawe River, a tributary of the Tongati River, is the only river system within the Dube TradePort development footprint. However, establishing the health of larger river systems remains valuable to determine if and how the operations of Dube TradePort affect the surface water resources at landscape level.

Below the Hazelmere Dam, the Umdloti River catchment is largely modified by urbanisation (Verulam) (Table 23), sand mining activities and extensive cultivation of sugar cane. The ecological state of the Umdloti River above the town of Verulam is considered good, while the downstream state of the river within the Mount Moreland estate is deemed poor, highly stressed and deteriorating over time, as reflected by the aquatic biota and water quality data. Urban settlement and associated activities have resulted in high nutrient levels (eutrophication), faecal bacterial contamination, heavy metal contamination and excessive growth of aquatic alien invasive plants and marginal vegetation (GroundTruth 2007, INR 2007), thereby significantly impacting the health of Umdloti River (Table 23).

The catchment of the Tongati River is described as transformed, largely through agricultural activities and possesses little remaining environmental resource assets (GIBB, 2011 & WCS, 2013). Based on the characteristics of the aquatic biota, the Tongati River appears to be in a modified and stressed condition.

This is evident in high nutrient loading, abnormally high river flow - attributed to supplementary sewage return flows - faecal contamination and the dense growth of marginally vegetation, as well as the proliferation of aquatic alien invasive plants. While water quality indicates that the Tongati River is moderately to heavily polluted (INR 2007), the overall ecological state has been considered to be fair (GroundTruth, 2007) (Table 23).

The Hlawe River, which drains the industrial areas of Tongaat and surrounding agricultural land, is considered to be highly stressed, indicated by significant impacts on the aquatic biota. The ecological state of the Hlawe River has been consistently categorised as poor and this was attributed to poor water quality, elevated nutrient levels and infestations by alien invasive plant species (GroundTruth, 2007) (Table 23).

According to the National Freshwater Ecosystem Priority Areas (FEPA) project, the Umdloti and Tongati Rivers are not considered to be Freshwater Ecosystem Priority Areas due to their modified and degraded states. However, reducing negative impacts on these water resources still remains critically important in order to prevent degradation of other associated valuable ecosystems, such as wetlands and estuaries.

TABLE 23: MAIN RIVER SYSTEMS SURROUNDING DUBE TRADEPORT, CURRENT IMPACTS, ECOLOGICAL STATE AND RIVER CONDITION (SANBI, 2011)

RIVER SYSTEM	THREATS/IMPACTS	ECOLOGICAL STATE AND DESCRIPTION	NFEPA RIVER CONDITION
Umdloti above Verulam	• Unregulated development and industrialisation • Raw sewage pollution inputs	Good, Reasonable Condition	Category D – Largely Modified
Mount Moreland	• Nutrient enrichment • Proliferation of aquatic IAPs • Loss of habitat due to excessive growth of reeds and grasses • Cumulative impacts of upstream catchment activities and inputs	Poor, Highly stressed	Category D – Largely Modified
Tongati/ OThongati	• Elevated nutrient levels • Faecal contamination • Proliferation of aquatic IAPs • Loss of habitat due to excessive growth of reeds and grasses	Fair, Stressed	Category D – Largely Modified
Hlawe	• Elevated nutrient levels • Proliferation of IAPs in riparian zone	Poor, Highly Stressed	Not assessed

WETLAND HEALTH

As with the riverine systems, the wetlands surrounding the Dube TradePort were evaluated as part of the EIA process in 2007. The specialist study identified and assessed the functionality of seven on-site wetland groups (Figure 38) (Cowden & Kotze, 2007; WCS, 2011), as well as two off-site wetlands, namely Mount Moreland's Lake Victoria and Froggie Pond, which would be affected by the construction and operations of Dube TradePort. The on-site wetlands were described as 'significantly modified' as a result of sugar plantations and alterations to natural hydrology through the construction of drainage canals. In terms of functional value, these wetlands scored Moderately Low to Intermediate for the majority of the ecosystem services assessed. The large wetland complex encompassing the Hlawe River was deemed the most important wetland, based on the 'greater potential to provide benefits and services within the landscape' (Cowden & Kotze, 2007). Wetland health was only determined for portions of the on-site wetlands falling within the Phase 1 development footprint (Figure 37) (WCS, 2011). Results revealed that the condition of these developed wetlands ranges between 'Seriously' and 'Critically Modified', with all displaying significant impacts on hydrological and vegetative integrity. The off-site wetlands exhibited greater functional value than on-site wetlands, scoring as Moderately High to High for the ecosystem services they provide. The health state of these systems was categorised as Largely Modified, predominantly as a result of hydrological and vegetation impacts within each wetland and the catchment. Lake Victoria was considered to have a slightly better ecological integrity than that of the Froggie Pond wetland, due to lower hydrological and vegetation impacts. It was also deemed to be of high importance for the maintenance of biodiversity, as the Barn Swallow roosting site, for the provision of habitat for rare species and due to the regional cumulative loss of wetland habitat and reed marsh vegetation (Cowden & Kotze, 2007).

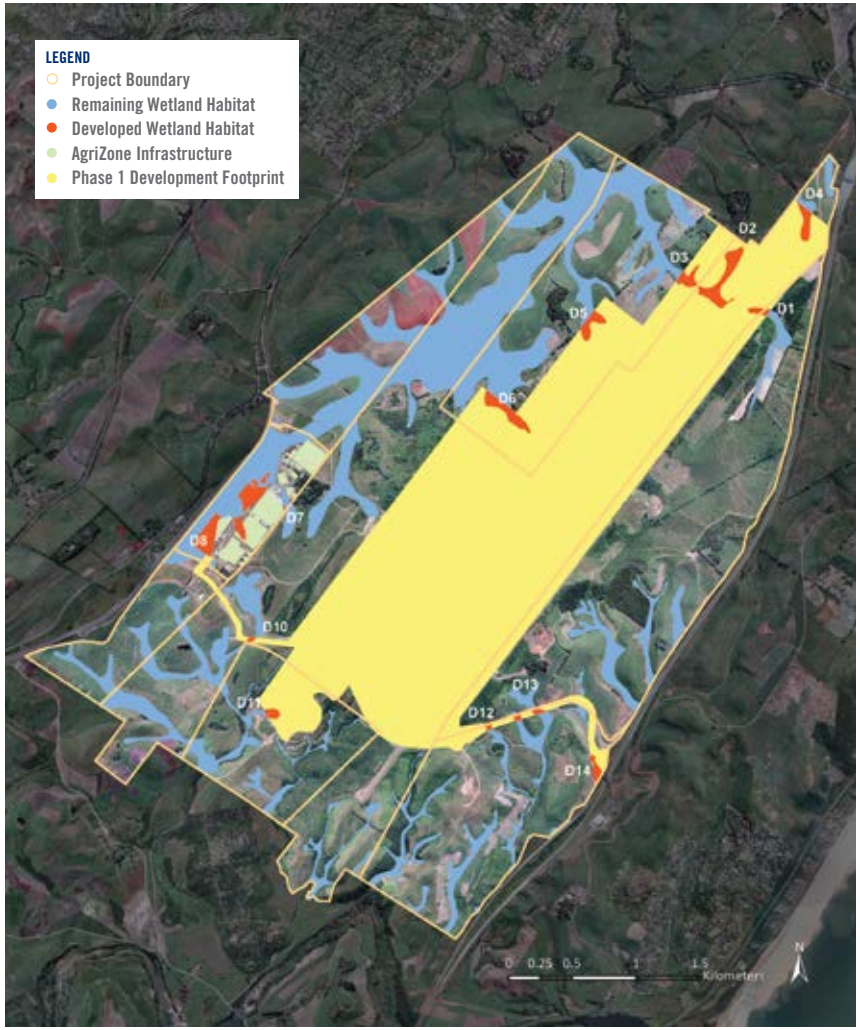


FIGURE 37: WETLANDS INCORPORATED INTO THE DUBE TRADEPORT DEVELOPMENT FOOTPRINT AND THEIR RESPECTIVE HEALTH STATES (WCS, 2011)

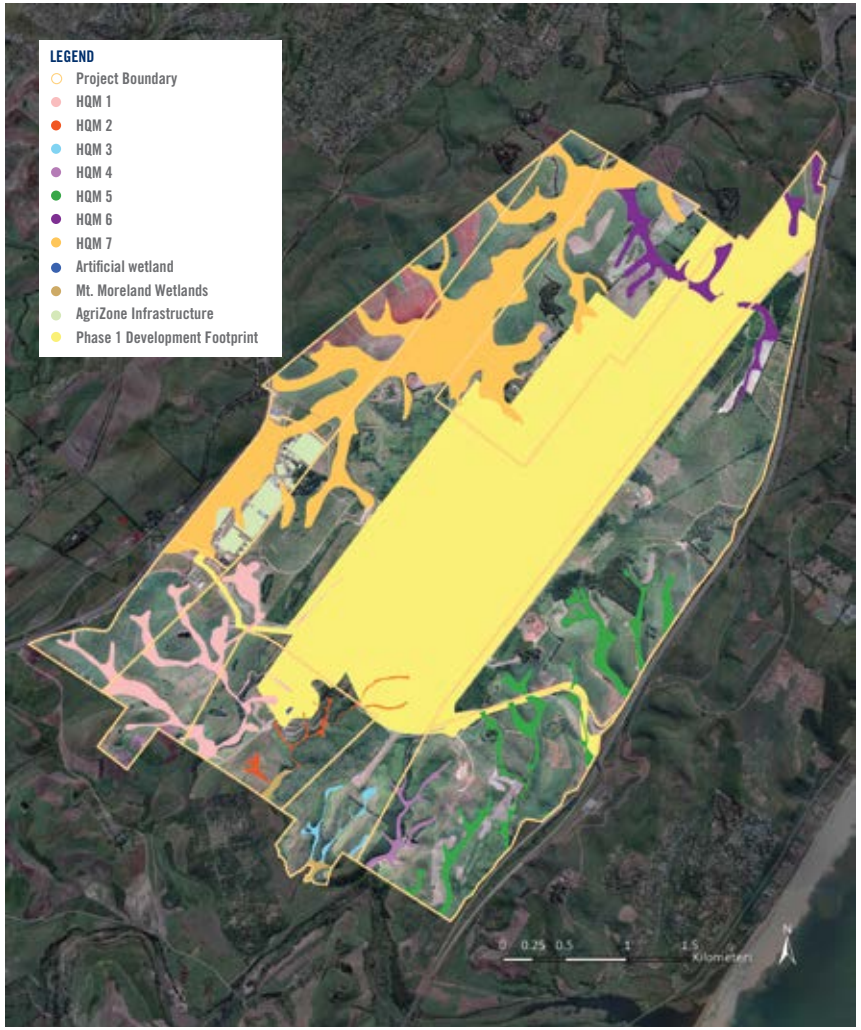


FIGURE 38: WETLANDS AND RIPARIAN AREAS DELINEATED WITHIN THE DUBE TRADEPORT COMPLEX (WCS, 2011)

9.3 IMPACTS

The major impacts to the water resources and wetlands surrounding Dube TradePort remain in relation to the quality of water that reaches the environment, namely through direct discharge from storm-water management systems, diffuse storm-water run-off, incidental spillages from the two operational WWTWs and alterations to hydrology which directly affect wetland ecosystems and drainage lines. These factors, if left unchecked, could result in habitat degradation and impairment of ecosystem services. The cumulative effects on coastal ecosystems should also be considered.

9.3.1 ECO-SYSTEM INTEGRITY

The quality and quantity of water entering the environment are the two most critical factors that affect the integrity of aquatic ecosystems. The introduction of harmful substances and contaminants contained in storm-water and waste water discharges may lead to accumulations beyond the tolerance levels of biota.

This will negatively affect community composition and structure (i.e. numbers and types of species present) and may, ultimately, result in undesirable eco-system change (e.g. proliferation of blue-green algae and aquatic alien invasive plants in response to high nutrient loads), habitat degradation, loss of rare and valuable species and impaired ecosystem functioning and services provision. While treated waste water from the Southern Waste Water Treatment Works, which does not comply with the SLVs and, thus, is not permitted to be discharged into the natural environment, is utilised for the irrigation of the surrounding cane lands, contamination of the nearby watercourse through diffuse run-off is a possibility, in addition to spillages and overflows.

The sustained supply of water is clearly required for the functioning of aquatic ecosystems. While removal of run-off through rainwater harvesting schemes is likely to have minimal impact, elevated flows as a result of increased storm-water run-off from impervious surfaces and purpose-built storm-water systems, may result in erosion impacts and altered hydrology of drainage lines, rivers and wetland systems. These areas serve as important ecological corridors, refuges and noteworthy sites for biodiversity in a landscape that has been dramatically modified through urbanisation and sugar cane plantations.

9.3.2 INTEGRATED COASTAL SYSTEMS

The impacts of catchment mis-management and resultant poor water quality often have implications for down-stream environments.

Since Dube TradePort is located close to the coastal zone, the Umdloti and Tongati estuaries and the coastal strip may be indirectly affected by the activities of Dube TradePort, predominantly through water quality impacts. The health state of the Tongati Estuary is best described as highly degraded as a result of long-standing and severe anthropogenic impacts, including habitat loss, high nutrient loading, sewage pollution and chemical contamination. The Umdloti Estuary is also threatened by the same impacts, compounded by freshwater diversion at the Hazelmere Dam, and its health status is deemed to be poor (Demetriades et al, 2007; Forbes & Demetriades, 2010). It is, therefore, imperative to acknowledge the potential contribution of Dube TradePort, as well as other surrounding land uses, to the coastal zone which may exacerbate the current degraded state of the estuaries if left uncontrolled, with further negative consequences for estuarine functioning, biodiversity and ecosystem services, as well for the marine near-shore environment.

9.4 RESPONSES

Dube TradePort Corporation has made significant strides in implementing its Water Demands and Conservation Management Strategy to reduce demand pressure on the regional water supply. Currently 80% of greenhouse water demand at Dube AgriZone is met by way of rainwater harvesting. Green initiatives in terms of supplementing the municipal water supply include the following (DTPC, 2013b):

- Harvesting of clean storm-water run-off from the roofs of the greenhouses, the Reverse Osmosis Plant, the tissue culture laboratory and other structures within Dube AgriZone, which is collected in covered attenuation ponds for irrigation use. Individual greenhouses are supplied with water for irrigation from their own harvested resources;
- When of acceptable standard, according to the General Limit Values, treated waste water from the Southern Waste Water Treatment Works will be used to supplement water for irrigation within Dube AgriZone. Effluent which is of unacceptable quality is transferred to the flush water ponds;
- Ground-water (borehole) resources are used in circumstances where rainwater and treated effluent is unable to meet desired capacity. Three boreholes are available for use at Dube AgriZone and a reverse osmosis desalination plant has been constructed and is awaiting commissioning and operation for the treatment of borehole water to acceptable standards, for irrigation purposes;
- An Integrated Waste and Waste Water Management Plan (IWWMP) have been developed for Dube AgriZone in support of authorisation of various water uses according to the National Water Act (NWA). The purpose of the IWWMP is to comprehensively define the water use and waste management practices at Dube AgriZone, evaluate their potential impacts on regional water resources and highlight the practices requiring formal authorisation (WSP 2013);
- As part of the sustainable farming initiatives, a brine treatment project and recycling project were also initiated, as proposed under the IWWMP. A Brine Re-use Options and Management Plan have been developed to determine the best practicable environmental option for brine disposal. The IWWMP suggests that waste water from various processes (e.g. Southern Waste Water Treatment Works, brine reject, flushwater), which meet required GLVs will be used to irrigate targeted cane plantations in the neighbouring properties (WSP, 2013).

9.4.1 ADDITIONAL KEY ACHIEVEMENTS WATER QUALITY MONITORING

In addition to the above, Dube TradePort Corporation has established a precinct-wide water quality monitoring programme (2007 - on-going), which incorporates more than 15 sample stations and a wide range of parameters.

This is to ensure that the water quality standards are being met and to serve as a mechanism for the detection

of potentially negative environmental impacts. A key outcome is the production of a long-term water quality data base, as well as a standardised monitoring protocol for future monitoring.

REHABILITATION

Dube TradePort Corporation has embarked on a widespread invasive alien vegetation removal programme.

Alien invasive plants have been estimated to consume up to 70% of the country's water resources (draft SAEO, 2012). Alien plant removal thus contributes positively to the freshwater resources available in the riparian ecosystem, ensuring natural run-off aquatic environments, and ecosystem health is improved. Further to this, Dube TradePort Corporation is also undertaking a land rehabilitation project, which has been described as potentially the largest and most complex of its kind taking place in KwaZulu-Natal. This project will see more than 600 ha of land rehabilitated by 2015 (DTPC, 2013b).

This includes extensive wetland rehabilitation, which entails the recreation of wetland conditions using engineering interventions and the planting of hydrophytic vegetation (refer to Chapter on Biodiversity and Ecology for more detail).

These initiatives illustrate the organisation's proactive commitment to environmental compliance, environmental sustainability, restoration, climate change resilience and enhancement.

9.5 CONCLUSION

By virtue of Dube TradePort's location, the impacts on the surrounding water bodies, river courses and drainage lines will be largely cumulative. This highlights the importance of ongoing collaboration between Dube TradePort Corporation and ACSA to increase efforts to alleviate the pressure on local water resources and to reduce site-water quality impacts through their respective operations and activities. While many water quality parameters are within the specified limits or below the detection limit, others are being exceeded at various points throughout the site, with certain points being more problematic than others.

These areas should be prioritised for further investigation and source-specific mitigation measures should be implemented where necessary.

Water demand will undoubtedly increase in parallel with anticipated industrial development. However, opportunities for additional rainwater harvesting will also increase, particularly with the expansion of Dube TradeZone, for example. Climate change is an emerging issue that further threatens future water supply and the current functioning of natural ecosystems in close proximity to Dube TradePort and King Shaka International Airport. For these reasons, treated waste water may, thus, become a critical supplementary water resource in the future. To this end, it is vital that the water quality standards for effluent are continuously met and that the waste water treatment works is well-maintained and operating within the design standards. In general, water quality risks associated with the treated effluent must be minimised, particularly in terms of faecal bacteria and nutrient inputs.

The water quality monitoring programme is instrumental in detecting water quality issues. It is further recommended that rapid ecological health assessments of the perennial rivers, drainage lines and wetlands be undertaken on an annual basis, in addition to water quality monitoring, so as to provide a holistic evaluation of the environment affected by Dube TradePort and to monitor the effectiveness of rehabilitation efforts.

10 LAND AND TRANSFORMATION

Implying far more than a physical space, the terms 'land' and 'landscapes' are a broad category for resources that underpin and drive a plethora of human activities on and below the earth's surface, ranging from agriculture and mining, to urban development and the way people move, as well as the concept of 'sense of place' (WC DEADP, 2012). Our relationship with the land is non-linear, multi-faceted and complex – not only are our activities and livelihoods influenced and driven by the state and condition of the land, but the condition and state of the land is influenced in interactive and cyclical patterns by human activities that exploit this valuable resource for the purposes of promoting human well-being (Pauw, 2011). Maintaining land in a good and/or productive condition is, therefore, particularly important for the protection of the natural resource base, where soil quality and habitat transformation are properly managed and controlled (GDARD, 2011).

In order to illustrate a component of land condition, Figure 39 shows the agricultural potential of the study area in 2012. According to the KwaZulu-Natal Department of Agriculture and Environmental Affairs (DAEA), Agricultural Land Potential Categories Report (Collet and Mitchell, 2012), land categorised as Irreplaceable (Category A) is regarded as very high potential agricultural land that should be retained exclusively for agricultural use to ensure national food security. Land categorised as Threatened (Category B) is regarded as high potential agricultural land. Primary Agricultural Land (Category C) is regarded as land with moderate agricultural potential, where significant interventions would be required to achieve viable and sustainable food production, although agriculture is still the majority land-use.

Secondary (Category D) land is regarded as land with low agricultural potential. This land requires significant intervention to enable sustainable agricultural production. Finally, Mixed Agricultural Land (Category E) land is regarded as having limited to very low potential for agricultural production.

According to the spatial data associated with Figure 39, the study area consists of Category B, C and Permanently Transformed areas.

Approximately 27% (572 ha) of the study area is permanently transformed, 11% (229 ha) is Primary Agricultural Land and 61% (1 266 ha) is Threatened Agricultural Land. This is illustrated graphically by Figure 40.

FIGURE 39: AGRICULTURAL POTENTIAL OF THE LAND WITHIN DUBE TRADEPORT (KZN DAEA, 2012)

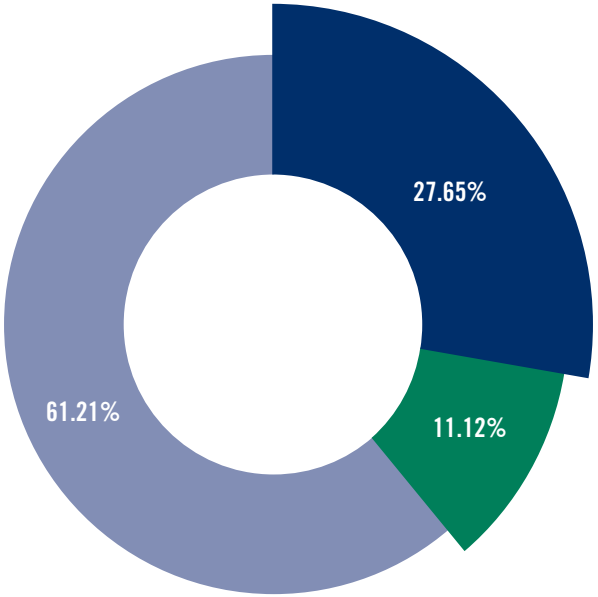


FIGURE 40: PERCENTAGE OF AGRICULTURAL LAND CATEGORIES WITHIN THE STUDY AREA

Permanently Transformed	27.65%
Primary Agricultural Land Use	11.12%
Threatened	61.21%

Inevitably, human activity results in changes to land resources. This change can take many forms, including, but not limited to, restructuring, degradation, cultivation and development. These changes can be grouped under the umbrella term 'transformation', since they all imply a dynamic state of moving from (and between) one state or condition to another, in often complex and synergistic ways over time. Of particular concern is the transformation of landscapes that contain sensitive or threatened natural vegetation, such as endangered ecosystems, which are often under threat from expanding urban areas, agriculture or mining (NW DEDECT, 2014).

The reliance on land resources for livelihood benefits and well-being (both directly and indirectly), provide reasons as to why and how the land is being transformed. This is a crucial factor which allows for such transformation to be monitored and the impact on biodiversity and human well-being accessed.

Optimising land-use within Dube TradePort is crucial to achieving the overall growth and development targets set as part of Dube TradePort's strategy, as well as for ensuring the sustainability of natural resources in the area.

Thus, magnitudes of change, type of change and rates of change are all key determinants of our understanding of land resources (within this chapter) and the implications of their loss, rehabilitation or other forms of transformation.

10.1 PRESSURES

While relatively small, at just over 2 000 ha (excluding newly-acquired land parcels of a little more than 500 ha), the study area of Dube TradePort is interesting from a land resource and land transformation perspective. In a sense, Dube TradePort may be regarded as a microcosm of the pressures that face land resources in urbanising areas. It is strategically located on the urban periphery of the eThekwini Metropolitan Area and the rapidly urbanising KwaZulu-Natal North Coast. As such, this area faces particularly acute development pressure, as the peripheries of urban areas are known to experience pressure to transform to urban land-uses (GDARD, 2011). In these areas, the protection of important agricultural and natural resources for the purpose of maintaining environmental quality, environmental goods and services, as well as natural productivity becomes particularly challenging.

Understanding the pressures that influence this area, in turn, allows us to understand why change is occurring. Regionally, Dube TradePort is located within the eThekwini-Umhlatuze provincial corridor, as defined in the Provincial Spatial Economic Development Strategy (PSEDS). The National highway (N2) acts as the development spine of the corridor, which is anchored by the Port of Durban in the south and the Port of Richards Bay to the north and which, together, function as the primary logistics gateway into Southern Africa (SSI, 2009). This corridor is focused predominantly

10 LAND AND TRANSFORMATION

on linking the opportunities associated with Dube TradePort and the King Shaka International Airport with Durban, Richards Bay and areas between these two important ports and logistical hubs.

As such, and due to their strategic location, land resources within this corridor (including Dube TradePort) face unique pressures, given their regional and national importance. In light of the above, specific pressures which promote land transformation include, but are not limited to:

- Urbanisation and concomitant demands for urban infrastructure;
- Population growth and concomitant demands for housing and bulk services;
- Demand for land for the purposes of industry and intensive agriculture; and
- Demand for land for the purposes of transport infrastructure, warehousing and logistics as part of the aerotropolis concept.

10.2 STATE

Land cover and baseline conditions within Dube TradePort are predominantly agriculture and secondary grassland and, to a lesser extent, wooded areas. Within the Driver-Pressure-Impact-State-Response (DPSIR) framework, an assessment of the 'State' component sheds light on the current condition of certain aspects of the resources, measured through specific indicators. For the Land and Transformation component of this SoER, changes in land cover, land-use and changes to land cover types were selected as appropriate indicators of the state of land resources within the study area. Indicators are intended to provide a 'snapshot' of resource condition, as opposed to a detailed assessment. While the terms 'land cover' and 'land-use' are often used interchangeably, they are, in fact, distinct. Land cover refers to the physical material on the surface of the earth, such as grassland, forests and water bodies. Land-use, by comparison, is a categorisation that is assigned on the basis of how people use the land or intend to use the land. Land-use is often derived from land cover data sets.

10.2.1 LAND-USE

Most recent spatial data for the study area shows a mixture of current and intended use of land resources (Figure 41). However, it should be noted that this data has been derived from the study undertaken in 2007 during the Environmental Impact Assessment carried out for the entire development.

It does not include the entire extent of infrastructure currently found on-site. This indicator should, therefore, be used as the baseline for further state of the environment reporting and any other framework studies. The overlap between aspects of land-use and land cover (Section 10.2.2) is noted in mitigation of this.

10.2.2 CHANGE IN LAND COVER

A useful indicator of transformation over time is change in land cover. Figure 42 shows aerial imagery for the Dube TradePort study area between 2006 and 2011.

The development of Dube TradePort and King Shaka International Airport are clearly visible over this five-year period, with non-permeable surfaces replacing large tracts of agricultural land, grassland and other open space. Figure 43 and Table 24 provide a more detailed analysis of this transformation, with an emphasis on determining the rate of change for the time period for which data is available. Figure 43 uses remotely-sensed data derived from provincial land cover data-sets captured in 2005 and 2008 for the study area.

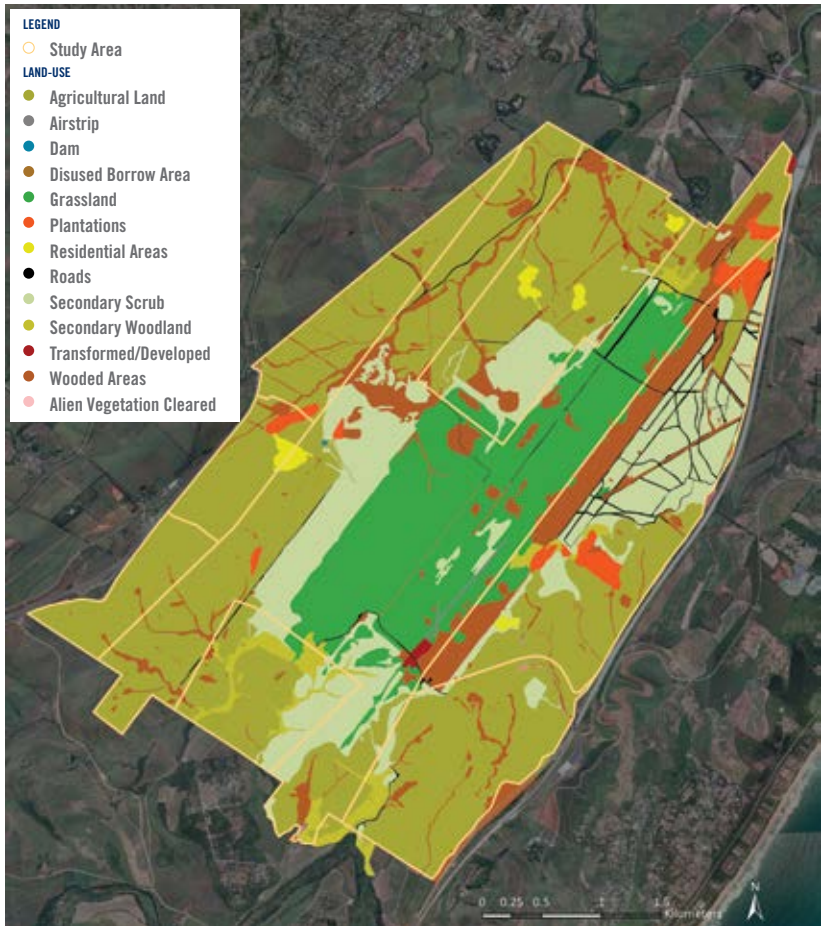
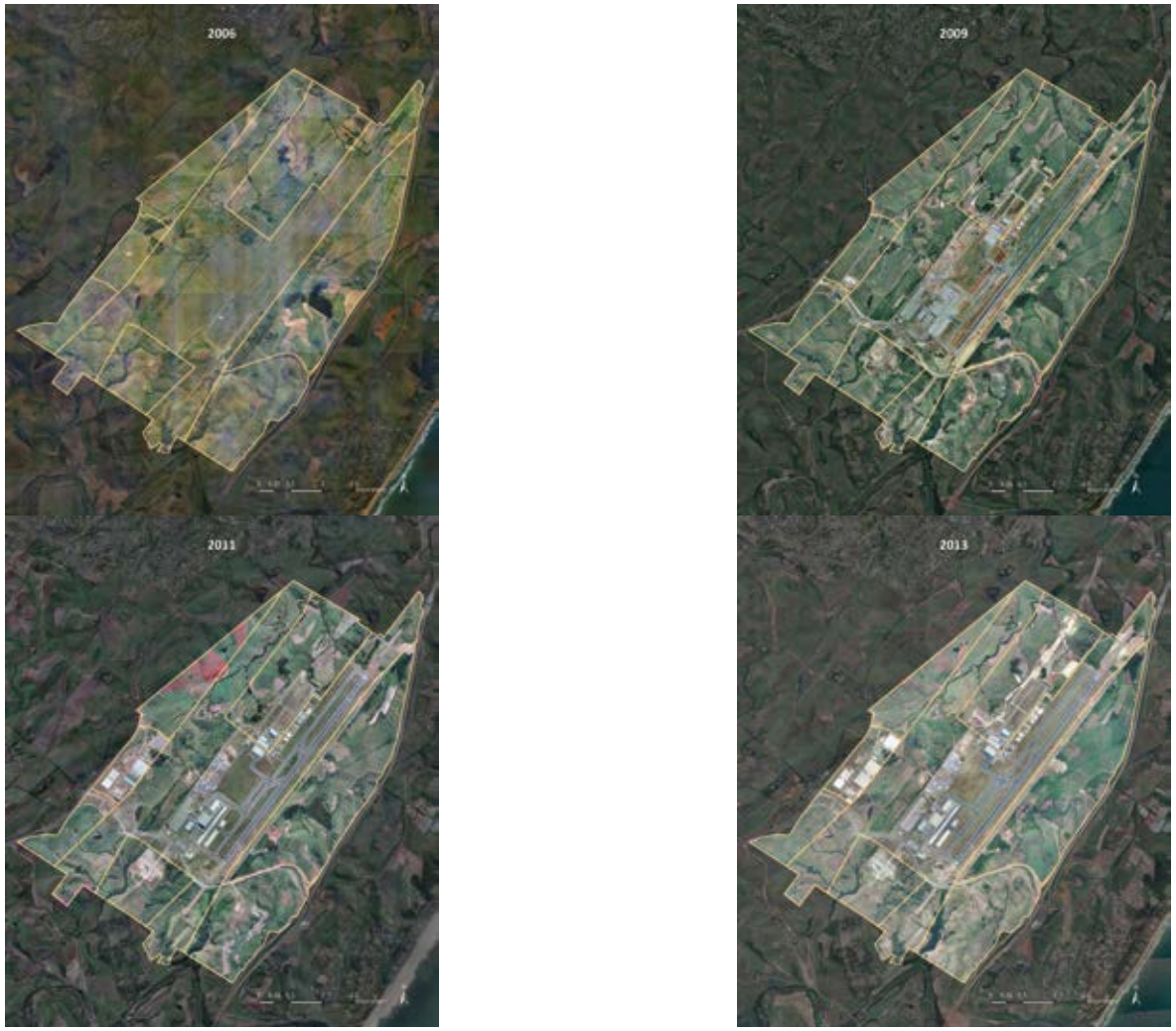


FIGURE 41: LAND-USE FOR THE DUBE TRADEPORT STUDY AREA (DTPC, 2007)

FIGURE 42: AERIAL IMAGERY FOR THE STUDY AREA (ETHEKWINI MUNICIPALITY 2006 - 2013)



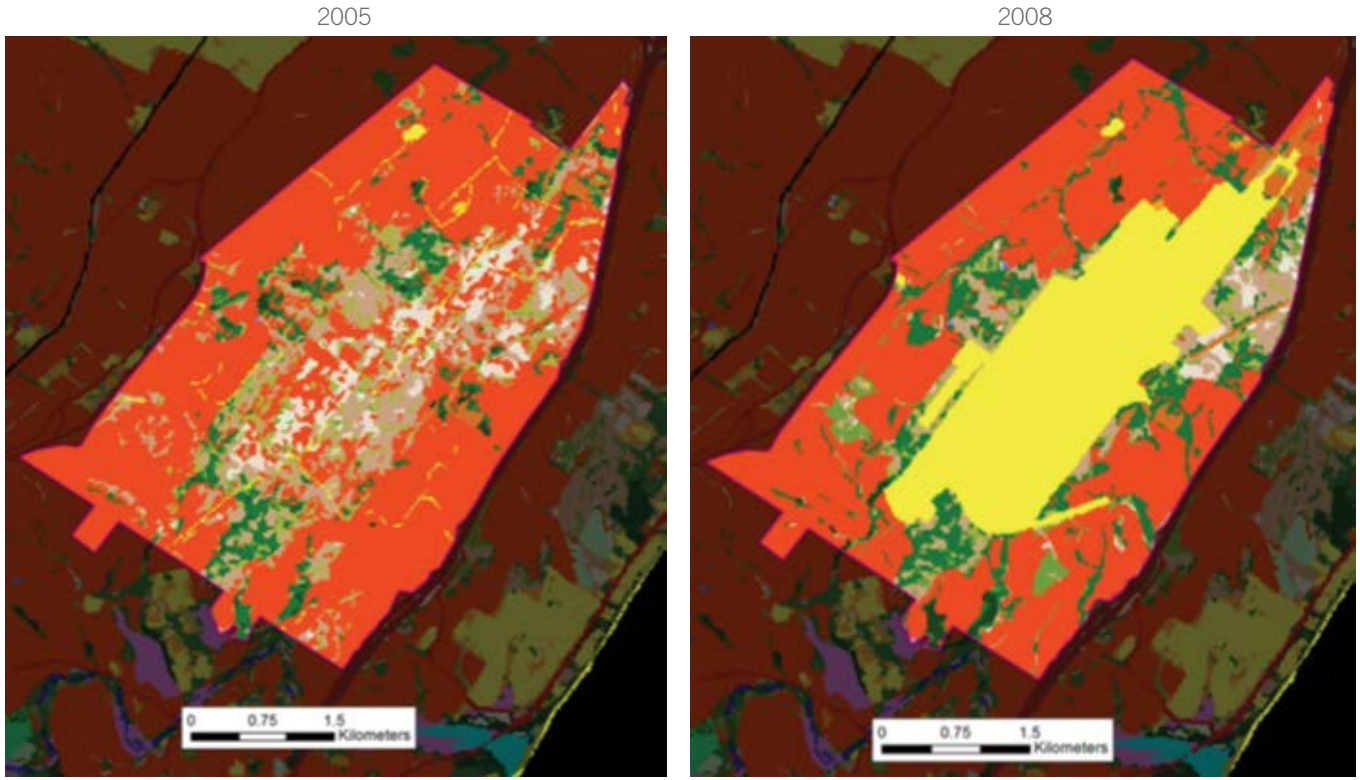


FIGURE 43: LAND COVER CHANGE BETWEEN 2005 AND 2008 (KZN DAEA, 2005-2008)

The most striking transformation in land cover (Figure 43) is the increase in built-up, dense settlement represented by the establishment of King Shaka International Airport and Dube TradePort between 2005 and 2008 (shown in yellow in Figure 43). Although these projects were only completed in 2010/11, the transformation of the project footprint from sugar cane, grassland and bushland (among others) is clearly visible.

Table 24 provides a detailed breakdown of the change between 2005 and 2008 for each land cover category.

TABLE 24: CHANGE IN LAND COVER 2005 - 2008 (KZN DAEA 2005-2008)

LAND COVER CATEGORY	2005 COVERAGE (HA)	2008 COVERAGE (HA)	2005 COVERAGE (%)	2008 COVERAGE (%)	% CHANGE
Waterbody - Natural	0.07	0.06	0.00	0.00	0.00
Plantation	18.35	38.09	0.89	1.84	0.95
Wetlands	0.00	0.72	0.00	0.03	0.03
Sugar Cane - Commercial	1 292.25	935.42	62.50	45.22	-17.28
Built-Up, Dense Settlement	26.20	574.02	1.27	27.75	26.48
Low Density Settlement	1.45	2.53	0.07	0.12	0.05
Forest	16.71	20.12	0.81	0.97	0.16
Dense Bush	140.89	225.97	6.81	10.92	4.11
Bushland	17.90	64.62	0.87	3.12	2.26
Grassland/Bush Clumps Mix	130.52	32.66	6.31	1.58	-4.73
Grassland	303.86	135.29	14.70	6.54	-8.16
Degraded Bushland	30.92	6.95	1.50	0.34	-1.16
Degraded Grassland	79.86	18.83	3.86	0.91	-2.95
KZN National Roads	7.96	11.78	0.39	0.57	0.18
KZN District Roads	0.49	0.93	0.02	0.05	0.02
Dams	0.18	0.67	0.01	0.03	0.02

10.2.3 LOSS/GAIN OF LAND COVER TYPES

Notable trends are significant decreases in the coverage of commercial sugar cane (17%), grassland (8%) and the grassland/bush clumps mix category (4%). Table 24 confirms the graphic trend of Figure 43 and shows that by far the biggest change is visible in the built-up, dense settlement category, which increased by 26% between 2005 and 2008. The remainder of the land cover classes showed marginal increases of between 0,1% and 0,9%, with the encouraging exception of Dense Bush and Bushland, which increased by 2,2 and 4,1% respectively. In terms of gaining a sense of the rate of transformation during this time period, Table 25 summarises the individual land cover classes described by Table 24 into two categories – transformed and untransformed.

TABLE 25: SUMMARISED CHANGES IN LAND COVER BETWEEN 2005 AND 2008

LAND COVER CATEGORY	2005 COVERAGE (HA)	2008 COVERAGE (HA)	2005 COVERAGE (%)	2008 COVERAGE (%)	% CHANGE
Transformed	1 346.88	1 563.45	65.14	75.58	10.44
Untransformed	720.73	505.89	34.86	24.45	-10.40

In 2005, transformed land cover accounted for approximately 65% of the study area, while this increased to an estimated 75,5% in 2008. These figures imply an annual rate of change in land cover from untransformed to transformed of approximately 3,4%. While this rate of change would be concerning on a sustained basis and/or on a larger scale, it is noted that this will diminish as rehabilitation begins to show results.

10.3 IMPACTS

Having assessed the pressures that influence the study area in Section 10.1, as well as the state of the land resources within the study area in Section 10.2, it is necessary to determine the impacts typically associated with changes in land cover and transformation of land resources. This is shown in Table 26. It should be noted that these are descriptions of impacts without mitigation or corrective intervention/responses and includes potential negative and positive impacts.

TABLE 26: IMPACTS OF ACTIVITIES TAKING PLACE WITHIN DUBE TRADEPORT

IMPACTS	DESCRIPTION
Habitat destruction	• Loss of habitat and species • Fragmentation of habitat • Loss of eco-system goods and services, such as flood attenuation
Spread of invasive alien species	• Reduced natural areas • Altered fire regimes • Reduced integrity/resilience of natural areas
Reduced resilience to climate change	• Replacement of natural areas with hardened surfaces decreases climate change resilience

TABLE 26: IMPACTS OF ACTIVITIES TAKING PLACE WITHIN DUBE TRADEPORT

IMPACTS	DESCRIPTION
Loss of high-value agricultural resources	• Replacement of areas with high agricultural potential will lead to a loss of these resources for agricultural purposes
Employment opportunities and economic growth	• Increased employment opportunities through Dube TradePort projects and economic growth initiatives
Spatial restructuring	• Use of marginal and/or undeveloped land for more productive purposes
Food security	• Food produced within the study area can make a positive impact on local and regional food security

In addition, the degradation of land resources affects water resources and vice versa. Soil degradation in croplands does not only affect farming, but also negatively affects rivers and other water bodies through siltation and pollution with agricultural chemicals. Cultivation affects the rate and proportion of rainfall infiltration and, thereby, ground-water recharge and flow rates in rivers (Evans 1996). Crop cultivation can cause water salinity (DEAT, 2006) and irrigation return flows or seepage may contain fertilisers and agro-chemicals and can cause pollution.

The state of the land has implications for the state of rivers, as land and rivers are inseparable. The conservation of rivers depends entirely on sound management of the entire catchment they drain (Nel et al., 2007). Dube TradePort is abutted by two critical river systems (Umdloti and Tongati) and, therefore, any changes and impact on ground-cover, soil loss and the maintenance and decline of plant species, has the potential to affect these critical systems.

10.4 RESPONSES

At the local level, Dube TradePort Corporation has formulated and implemented a number of policy responses to mitigate the negative impact of the above impacts and pressures. These are listed in Table 27:

TABLE 27: RESPONSES TO THE ACTIVITIES AND IMPACTS EXPERIENCED AT DUBE TRADEPORT (DTPC, 2013)

RESPONSE	DESCRIPTION
Development impact management and mitigation	Detailed and activity-specific environmental management programmes for all construction activities, including operational phase guidelines
Biodiversity management	Development and implementation of rehabilitation strategies for biodiversity assets, such as wetlands and grasslands
Water demand management	Numerous strategies aimed at re-use and more efficient utilisation of water resources, including rainwater and storm-water harvesting, use of treated effluent and water treated by reverse osmosis for irrigation and the use of borehole water resources, where appropriate
Water quality management	Establishment of a water quality monitoring programme to ensure water demand management does not have negative environmental impacts
Waste management	Recycling and waste management initiatives implemented across all sectors, including centralised collection of recyclable materials

The responses described in the previous table are overarched and driven by the framework shown in Figure 44 to ensure consistency, efficiency and accountability.

FIGURE 44: KEY PROJECT TASKS ASSOCIATED WITH ENVIRONMENTAL STRATEGY DEVELOPMENT (DTPC, 2013)

10.5 CONCLUSION

The themes within this chapter have highlighted the importance of land as a resource, which not only enables development and economic growth, but as a resource which plays host to critically important ecosystem services and processes.

While the indicators described in Section 3 have shed some light on the state of these resources, it is important to continue monitoring activities in order to accurately track change and respond accordingly to negative impacts. An important emerging issue from a land and transformation perspective is, therefore, the need to ensure that the latest data and information is used when assessing change and impacts on land and landscape. This includes spatial data and data captured during fieldwork and ground-truthing exercises. Land and landscape are useful concepts to track overall change and environmental impact, thus, the development and maintenance of a comprehensive land resources database is an important addition to Dube TradePort's existing data sets.

Emerging issues of climate change could affect both the development potential and the agriculture sector within Dube TradePort. In addition, alien vegetation competes for nutrients and water resources with both agriculture and natural vegetation (refer to Section 10.3 for information on alien vegetation at Dube TradePort).

An emphasis on greening projects and sustainability are clearly evident from Dube TradePort's Annual Reports and a number of initiatives which seek to address the efficient use of resources and the rehabilitation of degraded natural areas.

11 CONCLUDING STATEMENTS

11.1 EMERGING ISSUES AND FUTURE TRENDS

South Africa hosted the 17th Conference of Parties (COP17) of the United Nations Framework Convention on Climate Change (UNFCCC) in 2011. During this conference, the country reaffirmed its commitment to reducing its greenhouse gas emissions by 34% by 2020 and 42% by 2025. South Africa's greenhouse gas emissions are anticipated to peak, plateau and then decline, at the latest, by 2025. In theory, these emissions will stabilise for 10 years and then decrease in absolute terms. These goals place constraints on industries, as the burning of non-renewable resources for power generation is a key factor in South Africa.

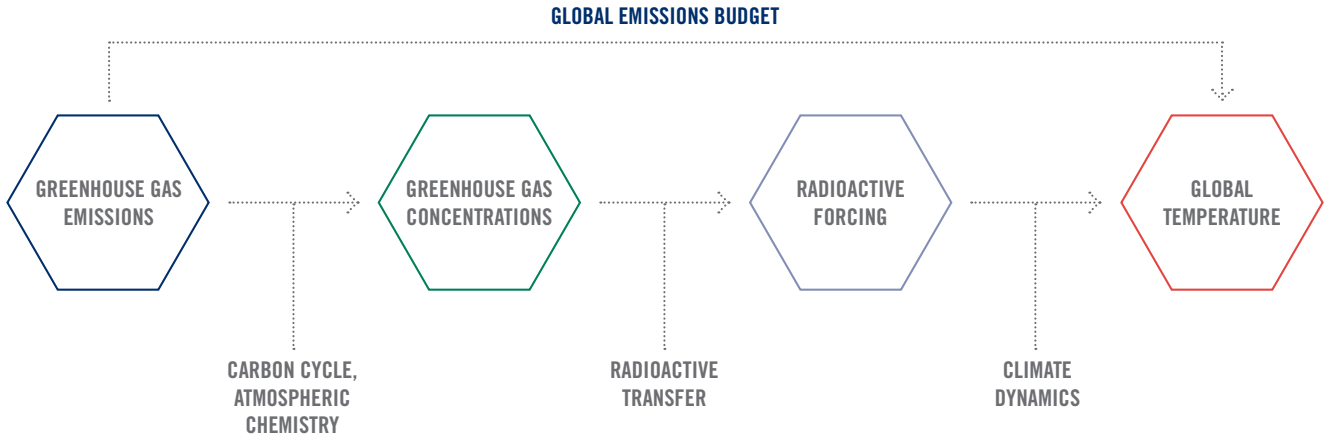


FIGURE 45: RELATIONSHIP BETWEEN GREENHOUSE GAS EMISSIONS AND GLOBAL TEMPERATURE (RAUPACH, HARMAN & CANADELL, 2011)

'Climate change' refers to any change in the average long-term climatic trend and is a natural part of the earth system. Human activities since the Industrial Revolution have, however, succeeded in altering the composition of the atmosphere to such an extent that it will absorb and store increasing amounts of energy in the troposphere within the coming century.

This will result in the atmosphere heating up, thereby altering weather and climate patterns. In particular, it is expected that the average temperature of the atmosphere will increase by between 1,5 and 4,5 degrees in the next 90 years, depending on the region (IPCC, 2013). This will lead to a cascade of effects, including changes to precipitation, seasons, micro-climates and habitat suitability. It is also reported that "there will be more frequent hot and fewer cold temperature extremes over most land areas on daily and seasonal timescales as global mean temperatures increase. It is very likely that heat-waves will occur with a higher frequency and duration" (IPCC, 2013:18). The impact of climate change has the potential to adversely affect the economy, natural resources and society of South Africa. Changes to both weather patterns and longer-term climate will induce changes to how land can be used and how exposed economic activities and people will be to climate and weather-related risks. Warmer temperatures, for example, will affect crop selection for agriculture, habitat suitability for wildlife, water availability, energy usage by urban populations and the spread of diseases.

Furthermore, climate change leads to indirect impacts as social and economic sectors attempt to adapt to the changing climate. Global efforts at mitigation will, for example, force a shift towards forms of energy with lower global warming potentials, thereby altering the foundations of the coal-based South African economy.

In view of the adverse environmental, health and economic impacts resulting from increased greenhouse gas emissions, Government has taken steps to reduce its carbon footprint through the gradual phasing of a carbon tax, a bio-fuels production incentive and greater vehicle emissions taxes. This will have an impact on Dube TradePort. The National Treasury Carbon Tax Policy, to be implemented in 2016, is expected to drive the following climate change outcomes:

- A carbon tax will initiate a shift towards low carbon and more efficient technology; and
- Carbon-intensive factors of production, products and services are likely to be replaced by low-carbon alternatives.

A carbon tax will create opportunities for research, development and technological innovation in low-carbon alternatives. It will also assist in reducing the gap between conventional carbon-intensive technologies and low-carbon alternatives.

Dube TradePort has the potential to have a large associated carbon footprint as the development grows. The risks of not incorporating climate change mitigation and adaptation aspects into future strategy development and design are significant and can be difficult to reverse, if poorly planned. As such, this should be a core focus area.

Dube TradePort Corporation also has the opportunity to influence the impact of the wider Municipal and Provincial patterns of compliance with environmental legislation and to act as a best practice benchmark for large-scale development projects, both locally and country-wide. This is a facet that is becoming clearer over time and is not considered to be a negative, but rather an opportunity to prove the precedent-setting status of Dube TradePort as an aerotropolis and a large-scale integrated development node.

11.2 SYNOPSIS AND CONCLUDING STATEMENTS

The State of Environment Outlook Report provides information on the current level of performance by Dube TradePort Corporation in terms of environmental sustainability thresholds. However, the report is also intended to provide a broad audience with an overview of the state of nine environmental themes. To aid with important issues being highlighted from the various themes, as well as their inter-linkages, a summary of the findings is presented below. Detail on the state of each component is found in the different theme chapters and should be referred to for clarity, further detail and a holistic view of each theme.

For each environmental theme, an outlook is given either as:

- **Improving** – implying that the environmental conditions are improving and societal responses are steering change in the right direction;
- **Stable** – where indicators show neither an improving nor declining trend and indications are that our responses to the concerns are generally positive;
- **Declining** – in cases where the indicators show a negative trend and/or the necessary societal response is not deemed to support environmental sustainability.

11.2.1 GOVERNANCE AND IEM

Trend: Stable

There is some uncertainty regarding the accuracy of the data recorded at present. To begin with, Dube TradePort Corporation was compliant and striving for sustainability. However, many of the indicators reported on were difficult to obtain and hence provided reporting challenges. Furthermore, the Governance and IEM chapter saw the introduction of many new indicators and, therefore, a trend is difficult to depict, as there is not necessarily a historical state with which to compare.

A peer benchmarking exercise which was conducted identified that if the Dube TradePort Corporation is to effectively incorporate environmental and sustainability issues into the day-to-day running of the company, it needs to be sure that its corporate governance structures, policies and strategies are suitably designed to encompass effective environment and sustainability management (WSP, 2013). The numerous plans, strategy reports, quick scans, risk and opportunity assessments and action plans have laid down an excellent foundation to kick-off green procurement and supply chain management. However, the duration for which these plans have been implemented is still relatively low, thereby making progress difficult to report on as the trends are not easily discerned.

TABLE 28: STATUS OF GOVERNANCE INDICATORS FOR DUBE TRADEPORT CORPORATION

INDICATORS	TRENDS	
Percentage compliance with authorisations, licences and permits (%)	→	Dube TradePort Corporation remains compliant and continues to maintain a high level of compliance of 98%.
Percentage budget allocated to environmental management (%)	→	A budget is allocated to the environmental management of Dube TradePort and surrounding areas when/where applicable. This also includes the development and application for relevant strategies, policies, licences and plans. The presence of an environmental management team further supports the commitment to this cause.
Percentage of locally-sourced services and materials (%)	→	A trend could not be determined for this indicator, due to both a lack of data and a lack of historical data with which to compare. This is a performance indicator identified for improvement on the Dube TradePort Corporation's part. It is recommended that initiatives, such as the inclusion of preference points for the use of local materials, as linked to a more qualitative assessment of procurement controls, be added to tender documents and that surrounding communities are encouraged to produce products that can be used by Dube TradePort Corporation.
Percentage of tenants on green leases (%)	→	Unfortunately, there are currently no tenants on green leases.
Percentage energy from renewable sources (%)	↑	The energy sourced from renewable sources is on the increase at Dube TradePort Corporation.
Percentage emissions off-set (%)	→	A trend could not be determined for this indicator, due to both a lack of data and a lack of historical data with which to compare. However, the study conducted towards a public transport strategy is a move toward decreasing emissions.
Percentage investment in skills development of staff (%)	→	The CSI Annual Report 2013/14 states that it has been a productive year, with much effort made to ensure that investment was linked to Dube TradePort Corporation's key focus areas, such as education and skills development.
Percentage staff employed from surrounding communities (%)	→	Dube TradePort Corporation continues to generate jobs (locally), but there has not been an increase or decline.
Percentage of profit invested in Community Social Investment (CSI) projects (%)	↑	Dube TradePort Corporation has invested substantially in the surrounding communities and has definitely shown an increase in this performance indicator.

11.2.2 NATURAL AND CULTURAL HERITAGE

Trend: Improving

Dube TradePort Corporation has made numerous efforts to identify heritage resources and develop management strategies for sensitive sites. The memorial garden is also a very positive contribution to the preservation of history and is an acknowledgement of the people that built the foundations on which the area relies today.

Overall, Dube TradePort Corporation has made concerted efforts to determine the presence of heritage resources on-site. Positive progress has been made in the preservation of sensitive heritage sites, such as the Inyaninga Ex-Residents' Grave Site/Memorial Garden. Most importantly, in working with the public, Dube TradePort Corporation has forged a strong relationship, which will see continued progress of this nature.

Heritage resource management at Dube TradePort has proceeded in a timely manner, systematically and in accordance with relevant legislation, including the NHRA and the KwaZulu-Natal Heritage Act 4 of 2008. It is recommended that financial provision is made for on-going heritage requirements, including Heritage Impact Assessments (HIAs) of non-surveyed land-holdings and the maintenance of the Inyaninga Ex-Residents' Memorial Garden. In addition, to preserve it as a heritage asset, Dube TradePort Corporation must lodge an application for permanent protection of the Inyaninga Memorial Site with the Provincial Amafa KwaZulu-Natal.

TABLE 29: STATUS OF NATURAL AND CULTURAL HERITAGE INDICATORS FOR DUBE TRADEPORT CORPORATION

HERITAGE INDICATORS	TRENDS	
Number and type of natural heritage sites	↑	A concerted effort has been made to determine and identify heritage sites and preserve sensitive sites.
Number and type of cultural heritage sites	↑	
Current use of heritage sites	↑	
Access to heritage sites	↑	Sensitive sites are handled with great care and with due consideration for the public. At present, only one site has been found to be of significance to the public – grave sites. A memorial garden was created with input from the public. The public has full access to the site, including for educational purposes. In addition, the site will be made more accessible as a whole, with pathways and trails developed for public enjoyment.

11.2.3 WASTE MANAGEMENT

Trend: Stable, potentially declining
There is some uncertainty regarding the accuracy of the data recorded at present, although a stable state has been recorded for the generation and management of waste products.

For the period January to March 2014, Dube TradePort Corporation has produced approximately 51.8 tonnes of solid waste across the 29° South building, Dube AgriZone, Dube TradeHouse and Dube Cargo Terminal. These waste types consist of paper, plastic, metal, glass, compost and general waste. Of this total, the Support Zone has managed to recycle 63% of waste, while Dube TradeHouse, recycled 57% of its waste. Dube AgriZone recycled 34% and 43% of the waste generated. It is interesting to note that the lowest amount of waste going to landfill was from the Support Zone and Dube TradeHouse. Furthermore, the general trend shows that waste going to landfill has increased over the three-year period. However, this is balanced by an increased amount of waste being recycled. The sections below will unpack the amount of waste generated in each zone and briefly look at the waste minimisation strategies and greening initiatives at Dube TradePort Corporation.

Furthermore, the subsequent section will provide a summary of the waste indicators and consider future projections of waste at Dube TradePort Corporation.

Waste will always pose a challenge as products will always be demanded by consumers. Another challenge Dube TradePort Corporation could face are the costs associated with incorporating green design principles and sustainability principles, which usually increase project costs in the short-term, but offer financial gains in the medium to long-term.

The following table provides a summary of the indicators used for the waste management chapter, the status of Dube TradePort Corporation when reporting on these indicators, as well as comments.

TABLE 30: STATUS OF WASTE MANAGEMENT INDICATORS FOR DUBE TRADEPORT CORPORATION

WASTE INDICATORS	TRENDS	
Waste generation by source and type (l/an)	→	For the period January to March 2014, Dube TradePort Corporation has produced approximately 51,8 tonnes of solid waste across 29° South, Dube AgriZone, Dube TradeHouse and Dube Cargo Terminal.
Percentage waste diverted from landfill, e.g. reduced, re-used, recycled (%)	↓	The Support Zone has managed to recycle 63% of waste, while Dube TradeHouse recycled 57% of its waste. Dube AgriZone recycled 34% and 43% of waste it generated.
Percentage waste disposed (%)	↑	Support Zone: 60% of waste was disposed of at landfill. Dube AgriZone: For the three months of 2014, 34% of waste was recyclable and 66% of waste was sent to landfill. The amount of waste sent to landfill has reduced from 70% in 2012.

11.2.4 AIR QUALITY

Trend: Stable
No trend was observed, due to data limitations. However, it is anticipated that with increasing air and road traffic, air quality will continue to decline.

The carbon emission by source was calculated by Dube TradePort Corporation for the period 2010/11. The calculated results reflect the following:

- Carbon emission emanating from the Dube TradePort precinct was calculated at 181 969 tCO_2e/ year;
- The highest contributor of carbon emission was from the landing and take-off (LTO) of aircraft, at 64%, while buildings energy contributed 27% to the carbon emission; and
- No visible trend was noted, as updated data on the carbon emissions were not provided.

The high carbon emissions emitted within Dube TradePort resulted in the organisation implementing initiatives to reduce the carbon footprint. For example, the use of a fleet of Euro 5 trucks, which has a low sulphur diesel content and contains additives that reduces toxic emissions. The table which follows lists the various initiatives carried out by Dube TradePort Corporation in this regard.

Aviation is responsible for the majority of carbon emissions emanating from Dube TradePort. Emissions should be measured on a yearly basis and compared to previous years in order to determine trends and compliance. All monitoring and reporting should adhere to the Greenhouse Gas Protocol. Continuous monitoring and management should be carried-out, with the goal of becoming 'carbon-neutral'. Off-setting of all emissions that cannot be reduced or avoided in the interim, should be carried-out according to the United Nations Framework.

The high energy demand at Dube TradePort/King Shaka International Airport, makes energy efficiency campaigns important, with activities aimed at tenants and partners to ensure emission reductions and energy-saving. Renewable energy projects are needed to provide sustainable power generation. These should be informed by the eThekwini renewable energy research and resulting reports. Alternative fuel sources should also be evaluated, such as a switch from petrol and diesel fuel to renewable fuels (bio-fuels) in both vehicles and aviation, wherever feasible from an environmental and financial perspective.

It is clear from the challenges associated with air quality management that it is critical that monitoring of all emissions take place. The data generated from such monitoring will be critical in terms of informing the development of appropriate management actions that will ensure improvement of air quality and reductions in its carbon footprint. The status of each of the indicators of air quality for Dube TradePort is outlined in Table 31:

TABLE 31: STATUS OF AIR QUALITY INDICATORS FOR DUBE TRADEPORT CORPORATION

INDICATORS	TRENDS	
Carbon dioxide emissions by source (CO_2e/annum)		The highest contributor to the carbon footprint is the landing and take-off of aircraft, which contributes 64,1% to the total carbon emission, followed by buildings energy, which contributes 26,6% of the carbon emissions.
Percentage emissions off-set (%)		Dube TradePort has initiated the following green initiatives in order to counter and off-set the carbon footprint emanating from the aerotropolis: • Development of a carbon footprint calculator in order to off-set the carbon footprint of the business. The carbon footprint calculator was developed in the early stages of development of the King Shaka International Airport and the TradePort; • Dube TradePort Corporation tenants and third party developers within the Dube TradePort precinct are encouraged to incorporate green leasing clauses into their lease contracts in order to disclose data regarding energy and water consumption, waste data and carbon footprint; • The use of Euro 5 emission trucks, which run on a low sulphur diesel fuel and has additives that reduce toxic exhaust emissions; • The installation of solar panels on the rooftops of Dube AgriZone. The solar panels generate 220 kilowatts at peak and reduces carbon emissions by 294 tonnes per year; and • Green star rating for the design of Dube TradePort Corporation's office building in Dube City, showing innovative technology for reducing energy requirements, such as light sensors, building orientation to maximise natural light and smart metering.

11.2.5 BIODIVERSITY AND ECOLOGY

Trend: Improving

Although slight at this point in time, an improvement in the state of biodiversity and ecology is anticipated as a result of diligent management plans and rehabilitation work currently being undertaken.

In 2008 when the King Shaka International Airport was under construction, the surrounding land was mostly under sugar cane. There were also some areas that had been transformed for platforming; work which took place in the 1970s for an airport. Ecosystems were disrupted through the agricultural activities and the infestation of alien invader plants. The wetlands to the south of the airport drew the most interest, due to the existing Pickergill's Reed Frog (hyperolius pickergilli) and large population of Barn Swallows (hirundo rustica) roosting during the summer season. Since the establishment of Dube TradePort, many alien-clearing activities and rehabilitation efforts have laid the foundation for the transformation of degraded areas into functional ecosystems, amongst a flourishing economic development. The commitment from Dube TradePort Corporation to make a meaningful contribution to biodiversity conservation is clear. The sound scientific and conservation value associated with current rehabilitation and restoration efforts have many valuable benefits for both biodiversity conservation bodies and research institutions.

TABLE 32: STATUS OF BIODIVERSITY AND ECOLOGY INDICATORS FOR DUBE TRADEPORT CORPORATION

INDICATORS	TRENDS	
Increase/decrease in species diversity (no. of species)	↑	Whilst it is still early to pronounce any significant improvements in biodiversity, Dube TradePort Corporation has made a significant effort to remove alien plant species and to improve the management of natural areas. These efforts have the potential to result in the improvement of biodiversity in the region.
Increase/decrease in alien and invasive species (ha)	↑	Alien-clearing work has resulted in approximately 650 ha cleared to date, since the commencement of this activity in 2012. In addition, 98,69 ha have been sprayed.
Increase/decrease in natural ecosystems (ha)	↑	From both the biodiversity and ecology chapter and the land and transformation chapter, it can be seen that the area of natural eco-systems has been maintained and, in some instances, increased. Although some development/land cover change has occurred, this has predominantly seen the loss of degraded habitats and historical sugar cane fields.
Area of critical eco-systems rehabilitated (ha)	↑	As of 2013, some 10 ha has been prepared and 58,2 kg seed sown. In addition, about 30,04 ha have been prepared for the sowing of 6 484,75 kg of grass seed.

11.2.6 INLAND WATERS AND WETLANDS

Dube TradePort Corporation has made significant strides in implementing its Water Demand and Conservation Strategy to manage demand pressure on the regional water supply. Water demand will undoubtedly increase in parallel with anticipated industrial development. Currently, 80% of greenhouse water demand at Dube AgriZone is met by means of rainwater harvesting. Opportunities for additional rainwater harvesting will also increase, particularly with expansions to Dube TradeZone.

Initiatives to supplement the municipal water supply include the following (DTPC, 2013b):

- Harvesting of storm-water run-off from the roofs of greenhouses, the tissue culture laboratory and other structures within Dube AgriZone, which is collected in covered attenuation ponds for irrigation use. Individual greenhouses are supplied with water for irrigation from their own harvested resources;
- When of acceptable standard, treated waste water from the Southern Waste Water Treatment Works is used to supplement water for irrigation. Effluent which is of unacceptable quality is transferred to the flush water ponds;
- Ground-water (borehole) resources may be used in circumstances where rainwater and treated effluent is unable to meet desired capacity. Three boreholes are available for use at Dube AgriZone, and a reverse osmosis desalination plant has been constructed and is awaiting commissioning and operation, for the treatment of borehole water to acceptable standards for irrigation purposes;
- As part of sustainable farming initiatives, a brine treatment project and recycling project were also initiated. A Brine Re-use Options and Management Plan was developed to determine the best practicable environmental option for brine disposal;

- An Integrated Waste and Waste Water Management Plan (IWWMP) has been developed for Dube AgriZone in support of authorisation of various water uses according to the National Water Act (NWA). The purpose of the IWWMP is to comprehensively define the water use and waste management practices at the AgriZone, to evaluate their potential impacts on regional water resources and to highlight the practices requiring formal authorisation (WSP 2013).

In addition to the above, Dube TradePort Corporation has established a precinct-wide water quality monitoring programme, which incorporates more than 15 sample stations and a wide range of parameters.

This is to ensure that water quality standards are being met and to serve as a mechanism for the detection of potentially negative environmental impacts.

While many water quality parameters are within the specified limits or below the detection limit, others are being exceeded at various points throughout the site, with certain points proving more problematic than others. These areas should be prioritised for further investigation and source-specific mitigation measures should be implemented where necessary.

The Southern Waste Water Treatment Works is operating according to design standards and continues to produce treated effluent generally compliant with GLVs. High levels of ammonia require specific attention.

Treated waste water may become a critical supplementary water resource in the future and to this end, it is vital that the water quality standards for effluent are continuously met and that the waste water treatment works is well-maintained.

Fresh water resources in close proximity to Dube TradePort have been transformed from their natural pristine state through historical human interference and modification of the surrounding landscape. However, these eco-systems continue to maintain a level of ecological functioning.

Dube TradePort Corporation has the opportunity to enhance these natural eco-systems through extensive rehabilitation and the sensitive management of its activities, including effluent and storm-water generation and management.

TABLE 33: STATUS OF INLAND WATERS AND WETLANDS INDICATORS FOR DUBE TRADEPORT CORPORATION

INDICATORS	TRENDS	
Water demand per category (m^3/day)	↑	Municipal water consumption from both Dube AgriZone and the Support Zone in 2012 accounted for almost 45% of total water consumption for Dube TradePort. In 2013, however, there was a visibly significant decline in the amount of municipal water consumed at Dube AgriZone and a slight decline at the Support Zone precinct. Overall, daily municipal water consumption across the Dube TradePort development was halved from 524 m^3/day in 2012, to 294m^3/day in 2013.
Increase/decrease of treated water quality (various)	↑	The Southern Waste Water Treatment Works is operating according to design standards and continues to produce treated effluent generally compliant with GLVs. The number of days when effluent is below standard has decreased. However, high levels of ammonia require specific attention.

TABLE 33: STATUS OF INLAND WATERS AND WETLANDS INDICATORS FOR DUBE TRADEPORT CORPORATION

INDICATORS	TRENDS	
Increase/decrease of quality of storm-water run-off (various)		Several parameters were exceeded during the reporting period 2013/14, particularly chlorine, copper, oil, grease and faecal bacteria, E.coli, which were consistently above the special limit values at all stations, with copper and zinc levels generally higher than the general standards. These two parameters were particularly high at stations 11 and 3, reaching 6 and 3 times the general limit values, respectively. Conductivity, pH, cadium and cyanide were also recorded to be above the special limit values.
Surrounding wetland health status (various)		On-site wetlands were described as 'significantly modified' as a result of sugar plantations and alterations to natural hydrology through the construction of drainage canals. In terms of functional value, these wetlands scored Moderately Low to Intermediate for the majority of the eco-system services assessed. Off-site wetlands exhibited greater functional value than on-site wetlands, scoring as Moderately-High to High for the eco-system services they provide. The health state of these systems was categorised as Largely Modified, predominantly as a result of hydrological and vegetation impacts within each wetland and the catchment.
Surrounding river health status (various)		Umdloti River catchment is largely modified by urbanisation (Verulam), sand mining activities, municipal sewerage treatment infrastructure and the extensive cultivation of sugar cane. The ecological state of the Umdloti River above the town of Verulam is considered good, while the downstream state of the river within the Mount Moreland estate is deemed as poor, highly stressed and deteriorating over time, as reflected by the aquatic biota and water quality data. Tongati River is described as transformed, largely through agricultural activities and possesses little remaining environmental resource assets. Hlawe River, which drains the industrial areas of Tongaat and surrounding agricultural land, is considered to be highly stressed. The ecological state of the Hlawe River has been consistently categorised as poor and this was attributed to poor water quality.

11.2.7 LAND AND TRANSFORMATION

Trend: Stable
The state of land is seen to be stable. However, transformation of environmentally and socially sensitive areas will need to be continuously monitored.

The indicators described in the land and transformation chapter have shed some light on the state of these resources. It is, however, important to continue monitoring activities in order to accurately track change and respond accordingly to negative impacts. An important emerging issue from a land and transformation perspective is, therefore, the need to ensure that the latest data and information is used when assessing change and impacts on land and the landscape. This includes spatial data and data captured during fieldwork and ground-truthing exercises. Land-use and land cover are useful concepts to track overall change and environmental impact, thus, the development and maintenance of a comprehensive land resources database is an important addition to Dube TradePort's existing data-sets. An emphasis on greening projects and sustainability are clearly evident from Dube TradePort's Annual Reports. A number of initiatives which seek to address the efficient use of resources and rehabilitation of degraded natural areas are clearly ingrained in the development plan.

TABLE 34: STATUS OF LAND AND TRANSFORMATION INDICATORS FOR DUBE TRADEPORT CORPORATION

INDICATORS	TRENDS	
Loss/gain of land-use types, including agricultural land and natural (ha)	→	Although a great number of land-use changes have taken place between 2005 and 2008, much of the loss of natural land has been in degraded areas. Overall, the percentage gain of settlements is recorded as 26,48%, while there have been small gains in bushland (2,26%), dense bush (4,11%), forest (0,16%) and wetlands (0,03%). While losses of grassland (-8,16%) and of grassland/bush clumps (-4.73%) have also been recorded. Unfortunately, updated information will only be available after June 2014.
Rate of change of land cover (%)	→	In 2005, transformed land cover accounted for approximately 65% of the study area, while this increased to an estimated 75,5% in 2008. These figures imply an annual rate of change in land cover from untransformed to transformed of approximately 3,4%. While this rate of change would be concerning on a sustained basis and/or on a larger scale, it is noted that this will diminish greatly over time as construction and development draw to a close and as rehabilitation begins to show results.

11.3 FUTURE OUTLOOK

Dube TradePort features numerous sustainability initiatives, policies, strategies and plans. While there are some teething problems with monitoring and reporting of various environmental aspects, there is clear initiative to improve. Alien plan removal and rehabilitation initiatives will soon begin to yield positive outcomes for biodiversity and ecosystem health. Focused initiatives on sustainable water use, and responsible water harvesting will continue to add benefit as Dube TradePort reaches its full capacity. Waste management already includes many positive contributions to waste minimisation and recycling. As reporting improves it will become easier to qualify the positive trend in this area of management. Numerous recommendations have also been made that will contribute to both the waste stream, and Governance and IEM. The compilation of a carbon footprint, which is currently underway, will provide invaluable information for future air quality and carbon off-set projects. The instalment of an integrated electronic reporting system, which the various zones are currently transitioning to, will assist greatly in monitoring and reporting challenges, as well as streamline the process and provide easy access to information. Overall, it is anticipated that Dube TradePort will progress to an 'improving' trend within the next reporting cycle, i.e. 2014/2015.

12 ABBREVIATIONS

µg/m³	Micrograms per cubic metre
ACSA	Airports Company South Africa
APP	Annual Performance Plan
BEE	Black Economic Empowerment
CAA	Civil Aviation Authority
CBAs	Critical Biodiversity Area(s)
CFC	Chlorofluorocarbon
CFL	Compact Fluorescent Lamp
CH4	Methane
CMS	Carbon Management Strategy
CMW	Mixed Paper
CO	Carbon Monoxide
CO_2e	Carbon Dioxide Equivalent
COP	Conference of the Parties
CSI	Corporate Social Investment
DAEA	Department of Agriculture and Environmental Affairs (KwaZulu-Natal province)
DDT	Dichlorodiphenyltricholoethane
DEA	National Department of Environmental Affairs
DEAT/DEA	National Department of Environmental Affairs and Tourism – now known as the Department of Environmental Affairs
DEDECT	Department of Economic Development, Environment, Conservation and Tourism
EDTEA	Economic Development, Tourism and Environmental Affairs (KwaZulu-Natal Province)
DFI	Direct Foreign Investment
DPIP	Development Planning and Infrastructure Programme
DPSIR	Driver-Pressure-State-Impact-Response
DTP	Dube TradePort
DTPC	Dube TradePort Corporation
DTPCA	Dube TradePort Corporation Act (Act No. 2 of 2010)
EA	Environmental Authorisation
ECN	Electronic Communication Network
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMA	eThekwini Metropolitan Area
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
EMS	Environmental Management System
ETV	Elevated Transfer Vehicle
FEPA	See NFEPA
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GHGP	Greenhouse Gas Protocol
GLV	General Limit Value
GVA	Gross Value Add
ha	Hectares
HCRW	Health Care Risk Waste
HD	High Density
HIA	Heritage Impact Assessment
HL1	Heavy Letter One
IAAQS	International Ambient Air Quality Standard
IEM	Integrated Environmental Management
ISO	International Standards Organisation
IUCN	International Union for Conservation of Nature and Natural Resources
IWMP	Integrated Waste Management Plan
KPI	Key Performance Indicator
KSIA	King Shaka International Airport
KZN DAEA	KwaZulu-Natal Department of Agriculture and Environmental Affairs
LD	Low Density
MRO	Maintenance, Repair and Operations
MSW	Municipal Solid Waste
NAAQS	National Ambient Air Quality Standard
NEM:AQA	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
NEM:BA	National Environmental Management: Biodiversity Act
NEM:PAA	National Environment Management: Protected Areas Act
NEM:WA	National Environmental Management: Waste Act
NEMA	National Environmental Management Act
NFEPA	National Freshwater Eco-system Priority Area
NFEPA	National Freshwater Eco-system Priority Area(s), shortened to FEPAs
NGO	Non-Governmental Organisation
NHRA	National Heritage Resources Act (Act No. 25 of 199)
NO	Nitrogen Oxide
NO_2	Nitrogen Dioxide
NSBA	National Spatial Biodiversity Assessment (2004)
NTU	Nephelometric Turbidity Units
NWMS	National Waste Management Strategy
OEMP	Operational Environmental Management Plan
PAs	Protected Area(s)
PAH	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PET	Polyethylene Terephthalate
PFMA	Public Finance Management Act (Act No. 1 of 1999, as amended)
PI	Performance Indicator(s)
PIWMP	Provincial Integrated Waste Management Plan
PM	Particulate Matter
PM10	Particulate Matter with an aerodynamic diameter of less than 10 µm
PM2.5	Particulate Matter with an aerodynamic diameter of less than 2.5 µm
PP	Polypropylene
PSEDS	Provincial Spatial Economic Development Strategy
PV	Photovoltaic
PVC	Polyvinyl Chloride
RoD	Record of Decision
SANBI	South African National Biodiversity Institute
SAHRA	South African Heritage Resource Agency
SANRCBD	South Africa's Fourth National Report to the Convention on Biological Diversity
SARS	South African Revenue Service
SAWIS	South African Waste Information System
SHEQ-IMS	Safety, Health, Environment and Quality – Implementation Management System
SLV	Special Limit Value
SMME	Small, Medium and Micro Enterprise
SO_2	Sulphur Dioxide
SoER	State of Environment Report
SWWTW	Southern Waste Water Treatment Works
THS	Tongaat Hulett Sugar
tpa	Tonnes per annum
UNFCCC	United Nations Framework Convention on Climate Change
VOC	Volatile Organic Compounds
WHO	World Health Organisation
WMP	Waste Management Plan
WWTW	Waste Water Treatment Works

13 GLOSSARY

AEROTROPOLIS
An aerotropolis combines traditional geospatial principles associated with city and airport developments, with a more modern outlook towards growth and sustainable economic development. It achieves this by offering agility, connectivity and speed in a way that generates value creation for all users: business, travellers and investors.

AIR QUALITY
A measure of exposure to air which is not harmful to your health. Air quality is measured against health risk thresholds (levels) which are designed to protect ambient air quality. Various countries, including South Africa, have Air Quality Standards (legally binding health risk thresholds) which aim to protect human health due to exposure to pollutants within the living space.

AMBIENT AIR
The air of the surrounding environment.

BIODIVERSITY
The diversity of animals, plants and other organisms found within and between eco-systems, habitats and the ecological complexes.

BUILDING AND DEMOLITION WASTE
Waste, excluding hazardous waste, produced during the construction, alteration, repair or demolition of any structure and includes rubble, earth, rock and wood displaced during that construction, alteration, repair or demolition.

BY-PRODUCT
A substance that is produced as part of a process that is intended to produce another substance or product that has the characteristics of an equivalent virgin product or material.

CARBON OFF-SET
A reduction in emission of carbon dioxide, or greenhouse gases, in order to compensate for, or to off-set an emission made elsewhere.

CARTON BOARD CUTTINGS (IMW)
Consists of new cuttings of paperboard as are used in the manufacture of folding paper cartons and similar boxboard products.

CONCENTRATION
When a pollutant is measured in ambient air it is referred to as the concentration of that pollutant in air. Pollutant concentrations are measured in ambient air for various reasons, i.e. to determine whether concentrations are exceeding available health risk thresholds (air quality standards), to determine how different sources of pollution contribute to ambient air concentrations in an area, to validate dispersion modelling conducted for an area, to determine how pollutant concentrations fluctuate over time in an area and to determine the areas with the highest pollution concentrations.

CRITERIA POLLUTANT
Criteria pollutants are air pollutants which cause smog, acid rain and health hazards. Primary pollutants are emitted by sources, such as mining, industry, power generation, agricultural activities and transportation. These include Particulate Matter, Oxides of Nitrogen, Sulphur Dioxide, Carbon Monoxide, Lead and Benzene. Secondary pollutants are formed as a result of chemical interactions of primary pollutants and these include Ozone and Particulate Matter.

DRY WASTE
Recyclable waste materials, which include:
- Paper products;
- Plastics;
- Glass; and
- Metals

ECOSYSTEM INTEGRITY
Ecological integrity refers to a condition in which biotic and abiotic components of ecosystems and the composition and abundance of native species and biological communities are characteristic for their natural regions and rates of change and ecosystem processes are unimpeded.

ECOSYSTEM SERVICES
Ecosystem services can be simply defined as 'the benefits people derive from ecosystems'. These include provisioning services or goods such as food, water, wood and other raw materials, while plants, animals, fungi and micro-organisms also provide essential regulating services, such as crop pollination, flood attenuation and water purification, supporting services such as nutrient cycling and a vast array of cultural services, such as recreational, spiritual and cultural benefits (www.sanbi.org.za).

EMISSIONS
The production and discharge of pollution from a source of pollution.

ENVIRONMENT
In terms of the National Environmental Management Act (Act No. 107 of 1998) (as amended) (NEMA), 'environment' means the surroundings within which humans exist and that are made up of:
(i) The land, water and atmosphere of the earth;
(ii) Micro-organisms, plant and animal life;
(iii) Any part or combination of (i) and (ii) and the inter-relationships among and between them; and
(iv) The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

ENVIRONMENTAL MANAGEMENT
The identification, assessment and control of environmental aspects and impacts, compliance to environmental legislation and adherence to other components within an Environmental Management System (EMS), such as environmental monitoring and incident reporting.

EUTROPHICATION
The process whereby a water body becomes enriched in dissolved nutrients, such as phosphates and nitrates, which stimulates excessive growth of algae and other aquatic plants, usually resulting in the depletion of dissolved oxygen.

GENERAL WASTE
Waste that does not pose an immediate hazard or threat to health or the environment, and includes:
- Domestic waste;
- Building and demolition waste (excluding asbestos);
- Business waste; and
- Inert waste.

GOVERNANCE
Within an organisation, this includes issues of Corporate Social Responsibility, along with improved management of corporate social and environmental impacts and improved stakeholder engagement. Support is garnered for this new management style as it promises to create long-term shareholder value by embracing opportunities and managing risks derived from ongoing economic, environmental and social developments.

GREEN WASTE
Biodegradable waste that can be composed of garden or park waste, such as grass or flower cuttings and hedge trimmings, as well as domestic and commercial food waste.

GREENFIELD
Undeveloped land in a city or a rural area, used either for agriculture or urban development.

GREENHOUSE GASES
Greenhouse gases are gases in the earth's atmosphere which absorb and emit radiation within the thermal infrared range. Greenhouse gases are methane, water vapour, carbon dioxide, nitrous oxide and ozone.

HAZARDOUS WASTE
Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

HEAVY LETTER ONE (HL1)
Consists of white printed or unprinted sheets, shavings originating from printers or office records. This grade must be free of heavily printed or coloured stock and non-water-soluble adhesives.

INDUSTRIAL SYMBIOSIS
The sharing of services, utility and by-product resources among industries in order to add value, reduce costs and improve the environment.

LEACHATE
Any liquid material that drains from land or stock-piled material and contains significantly elevated concentrations of undesirable material derived from the material that it has passed through.

MIXED PAPER (CMW)
A mixture of various grades of paper and board without restriction on fibre content.

PARTICULATE MATTER (PM)
The collective name for fine solid or liquid particles added to the atmosphere by processes at the earth's surface and includes dust, smoke, soot, pollen and soil particles. Particulate Matter is classified as a criteria pollutant, thus national air quality standards have been developed in order to protect the public from exposure to the inhalable fractions. PM can be principally characterised as discrete particles spanning several orders of magnitude in size, with inhalable particles falling into the following general size fractions:

- PM10 (generally defined as all particles equal to and less than 10 microns in aerodynamic diameter; particles larger than this are not generally deposited in the lung);
- PM2.5, also known as fine fraction particles (generally defined as those particles with an aerodynamic diameter of 2,5 microns or less);
- PM10-2.5, also known as coarse fraction particles (generally defined as those particles with an aerodynamic diameter greater than 2,5 microns, but equal to or less than a nominal 10 microns); and
- Ultra-fine particles generally defined as those with an aerodynamic diameter of less than 0,1 microns.

POLICY
The Dube TradePort Corporation's Environmental Policy.

REVERSE OSMOSIS
Reverse Osmosis is a water purification process typically used for the removal of salts (desalination) from borehole water or seawater to produce drinking water. Water is forced through a semi-permeable membrane, against the natural osmotic gradient, which separates and removes dissolved solids, organics, viruses and bacteria from the water.

SUSTAINABLE DEVELOPMENT
The integration of social, economic and environmental factors into planning, implementation and decision-making, so as to ensure that development serves present and future generations.

TRIPLE BOTTOM LINE
Refers to the three spheres of social, economic and environment.

WASTE
Any substance, whether or not that substance can be reduced, re-used, recycled and recovered –

- That is surplus, unwanted, rejected, discarded, abandoned or disposed of;
- Which the generator has no further use of for the purposes of production;
- That must be treated or disposed of; or
- That is identified as a waste by the Minister by notice in the Gazette, and includes waste generated by the mining, medical or other sector; but –
  - A by-product is not considered waste; and
  - Any portion of waste, once re-used, recycled and recovered, ceases to be waste.

WET WASTE
Non-recyclable waste material.

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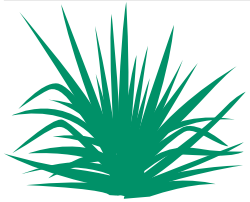
DUBE TRADEPORT STATE OF THE ENVIRONMENT

63% TOTAL RECYCLABLE WASTE FOR 2014

650 HECTARES ALIEN-CLEARING COMPLETED SINCE 2012



30,04 HECTARES HAVE BEEN PREPARED FOR THE SOWING OF

6 484,75 KG OF GRASS SEED

80% OF DUBE AGRIZONE GREENHOUSE WATER DEMAND IS RAIN-WATER HARVESTED

701 kWp CAPACITY TO GENERATE ENERGY BY SOLAR PANELS AT DUBE AGRIZONE

REDUCED ENVIRONMENTAL IMPACT

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