STATE OF BIODIVERSITY REPORT: 2011/2012

"This is the assembly of life that took a billion years to evolve. It has eaten the storms – folded them into its genes and created the world that created us. It holds the world steady."

– EDWARD O. WILSON

ETHEKWINI MUNICIPALITY
ENVIRONMENTAL PLANNING & CLIMATE PROTECTION DEPARTMENT
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BIO DIVER SITY

Biodiversity (biological diversity) is the variety of life and its processes. It includes the variety of organisms, the genetic differences among them, the communities and ecosystems in which they occur, and the ecological and evolutionary processes that keep them functioning, yet ever changing and adapting. This includes all species (including humans), habitats and ecosystems and the connections between these. It is known that biodiversity provides us with essential ecosystem services. Ecosystem services are the benefits provided by healthy ecosystems to all living organisms. There is growing recognition of the value of ecosystem services to human well-being in terms of health, social, cultural and economic needs. Read more about ecosystem services on Page 5 of this report.

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INTRO**DUCTION**

The intention of State of Biodiversity reporting is to present qualitative and quantitative data which describe the status of biodiversity and the ecosystem services that it provides in the eThekwini Municipal Area, to highlight key threats to this biodiversity and to record actions aimed at protecting and managing biodiversity. These reports are produced annually and this is the eThekwini Municipality's fourth State of Biodiversity report. The State of Biodiversity report is dynamic and takes cognisance of local, national and international trends in biodiversity and ecosystem services conservation, management and monitoring. This means that reports may differ from year to year. The current report collates information relevant to the 2011 / 2012 municipal financial year[1]. In this report we will introduce the concept of Planetary Boundaries and a Safe Operating Space for Humanity. Another very important addition is a strong focus on climate change and the green economy – demonstrating the important link between biodiversity conservation, poverty alleviation and human wellbeing.

[1] *A municipal year starts on 01 July and ends on 30 June.*

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A TIME OF CHALLENGES AND OPPORTUNITIES

The Cities and Biodiversity Outlook (CBO)[2] was launched at the Cities for Life Summit this year during the CBD COP11 held in Hyderabad, India. This report is a global assessment of the links between urban development, biodiversity and ecosystem services. More than 60% of the area projected to be urban by 2030 is yet to be built, a challenge to natural environments but also an opportunity for urban dwellers to foster sustainable stewardship of the planet's living resources.
The key messages from the CBO are as follows:

- Urbanization is both a challenge and an opportunity to manage ecosystem services globally.
- Rich biodiversity can and does exist in cities.
- Biodiversity and ecosystem services are critical natural capital.
- Maintaining functioning urban ecosystems can significantly improve human health and well-being.
- Urban ecosystem services and biodiversity contributes to climate-change mitigation and adaptation.
- Increasing the biodiversity of urban food systems can enhance food and nutrition security.
- Ecosystem services must be integrated in urban policy and planning.
- Successful management of biodiversity and ecosystem services must be based on multi-scale, multi-sectoral, and multi-stakeholder involvement.
- Cities offer unique opportunities for learning about a resilient and sustainable future.
- Cities have a large potential to generate innovations and governance tools and therefore can—and must—take the lead in sustainable development.

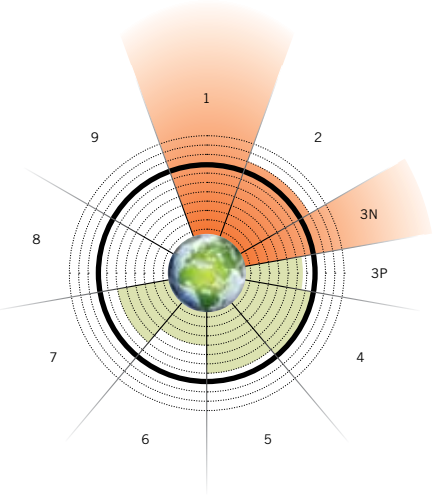
For the detailed report, go to http://www.cbd.int/en/subnational/partners-and-initiatives/cbo/cbo-action-and-policy-executive-summary/cbd-cbo1-book-f-web-rev2

TABLE 1: PLANETARY BOUNDARIES

DEFINED BY ROCKSTRÖM ET AL. (2009)

Earth-system process	Parameters	Proposed boundary	Current status	Pre-industrial value
Rate of biodiversity loss	Extinction rate (number of species per million species per year	10	>100	0.1 - 1
Climate Change	(i) Atmospheric carbon dioxide concentration (parts per million by volume)	350	387	280
	(ii) Change in radiative forcing (watts per metre squared)	1	1.5	0
Nitrogen (part of a boundary with the phosphorus cycle)	Amount of N_2 removed from the atmosphere for human use (millions of tonnes per year)	35	121	0
Phosphorous cycle (part of a boundary with the nitrogen cycle)	Quantity of phosphorous flowing into the oceans (millions of tonnes per year)	11	8.5 - 9.5	-1
Stratospheric ozone depletion	Concentration of ozone (dobson unit)	276	283	290
Ocean acidification	Global mean saturation state of aragonite in surface of sea water	2.75	2.90	3.44
Global freshwater use	Consumption of fresh water by humans (km^3 per year)	4,000	2,600	415
Change in land use	Percentage of global land cover converted to cropland	15	11.7	low
Atmospheric aerosol loading	Overall particulate concentration in the atmosphere, on a regional basis	To be determined		
Chemical pollution	e.g. amount emitted to, or concentration of persistent organic pollutants, plastics, endocrine disrupters, heavy metals and nuclear waste in the global environment, or the effects on ecosytem and functioning of earth system thereof	To be determined		

"The biggest concern is that three of these boundaries have already been exceeded at a global level."



1: EARTH'S SAFE OPERATING SPACE

In 2009, a group of leading global thinkers identified and quantified the existence of planetary boundaries[3] (Table 1). These boundaries define the "safe operating space for humanity with respect to the functioning of the Earth system" and are intended to define thresholds beyond which the world becomes a dangerous and more risky place for our society and our species and within which true sustainable development is possible.
The biggest concern is that three of these boundaries have already been exceeded at a global level – climate change, rate of biodiversity loss and changes to the global nitrogen cycle. Others (such as ocean acidification) are close to being exceeded and scientific knowledge is insufficient to determine where we are with respect to the boundaries of chemical pollution and aerosol loading.

Proposed safe operating levels

Current operating levels

Nine critical boundaries have been identified to date. These are:

1. Rate of biodiversity loss
2. Climate change
3. Biogeochemical flows: Interference with P and N cycles
4. Stratospheric ozone depletion
5. Ocean acidification
6. Global freshwater use
7. Change in land use
8. Atmospheric aerosol loading
9. Chemical pollution

We have overstepped three of the nine boundaries and are at grave risk of transgressing several others.

[2] Secretariat of the Convention on Biological Diversity (2012) Cities and Biodiversity Outlook. Montreal, 64 pages.
[3] Rockström , J. et al. (2009). A safe operating space for humanity. Nature 461: 472–475.

TABLE 2. TARGETS AND DEFICITS

FOR 14 VEGETATION TYPES IN DURBAN

Vegetation Type (KZN classification)	Area available in the EMA*	Target for conservation (ha)	Protected statutorily in the EMA[4] (ha)	Deficit/excess (ha)
Dry Ngongoni Veld	7863	4527	0	3336
Moist Ngongoni Veld	3871	3099	0	772
Eastern Valley Bushveld	11182	5020	0	6162
KZN Hinterland Thornveld	3664	1706	0	1958
KZN Sandstone Sourveld	3259	3920	116	-545
North Coast Bushland	9246	8189	11	1067
South Coast Bushland	765	488	0	277
North Coast Grassland	9022	29150	218	-19910
South Coast Grassland	2551	6046	0	-3495
Southern Coastal Scarp Forest	8817	5470	531	3878
KZN Coastal Forest	2075	1572	34	537
KZN Dune Forest	1285	888	26	423
Mangrove Forest	65	65	47	0
Swamp Forest	55	55	0	0

What does exceeding these boundaries mean for humankind?

When natural boundaries are crossed, the world becomes an increasingly unsafe place with a growing probability of disastrous consequences. In this world, everyone is negatively impacted, but it is the poor and the vulnerable who are most likely to be worst affected. This is because they have the least ability to adapt to and protect themselves from extreme events, and because they are the most reliant upon increasingly dysfunctional and unproductive natural systems for their survival.
The concept of Peak Oil is already well known, but we are now witnessing "Peak Everything"[5] with declines in a wide array of natural resources including fresh water, natural gas, coal, minerals and ores (such as copper and platinum). We are also seeing increased climate instability and lower economic growth. Declining resources combined with a rapidly growing human population, means that we now live in a different world to the one we were born into. Adapting our lifestyles to ensure our survival and well-being in this new world will require that we begin to make radical changes to our societies, economies and the way we live our lives, including changing our attitudes, behaviour and expectations of what constitutes development and improved quality of life.

> "Declining resources combined with a rapidly growing human population, means that we now live in a different world to the one we were born into."

Vegetation types for which conservation targets can no longer be met.

Vegetation types where further significant loss of habitat is likely to result in targets not being met.

Explaining planetary boundaries at a local level

In Durban these global patterns are being repeated at a local level. From a biodiversity perspective, for example, the natural environment in the eThekwini Municipality has been severely impacted by landscape transformation and fragmentation (Figure 7 and 8), invasive alien species, over exploitation and pollution. Climate change is also a significant and increasing threat to biodiversity. Already, scientifically-derived quantitative conservation targets for 14 key vegetation types in the city indicate that four of these (KZN Sandstone Sourveld, North and South Coast Grasslands and Mangroves) are in all likelihood already beyond the natural threshold required for long term survival and that a further five are at a point where continued transformation is likely to transgress natural thresholds for these systems too (Table 2). These ecosystems are threatened and face a high risk of extinction, suggesting that current policy, law, governance and environmental management efforts have been inadequate to prevent this degradation.
From a climate change perspective, current projections downscaled from global circulation models suggest that by 2100 average temperatures in Durban could be up to 3-5°C warmer. Rainfall patterns are also likely to become increasingly variable, while extreme weather events are likely to increase in severity and frequency. In addition, conservative estimates suggest that the current rate of sea-level rise will result in an increase of 20-30 cm by the end of the century, and that this is likely to be compounded by heavy storm surges.

** EMA refers to eThekwini Municipal Area.*

[4] Statutory protection in the six Ezemvelo KZN Wildlife nature reserves that occur in the eThekwini Municipal Area and the Palmiet Nature Reserve.

[5] Heinberg, R. 2007. Peak Everything: Waking Up to the Century of Declines. New Society Publishers.

The challenge for local governments like eThekwini Municipality is to localise the planetary boundary concept and to develop new methodologies to define city-level boundaries. Work on this has already begun in Durban, but is likely to be hampered by the lack of good quality data and the ability to define an acceptable level of risk for the city's residents. Progress in this regard will be reported on in subsequent reports.

It is clear that even in Durban, we are fast approaching environmental thresholds that, if exceeded, will push us towards an unpredictable and risk laden future. But while the thought of this can be overwhelming, it also presents us with an opportunity to effect changes that will minimize and manage our vulnerability to this complex set of risks. We have an opportunity to make radical change – to discard our 'business as usual' approach, to adopt new, creative and critical approaches to the challenges we face, and to challenge ourselves and others to think completely differently about how we live on this planet and in our municipal area. This will require bold and decisive action, but offers us one last opportunity to shift our development path to something that is more sustainable and equitable.

"We are fast approaching environmental thresholds that, if exceeded, will push us towards an unpredictable and risk laden future."

"We have an opportunity to make radical change and discard our 'business as usual' approach..."

2:

ECOSYSTEM SERVICES PROVIDED BY DURBAN'S NATURAL ENVIRONMENT

A. Food production: e.g., fish, crops and fruit.

B. Waste treatment: removal and breakdown of excess nutrients in wetlands, detoxification of air pollution by vegetation.

C. Water supply: supply and storage of water by rivers.

D. Disturbance regulation: flood control, drought recovery.

E. Cultural: aesthetic, educational, spiritual and scientific use.

F. Recreation: eco-tourism sports, fishing, swimming.

G. Raw materials: fuel, craft work and building materials.

H. Pollination: movement of pollen by certain species (e.g., bees) to enable plant reproduction.

I. Biological control: e.g., rodent and insect control (spiders controlling mosquito populations).

J. Refugia: habitat for resident or migrant populations e.g., nurseries for fish.

K. Nutrient cycling: capture, storage and processing of nutrients e.g., nitrogen fixation.

L. Soil formation: e.g., weathering of rock by water.

M. Climate regulation: control of temperatures e.g., wind reduction.

N. Gas regulation: control of the chemical composition of the atmosphere.

O. Genetic resources: Unique biological materials and products e.g., plant and animal medicines.

P. Erosion control: storage of soil within an ecosystem e.g., wetlands.

Q. Water regulation: control of water flow e.g., capture and release of water by vegetated landscapes for urban use.

An example of the services highlighted in yellow is provided on pages 07 and 08.

WHAT'S THE BUZZ ABOUT BEES?

Global bee populations are in decline – a phenomenon termed Colony Collapse Disorder. Research shows that the disappearance of bees might be due to intense agricultural practices, use of damaging pesticides, habitat destruction resulting in the declines of flowering plants and worldwide spread of pests and air pollution. But why is the loss of these insects so important?

The answer is simple. Bees pollinate crops, making food production possible. Bees are, without dispute, the most important pollinators in the world. In fact, of the 100 crop species that provide 90% of the world's food, over 70 are pollinated by bees! If bees continue to disappear, foods that we take for granted will decrease in supply and increase significantly in price. These foods include but are not restricted to: almonds, apples, broccoli, cabbage, carrots, cauliflower, coconuts, coffee plants, cotton, cucumbers, eggplants, grapes, lemons, limes, mangoes, mustards, onions, pears, plums, raspberries, soybeans, squashes, strawberries, sunflowers, tomatoes and watermelons. There is a direct link between bees pollinating crops and our ability to feed ourselves. Furthermore, bee venom has been found to have medicinal properties, used for treating arthritis, multiple sclerosis and even fibromyalgia.

There are a number of interventions that can be made to stop the decline of bees in urban environments. On a city-wide scale, open spaces containing indigenous vegetation act as migratory routes, nectar corridors and nesting sites for pollinator groups. Green roofs have also been shown to improve inner city biodiversity. On an individual level, planting diverse indigenous gardens containing nectar rich plants and avoiding using harmful pesticides will help protect these extremely valuable and under-appreciated creatures. It is not too late to protect these under-valued providers of such essential services.

"Bees underline the reality that we are more, not less, dependent on nature's services in a world of close to seven billion people."

- ACHIM STEINER
UN Under-Secretary-General and UNEP Executive Director

3: PROFILE OF DURBAN

TABLE 3. KEY STATISTICS

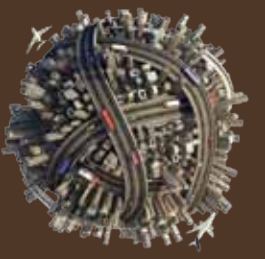
DESCRIBING DURBAN IN 2011 / 2012[6]

Municipal area	2297 km^2 (1.4% of KZN)
Population	3.44 million
Population growth (1996 – 2011)	1.3%
Percentage of people in poverty	31.3%
Rate of urbanisation	93.4%
Total exports	R44.3 billion
Total imports	R71.2 billion
Largest sectors	Manufacturing, tourism, finance and transport
GVA[7]	R176.1 billion
GDP[7]	R196.7 billion

[6] Denny Thaver, Global Insight / Economic Development and Investment Promotion Unit / Procurement and Infrastructure: Development Engineering, eThekwini Municipality

[7] The Gross Domestic Product (GDP) is the total value of all goods and services produced within the economy in a given period. Gross Value Added (GVA) is the value of all goods and services produced in an area or sector of an economy and is used in the estimation of Gross Domestic Product (GDP).

[8] Conservation International - www.conservation.org



A RAPIDLY CHANGING WORLD

Throughout most of history, the human population has lived a rural lifestyle, dependent on agriculture and hunting for survival. In 1800, only 3% of the world's population lived in urban areas. By 1900, this increased to 14% and by 1950, 30% of the world's population resided in urban centres (Population Reference Bureau, 2012). The world has experienced unprecedented urban growth in recent decades. In 2008, for the first time, the world's population was evenly split between urban and rural areas. It is expected that 70% of the world population will be urban by 2050, and that most urban growth will occur in less developed countries.

Urban expansion will put pressure on natural resources, negatively impacting biodiversity and ecosystem services on a global scale. Furthermore, the highest rates of expansion are predicted to occur next to biodiversity hotspot areas. Hotspots are areas that contain high levels of endemism and threats. Over 50% of the world's plant species and 42% of all terrestrial vertebrate species are endemic to the 34 global biodiversity hotspots, despite these areas covering only 2.3% of the Earth's land surface[8].

For this reason, it is pivotal that cities take the lead in fostering a more sustainable stewardship of the natural resource base.

4:
THE NATURAL ENVIRONMENT

South Africa is the third most biodiverse country in the world[9], and Durban contains:

- Three of the country's eight terrestrial biomes – savanna, forest, grassland;
- Eight broad nationally recognised vegetation types. These include:
  - Eastern Valley Bushveld,
  - KwaZulu-Natal Coastal Belt,
  - KwaZulu-Natal Hinterland Thornveld,
  - KwaZulu-Natal Sandstone Sourveld,
  - Ngongoni Veld,
  - Scarp Forest,
  - Northern Coastal Forest and,
  - Mangrove Forest;
- Over 2 000 plant species;
- 97 kilometres of coastline with a diversity of beach types and productive rocky shores;
- 17 river catchments and 16 estuaries;
- 4 000 kilometres of rivers; and
- An open space system of approximately 75 000 ha (2011 / 2012), representing almost ⅓ of Durban's total municipal area.

[9] The biodiversity of South Africa 2002: Indicators, trends and human impacts (2002). Endangered Wildlife Trust, Struik Publishers, Cape Town.

"D'MOSS is a system of green open spaces that incorporates areas of high biodiversity and ecosystem goods and service value."

5:
THE IMPORTANCE OF STATE OF BIODIVERSITY REPORTING

An effective State of Biodiversity reporting programme which tracks trends over time is arguably one of the most valuable means of informing policy makers, the public and other stakeholders about the status of natural resources, and the sustainability of resource use patterns.
The current report collates information relevant to the 2011 / 2012 municipal financial year. Most indicators are linked to the Durban Metropolitan Open Space System (D'MOSS) which is used as a key planning tool, contributing to the attainment of provincial and national biodiversity targets. D'MOSS is a system of green open spaces that incorporates areas of high biodiversity and ecosystem goods and service value.
NB: In 2011 / 2012, the Environmental Planning and Climate Protection Department (EPCPD) underwent several staff changes and as a result, certain datasets have not been adequately updated. The Department is currently revising data management systems to improve our ability to monitor and evaluate biodiversity in Durban on a continuous basis.

WHAT CANNOT BE MEASURED, CANNOT BE SAVED – DAVID CADMAN (ICLEI President)

This year Durban expressed its commitment to utilising and testing the Singapore Cities Biodiversity Index (CBI), the first global self-assessment tool for cities around the world to measure biodiversity. The CBI was endorsed at the 10th Conference of the Parties to the Convention of Biological Diversity (CBD/COP10) in Nagoya, Japan. The aims of the CBI are to:

- Serve as a self-assessment tool,
- Assist national governments and local authorities in benchmarking biodiversity conservation efforts in the urban context at the city level,
- Help evaluate progress in reducing the rate of biodiversity loss in urban ecosystems,
- Help measure the ecological footprint of cities,
- Help develop guidelines to prepare a Plan of Action for cities' biodiversity to achieve the three objectives of the convention,
- Make cities aware of important gaps in information about their biodiversity.

The CBI is an important information sharing and communication platform as it encourages cities from around the world to make information about their biodiversity assets available. This initiative enables the trending of biodiversity data and encourages cities to develop systems to monitor their biodiversity. The CBI is a huge leap towards the collection of detailed and accurate biodiversity data on a global scale. Durban is one of 36 cities from around the world that have already supplied data to the CBI. An additional 40 cities have indicated their intention to utilise the CBI.

CREW FINDS FOUR THREATENED SPECIES AT A SINGLE SITE IN DURBAN

The Custodians of Rare and Endangered Wildlife (CREW) programme involves volunteers from the public in the surveying and conservation of South Africa's threatened plants. CREW aims to capacitate a network of volunteers from a range of socio-economic backgrounds and link these volunteers with their local conservation agencies and particularly with local land stewardship initiatives to ensure the conservation of key sites for threatened plant species.
Sisyranthus anceps, Senecio exuberans, Hypoxis hemerocallidea (Star Flower) and *Brachystelma pulchellum* (Beautiful Brachystelma) were found by the Highway CREW volunteer group in the Hillcrest area. *Sisyranthus anceps* is listed as Data Deficient in the South African Plant Red List and is it is likely to be a very rare KZN Sandstone Sourveld/Ngongoni Veld endemic.
For more information on CREW, please contact Suvarna Parbhoo: s.parbhoo@sanbi.org.za

6:
INDICATORS

6.1. Total area of D'MOSS: In 2011 / 2012 D'MOSS covered an area of 75 000 ha, representing approximately 33% of the total municipal area. The D'MOSS spatial layer is a dynamic one, undergoing modifications and refinements as new information becomes available. Figure 2 shows the adopted D'MOSS per habitat type as at December 2010.

6.2. Percentage of D'MOSS that is protected and managed in Durban: Tools used by the EPCPD to secure and formally protect environmentally sensitive areas in the City include:

- **6.2.1. Non User Conservation Servitudes (NUCS):** In some instances, the outcome of the development assessment process requires the registration of a conservation servitude over that portion of the application property that is within D'MOSS. The area affected by the servitude remains in the ownership of the land owner and can be used for purposes that do not compromise the integrity of the natural environment.

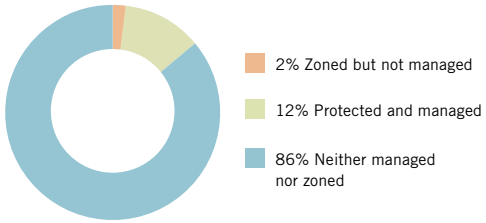


Figure 1. Percentage of D'MOSS that is managed

- **6.2.1.1. Update on the NUCS inspection project:** In 2010 / 2011, the EPCPD undertook a project to follow-up on the status of NUCSs that were requested by the department as a condition of development approval. As part of this a portion of registered NUCSs were selected and prioritised for follow-up site inspections. The aims of the project are to:
  - Ascertain whether the NUCSs are being managed by the landowners and which NUCSs would require further monitoring;
  - Establish if structures have been erected within the NUCSs without EPCPD approval; and
  - Update the NUCS and D'MOSS GIS shapefile.

  Last year, 24 grassland sites were visited by the Biodiversity Impact Assessment staff of EPCPD. In 2011/2012, 34 Scarp and Northern Coastal Forest sites were selected for inspection. Figure 3 shows the condition of the inspected NUCS sites. Nearly 57% of NUCS sites were in a good condition, 39% intermediate, none were degraded and only 4% of the sites were transformed. The level of invasive alien plants (IAPs) on the inspected sites is shown on Figure 4. An illegal platform and clearing of an indigenous forest was found on one of the sites. This is the first NUCS whereby significant activities that are contrary to the conditions of NUCS establishment were found and the necessary compliance enforcement action will have to be initiated. The condition of Grassland NUCS sites was also updated with information that was collected during the process of the current investigation (Figure 5).
- **6.2.2. Land Acquisition:** In some restricted instances, threatened or important areas are protected through acquisition. This is achieved by either purchasing the property from the owner at an agreed upon value or by property owners donating their land to the eThekwini Municipality. In 2011 / 2012, 2.35 ha of land were acquired by the EPCPD for environmental conservation.
- **6.2.3. Nature Reserve Proclamation:** Work is currently being undertaken on the proclamation of 11 municipal nature reserves in terms of the National Environmental Management: Protected Areas Act. These are: Roosefontein, Burman Bush, Empisini, Marian Woods, New Germany, Paradise Valley, Pigeon Valley, Silverglen, Springside, Virginia Bush, and extensions of the Krantzkloof Nature Reserve. This exercise will give these nature reserves a higher conservation status, thus further protecting Durban's biodiversity assets.

LAND ACQUISITION IN 2011/2012

The acquisition of land for environmental protection was extremely onerous this year resulting in the EPCPD only acquiring two small properties. The reasons for this were changes to several processes, which included reporting to committees with no previous experience of this aspect of the Department's work. To ensure that this does not happen in future, meetings have been held with key members of the eThekwini Council, including the Deputy Mayor, to build support for the environmental land acquisition process and its purpose. Meetings have also been held with the Real Estate Department to better streamline the valuation process.

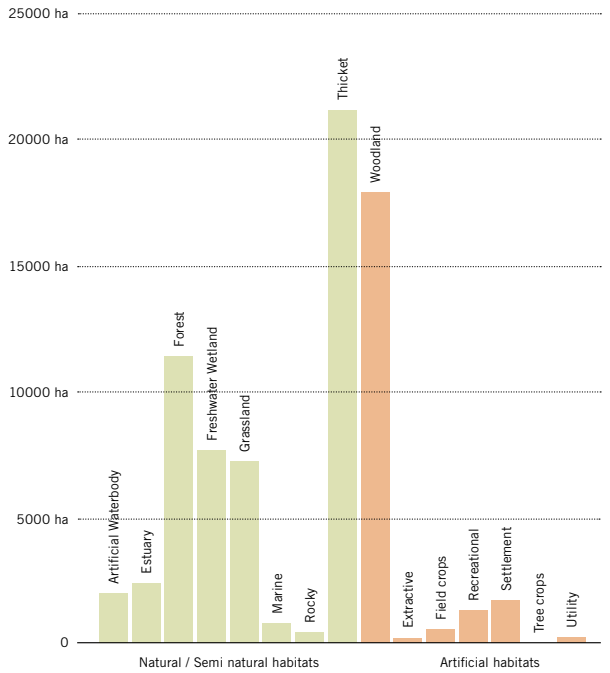


Figure 2. Summary of the different D'MOSS habitat types and their extent

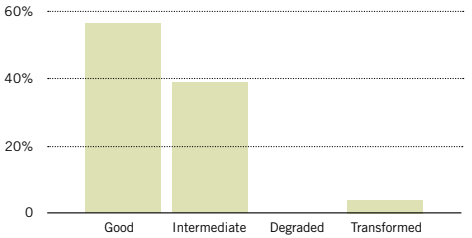


Figure 3. Condition of inspected NUCS sites

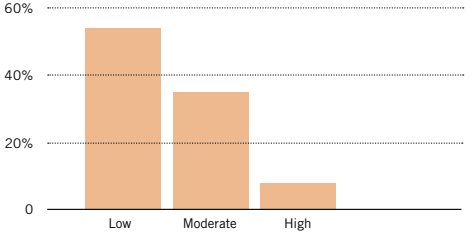


Figure 4. Percentage of invasive alien plants in Forest NUCS

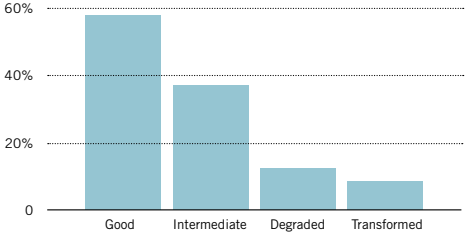


Figure 5. Updated Grassland NUCS condition

Good: *Majority of area, ~⅔ or greater in natural state or at advanced stage of restoration.*

Intermediate: *Area recently disturbed, disturbance evident on more than ⅓ of site but less than ⅔, success of restoration likely in short term.*

Degraded: *Majority of area distributed ~⅔ or greater, restoration efforts will require long term intervention.*

Transformed: *Area totally transformed from indigenous state.*

TABLE 4. PERCENTAGE OF D'MOSS

WITH SOME FORM OF PROTECTION

Name of protected area	Explanation	% D'MOSS
Proclaimed Nature Reserves (Municipal and otherwise)	Protected in terms of the Protected Areas Act – may be Ezemvelo KZN Wildlife (EKZNW) or municipal owned and managed	1.52
Municipal Nature Reserve	Not proclaimed in terms of the Protected Areas Act, owned by the eThekwini Municipality (EM) and managed by the EM Natural Resources Division	2.62
State Nature Reserve	Not proclaimed in terms of the Protected Areas Act, owned by a state entity other than EKZNW	2.93
Private Nature Reserve	Not proclaimed in terms of the Protected Areas Act and in private ownership	0.41
Special Rating area (e.g. Giba Gorge)	Not proclaimed in terms of the Protected Areas Act, ownership and management shared by eThekwini Municipality and private landowners	0.43
Conservation Zone (CZ)[10]	Not proclaimed in terms of the Protected Areas Act, zoned or proposed to be zoned to Conservation Zone and in private ownership	2.25
Environmental Conservation Reserve (ECR)[10]	Not proclaimed in terms of the Protected Areas Act, zoned or proposed to be zoned to ECR	2.23
NUCS (registered, pending etc.)	Registered or pending non-user conservation servitudes requested by municipal entities as conditions of approval to private developers	1.35

A JOURNEY OF 11 000 km OR MORE...

From around mid-October to mid-April Barn Swallows, *Hirundo rustica,* arrive in numbers ranging from 3–5 million to the reed beds of Mt Moreland, KZN. These birds are trans-equatorial migrants that embark on an epic journey of over 11 000 km from across Europe and Asia to roost in southern Africa's warmer climate where they feed on the rich and abundant insect life. At the end of the summer, the swallows reverse their migration, returning to the Northern hemisphere where they breed. The Mount Moreland wetlands with the abundant Phragmites reed beds are an integral part of the Barn Swallow migration and also play host to a wealth of other bird, reptile, small mammal and amphibian species including the rare and endangered Pickersgill's Reed Frog.

In 2006, Mount Moreland was designated a global Important Bird Area (IBA) by Birdlife South Africa. IBAs form part of an international conservation programme run by Birdlife International and their partners. According to Birdlife International's IBA criteria, Mount Moreland qualifies as an IBA under category 'A4' for congregatory birds i.e., "a site known or thought to hold, on a regular basis, ~1% of the global population of a congregatory seabird or terrestrial species". There are ~120 IBAs in South Africa and Mount Moreland is currently the only IBA in Durban.

> "The results from the past nine years of monitoring show an alarming decline in Dwarf Chameleon populations in the surveyed areas."

6.3. Species abundance: In terms of representing urban biodiversity, three taxonomic groups are commonly surveyed i.e., plants, birds and butterflies. In Durban, reliable, quantitative data sets for most groups of organisms are difficult to obtain because of the lack of long term monitoring initiatives. For the purposes of this report only data that are collected consistently and quantitatively are utilised.

- **6.3.1. Waterbirds of Durban Bay:** Despite the Waterbirds of Durban Bay dataset being one of the most comprehensive datasets available in the eThekwini Municipal Area, actual trending is not possible on a year by year basis. This is because long term trends are best seen over longer periods of times (decadal, for instance). The Durban Natural Science Museum is currently compiling a synthesis of the past 13 years of Waterbird counts in Durban Bay. These data will be available in the next State of Biodiversity report.
- **6.3.2. Black-headed Dwarf Chameleon:** *Bradypodium melanocephalum* is a regionally endemic chameleon and its range is restricted to the coastal belt of KZN. The two vegetation types inhabited by this chameleon are North Coast Grassland and South Coast Grassland, both of which are classified as Critically Endangered.
  Some of the key management actions to conserve this important species include:
  - Managing the D'MOSS strip and Chameleon Park appropriately to increase the available chameleon habitat.
  - Increase the protection status of the Chameleon Park from Public Open Space to Environmental Conservation Reserve.
- Continue monitoring the Chameleon Park sub-population.
  In 2002, Ezemvelo KZN Wildlife initiated the monitoring of this species at two localities in Durban i.e., Chameleon Park and a plot of land within D'MOSS next to the Edwin Swales Business Park.
  The results from the past nine years of monitoring show an alarming decline in Dwarf Chameleon populations in the surveyed areas.

[10] The rezoning of the properties to Conservation Zone and Environmental Conservation Reserve was rescinded by council. The categories of protection of D'MOSS may change in future reports.

In 2011 / 2012, the eThekwini Municipality met with Ezemvelo KZN Wildlife to attempt to address the alarming decline of this locally endemic species. Following this meeting, a management plan was developed for the area. The following has been noted since the development and implementation of the management plan:

- Few dwarf chameleons were recorded in 2011 / 2012 (Figure 6) but since the area of suitable habitat is increasing, it is likely that the population will increase over the years if appropriate management is continued.
- Alien plant control has been initiated at Chameleon Park, but it is critical that this continues regularly as there is still a substantial amount of work to be done.

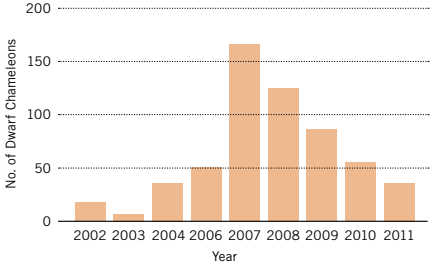


Figure 6. Estimated number of Black-headed Dwarf Chameleons at Chameleon Park

- There are signs that if the alien plant control is implemented regularly, the habitat will be returned to a good condition for the dwarf chameleons and other wildlife.
- The variety and number of seed-eating and other birds appeared greater than in previous years.
- The amount of habitat is also increasing with the decrease in incompatible management practices, such as mowing.

"Transformation reduces the ability of ecosystems to deliver services."

6.4. Threats to Biodiversity in Durban

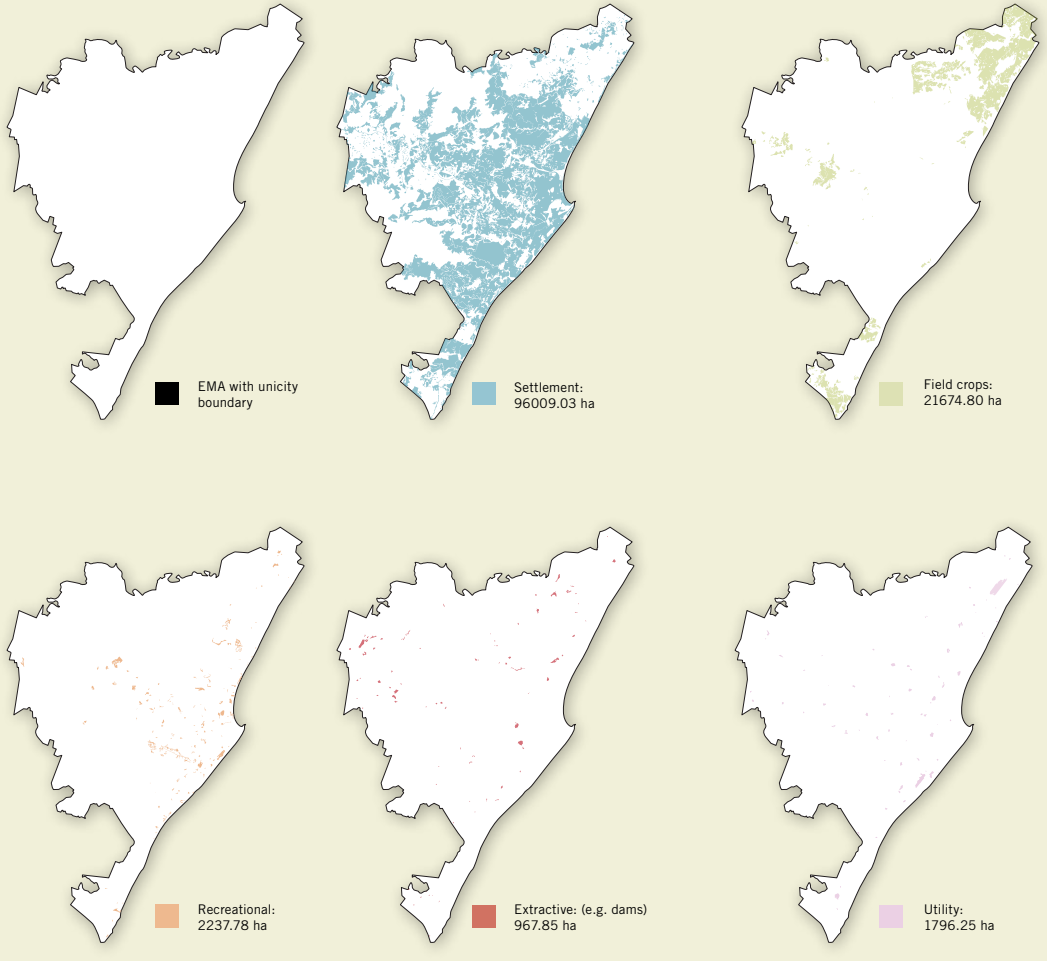
Some of the major threats to biodiversity include:

- Transformation of natural areas (habitat destruction, degradation and fragmentation);
- Introductions of alien invasive species;
- Over-exploitation (harvesting, sandmining);
- Pollution and diseases; and
- Human induced climate change.

Due to the lack of quantitative data relating to many of these threats, this report will only focus on transformation, invasive alien species and climate change. As more information becomes available, these will be included.

- **6.4.1. How much land has been transformed?**
  Transformed areas in the city are those areas that have been altered dramatically from their natural state by human activities. This is one of the single greatest threats to biodiversity as it implies habitat loss, habitat destruction and fragmentation of natural areas. Transformation reduces the ability of ecosystems to deliver services.

Figure 7. In 2011 / 2012, 53 % (122685.7 ha) of the eThekwini Municipal Area was classified as transformed. Below are the categories of transformation with the corresponding area.

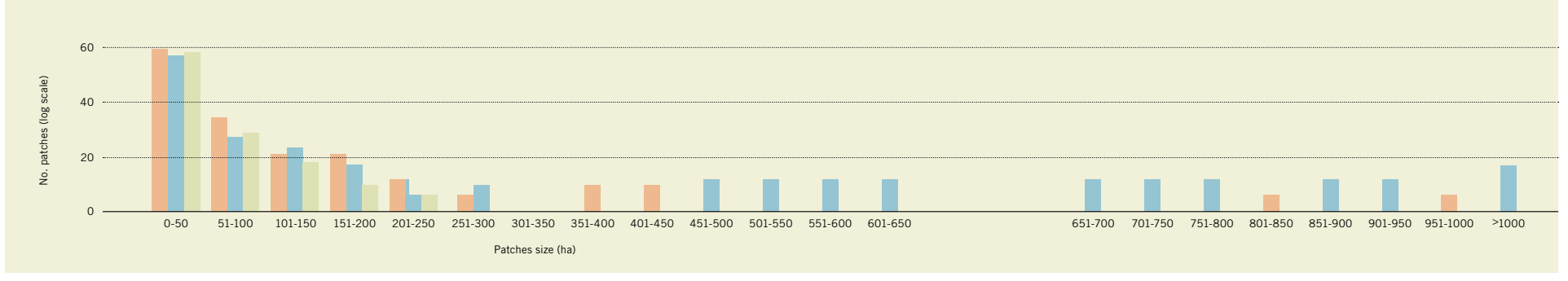


Above: Rivina humilis
Right: Petiveria alliacea

NEW EMERGING WEEDS IN DURBAN

The family *Phytolaccaceae* contains a number of well known weeds that are a problem in South Africa: *Phytolacca octandra, P. dioica, P. americana* and *Rivina humilis.*
SANBI's Early Detection and Rapid Response Programme (EDRR) highlights two species from this family that are currently invading the eThekwini Municipal Area:
Petiveria alliacea is a New World herb or subshrub and is native to southern USA, Ecuador and Argentina as well as on a number of Caribbean islands. Named after James Petiver (an English apothecary and botanist), this species is also commonly called the Guinea-hen weed. The word *"alliacea"* refers to the garlic odour emitted from its crushed leaves.
In 2011, large populations (over 500 individuals) of Guinea-hen weed were found on two properties within the eThekwini Municipality. All plants have since been removed; however this species has demonstrated a strong ability to resprout. Flowering occurs from spring to autumn, after which the flowers are replaced by small, compact fruit. The fruit are armed with four delicate hooks that enable the fruit to stick to fur or clothes and this is the most important dispersal method for this plant.
Rivina humilis, commonly called the Bloodberry is a herbaceous perennial recognised as a short (<1m) shade-tolerant species with very thin, ovate leaves. Originating from the Americas and the West Indies, *R. humilis* has small greenish-white flowers that are produced all year round resulting in "blood-red", globular fruit. These fruit (each containing a single seed) are eaten by birds, resulting in efficient seed dispersal and enhancing the spread of this species. *R. humilis* can displace indigenous plants and is a Category 1 declared invader on the Conservation of Agricultural Resources Act (CARA) list (http://www.agis.agric.za/wip/). Habitats that are at risk of invasion by this species include forests, riverbanks, roadsides and urban open spaces. These plants are poisonous. The EDRR are aware of a few localities of *R. humilis* within KZN but because of the nature of this plant (shade-loving understory species), detection is a big challenge. Please report localities of these plants to the EDRR Programme. (alienplants@sanbi.org.za)

"The fruit are armed with four delicate hooks that enable the fruit to stick to fur or clothes."



"Human causes of fragmentation include the transformation of land due to agriculture and urbanisation."

- **6.4.2 Habitat Fragmentation:** Fragmentation of natural areas is one of the main threats to biodiversity in a city. As the name implies, habitat fragmentation isolates one habitat fragment from other areas of habitat. In this way, habitats which were once large and continuous are divided into separate, smaller fragments. Human causes of fragmentation include the transformation of land due to agriculture and urbanisation. It is recognised that the fragmentation of natural areas affects species differently. For example, a strip of urban development may not affect the dispersal of wind-pollinated plants, but a plant that depends on small mammals for dispersal could be adversely affected.

Figure 8. This graph shows the number of patches of three categories of vegetation i.e., grassland, valley bushveld and forest, and the corresponding size (hectares) of these patches. A larger patch size implies greater connectivity. In the eThekwini Municipal area, transformation of natural areas has resulted in the existence of a large number of smaller patches that are not connected, meaning that the landscape is more fragmented.

Grassland Valley Bushveld Forest

CREATING ENVIRONMENTAL CHAMPIONS

Nondumiso Khumalo is currently employed as an Initiative Manager in the municipality's Buffelsdraai Community Reforestation Programme. She's well renowned in the Buffelsdraai area for her passion for the environment and is one of the driving forces behind the highly successful reforestation project. She is not only a hard worker, but also a keen scholar and an excellent manager. During the four years she has worked at Buffelsdraai, she has taken full advantage of the opportunity to grow her skills and knowledge about reforestation and people management. Prior to her current post, she worked as a field ranger and tour guide, and also as a site manager at the Mduna Royal Reserve in northern KZN. Since starting her work at Buffelsdraai, Nondumiso's many hours of study, usually late at night after a day in the field, have paid off. Earlier this year she was awarded her Diploma in Nature Conservation. She has also just completed a Project Management Diploma and is completing a diploma course in Supply Chain Management. What's next? She's looking forward to tackling a B-Tech in Nature Conservation.

"Invasive alien species can cause economic or environmental harm or can adversely affect human health."

- **6.4.3. Invasive alien species**: Invasive alien species are plants, animals, pathogens and other organisms that are not indigenous to an ecosystem, and which are capable of spreading naturally (often rapidly) into natural or semi-natural habitats. They can cause economic or environmental harm or can adversely affect human health. In particular, they impact adversely upon biodiversity, causing the decline or elimination of indigenous species through competition, predation, or transmission of pathogens, and the disruption of local ecosystems and ecosystem functions.
- **6.4.3.1. Ecosystem-based adaptation**

  a) Invasive alien plant control: In the 2011 / 2012 municipal financial year, the EPCPD had a budget of **R9,233,033.35** allocated to invasive alien plant control. The management of natural areas allows for a unique opportunity to address one of the biggest threats to biodiversity i.e., poverty. Two teams, Working on Fire (WoF) and Working for Ecosystems (WfE) were appointed to tackle the problem of invasive alien species in Durban. Both WoF and WfE are sustainable development programmes that aim to alleviate poverty and develop skills by employing people to manage aspects of the environment such as burning of grasslands and invasive alien species. Both programmes also have a strong education and training component.

  b) Reforestation: The EPCPD have partnered with the Wildlands Conservation Trust to restore areas in the eThekwini Municipality by creating indigenous forests. The reforestation projects have adopted the Community Ecosystem Based Adaptation (CEBA) model which demonstrates the strong and vital link between socio-economic upliftment and biodiversity conservation, enhanced ecosystem functioning and carbon sequestration. Trees are propagated by community 'Tree-preneurs' at their homesteads, through the Indigenous Trees for Life Programme run by Wildlands Conservation Trust. Tree-preneurs then trade their trees for basic food items, clothes and even school fees. Many of these Tree-preneurs are vulnerable women and children, unemployed adults and pensioners. For more information on CEBA, go to www.durbanceba.org

TABLE 5. BREAKDOWN OF EPCPD INVASIVE ALIEN PLANT CONTROL
FOR THE 2011/2012 MUNICIPAL FINANCIAL YEAR

Programme	Working for Ecosystems	Working on Fire
Total area of IAP control	1 088 ha	48 ha (initial) 655.5 ha (follow-up) 98.4 ha (burning)
Training courses	11	20
Training person days	335	549
Total jobs created	304 (54% youth, 30% women)	61 (38% women)
Total person days	17 900	17 119

TABLE 6. REFORESTATION PROJECTS
FOR THE 2011/2012 MUNICIPAL FINANCIAL YEAR

	Buffelsdraai Landfill Site	Inanda Mountain
Total permanent jobs	24	25
Total temporary jobs	58	18
Total part-time jobs	10	n/a
Active treepreneurs	638	138
Area planted	100 ha	116 ha
Trees planted	119 878	5 817

FROM UNEMPLOYED TO SENIOR TRAINER

Linda Mlotshwa is currently the Senior Trainer in the municipality's Working for Ecosystems (WfE) programme. His knowledge and expertise in invasive alien plant control, and his ability to communicate this knowledge to others, makes him a real asset to the WfE team. He is also regarded by his peers as a highly motivated and pragmatic individual. His success, however, was built on his commitment to the WfE programme, and hard work. Prior to the launch of WfE in his home town of Ntshongweni, in 2007, he was not permanently employed. His first post as a WfE team supervisor gave him the opportunity to hone his leadership skills, and he was later accepted into the second phase of the programme. In 2007 he registered as a contractor and began undertaking invasive alien plant (IAP) control projects. During phase 3 of the WfE programme, he was employed as part of the team that provided IAP control training to new staff members. His passion, hard work and determination allowed him to move quickly up the WfE ladder, and in the next WfE phase, he was appointed as a Field Manager and Senior Trainer. Linda continues to study and expand his knowledge about IAPs, their impacts on our environment, and the best ways to eradicate them. He now plans to study Environmental Management and Project Management in order to improve his managerial, organisational, and training skills.

"At present the sea level along the Durban coastline is rising by 2.7 cm every decade."

- **6.4.4 Climate change**: In Durban, the following changes have been projected to occur:
  - Increases in temperature of 1.5-2.5°C by 2045-2065 and 3-5°C by 2081-2100. Rainfall in Durban is projected to increase in the future (up to an additional 500 mm by 2081-2100). The distribution and variability of this rainfall will change; with rainfall events becoming more erratic.
  - At present the sea level along the Durban coastline is rising by 2.7 cm every decade. Projections indicate that this rate is likely to accelerate in the future.
  - Due to these changes in temperature and rainfall, the bio-climatic envelopes (distributions of plants and animals based on climatic variables) in which the fauna and flora of Durban exist could shift. This places additional pressure on Durban's biodiversity.
- **6.4.4.1. Greenhouse Gas Inventory**: A Greenhouse Gas (GHG) Emissions Inventory for the eThekwini Municipality has been compiled for the 2010 calendar year. The inventory identifies the sources of GHG emissions from both the government and community sectors within the eThekwini Municipal Area. The eThekwini Municipality has compiled the Emissions Inventory to help plan climate change mitigation strategies within the Municipality. The total greenhouse emissions recorded for entire eThekwini Municipal Area was 27 069 288 tCO_2 equivalent for the 2010 year. The largest contribution to this footprint was transportation (37% of the total GHGs) followed closely by Industry emissions (24%). A graph showing the inventory by sector is shown in Figure 9. The 2010 GHGEI was developed as an easy to use EXCEL sheet and will allow for reporting of GHG emissions on an annual basis. The process of developing the GHGEI highlighted a number of data inadequacies, which will be systematically addressed in future GHGEIs. The 2010 inventory will be used as a baseline year for future inventories.

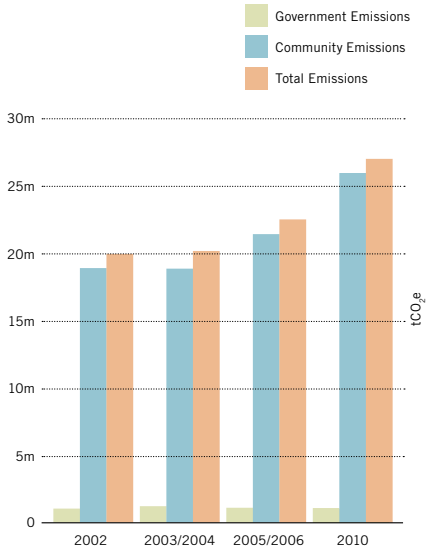
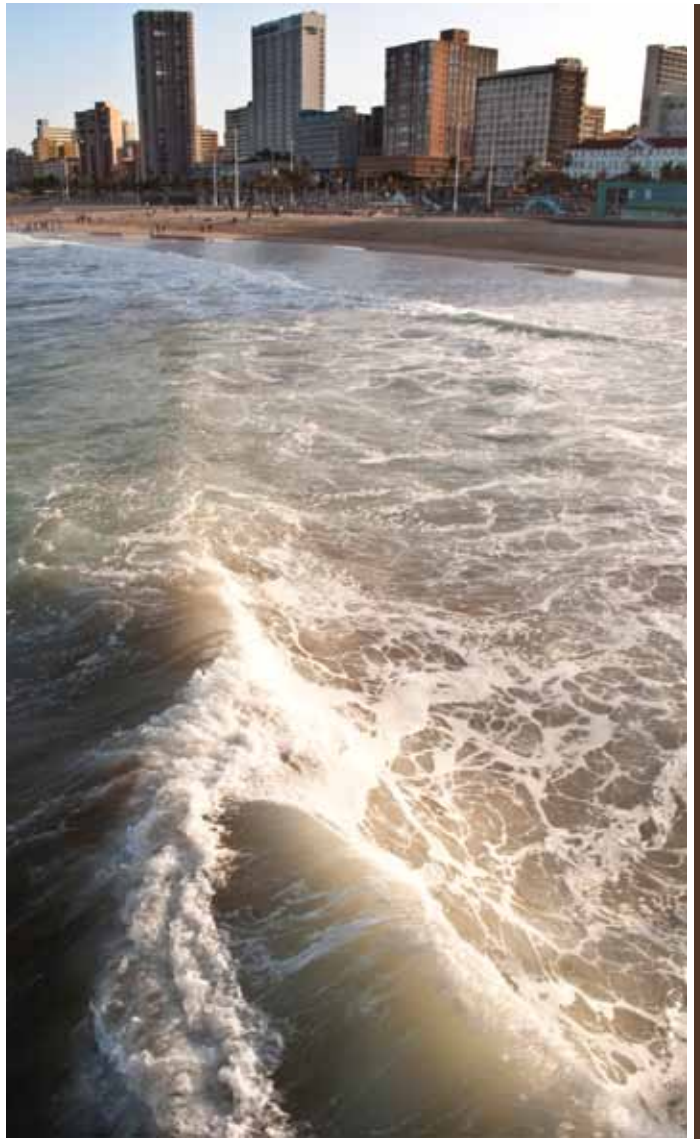


Figure 9. Carbon emissions by sector



COP17/CMP7 OUTCOMES

From 28 November to 9 December, Durban played host to an estimated 190 nations and over 28 000 people for the 17th Conference of the Parties to the United Nations Framework Convention on Climate Change and the seventh Conference of the Parties to the Kyoto Protocol (COP17/CMP7). This is only the second time that the COP was held on African soil.

The following is an excerpt from the EPCPD publication, COP17/CMP7 Outcomes (2012)[11]:

Looking at the range of national and local outcomes, a number of different perspectives are important. From Durban's perspective, the hosting of COP17/CMP7 provided a number of economic and tourism benefits, as well as providing a platform to raise awareness of climate change amongst the city's residents. Durban demonstrated again that the city is capable of hosting mega-events in an effective and highly professional manner, and is now being used as a benchmark by the UNFCCC for the logistics and coordination of future COP's. From a local government perspective, COP17/CMP7 provided an opportunity for the development and approval of the Durban Adaptation Charter which provides a roadmap and framework for effective and meaningful local adaptation action. From the perspective of the negotiations however, the outcomes are less inspiring and seem like a case of 'too little, too late'. While hoping that COP17/CMP7 would deliver a transformative solution in a world that respects and operates within natural thresholds, the author of the editorial in Nature (2011) may have been more accurate in observing that "…as the Durban Platform crowds with politicians, the climate train they wait for has left the station".

One thing that COP17/CMP7 has revealed is that we must work harder to ensure that climate policy is driven by science rather than the vagaries and complexities of international politics. Poverty, under development, hunger, disease – none of these battles can be won without a functioning environment. It is clear that humankind has not risen to the immense challenge of preventing dangerous climate change and ensuring global sustainability. Since Durban was not able to produce any meaningful global transformation, the world will now turn its attention to Doha for COP 18/CMP8 in the hope that this will yield something more significant.

[11] COP17/CMP7 Outcomes 2011/2012, EPCPD.

TABLE 7. SUMMARY OF THE STATE OF BIODIVERSITY INDICATORS

Shortlisted indicators	2008 / 2009	2009 / 2010	2010 / 2011	2011 / 2012	Additional information/comment
1. Total area of D'MOSS	74 703 ha	74 711 ha	75 000 ha	75 000 ha	This is D'MOSS that has been adopted and incorporated into Town Planning Schemes.
2. D'MOSS with some form of protection	NUCS: 55.11 ha	NUCS: 67.7 ha	NUCS: 171.7 ha	NUCS: 185.96 ha	This value represents a running total.
	Land acquisition: 4.33 ha	Land acquisition: 18.08 ha	Land acquisition: 45.05 ha	Land acquisition: 2.35 ha	Ptn 4 of Erf 1394 New Germany Ptn 1 of Erf 1256 New Germany
	Nature reserves proclaimed in 2008 / 2009: nil	Nature reserves proclaimed in 2009 / 2010: nil	Nature reserves proclaimed in 2010 / 2011: nil	Nature reserves proclaimed in 2011 / 2012: nil	The survey diagrams for the Roosefontein Nature Reserve are currently being prepared.
3. Percentage of D'MOSS that is managed	Data not available	Managed: 8.4% Zoned (not managed): 2.5% None: 89.1%	Managed: 12% Zoned (not managed): 2.0% None: 86%	Managed: 12% Zoned (not managed): 2.0% None: 86%	In 2011 / 2012, the Environmental Planning and Climate Protection Department (EPCPD) underwent several staff changes and as a result, certain datasets have not been adequately updated. The Department is currently revising data management systems to improve our ability to monitor and evaluate biodiversity in Durban on a continuous basis.
4. Patterns in abundance of certain species of fauna/flora	General decrease in waterbird and chameleon species abundance.	General decrease in waterbird and chameleon species abundance	General decrease in waterbird and chameleon species abundance	Waterbird data for Durban will be collated in 2012 / 2013. A decrease in Dwarf Chameleon abundance was noted	Due to the alarming decline of Dwarf Chameleons at the monitored sites, a meeting was convened with the relevant parties, the outcomes of which was the development of a management plan for the sites.
5. How much land has been transformed	112827.65 ha	112827.65 ha	122685.7 ha	122685.7 ha	53% of the eThekwini Municipal area. The EPCPD are currently revising data management systems to improve the ability to monitor and evaluate changes to the land class layer.
6. Invasive alien species and climate change	Budget (EPCPD): R3.24m for invasive alien clearing	Budget (EPCPD): R4.57m for invasive alien clearing	Budget (EPCPD): R6.33m for invasive alien clearing	Budget (EPCPD): R9,23m for invasive alien clearing Total area cleared: 1791.5 ha (initial and follow up) 98.4 ha of grasslands burnt Total jobs created: 365	
	Natural Resources Division (NRD) budget for IAS control: R1.15 million Total trees planted: 2543	Natural Resources Division (NRD) budget for IAS control: R1.17 million Total trees planted: 2654	Natural Resources Division (NRD) budget for IAS control: R1.66 million Total trees planted: 1999	No data available for the Natural Resources Division of the Parks, Leisure and Cemetries Department	Reporting is under development.
7. Reforestation	Data not available	Data not available	Data not available	Buffelsdraai: 100 ha (119 878 trees planted) 24 permanent jobs created Inanda: 16 ha (5 817 trees planted) 25 permanent jobs created	

This is the eThekwini Municipality's fourth State of Biodiversity Indicators report. The next report will be for the 2012 / 2013 municipal financial year and produced in December 2013.

Acknowledgements

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