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4.6 COASTAL VEGETATION

Dr Debbie Jewitt (Ezemvelo KZN Wildlife)

INTRODUCTION

The biome called the Indian Ocean Coastal Belt (IOCB) (Mucina and Rutherford 2006) is a rich vegetation with distinctive climatic, ecological and biogeographical features. It represents the southernmost extent of coastal subtropical forests, thickets, hygrophilous grasslands and bush clumps of the wet, tropical and subtropical seaboard of East Africa (Figure 4.10a) and consists of the following vegetation types (Figure 4.10b):

1. KZN Coastal Belt Grassland
2. Maputaland Coastal Belt
3. Maputaland Wooded Grassland
4. Pondoland-Ugu Sandstone Coastal Sourveld
5. Subtropical Dune Thicket and
6. Subtropical Seashore Vegetation

Part of the KZN Coastal Belt Thornveld occurs in the Mucina and Rutherford (2006) biome boundary; however, the provincial vegetation map classes this vegetation type as savanna. Interspersed in this biome are a myriad of wetlands, estuaries and forest patches. The area forms part of the Maputaland-Pondoland-Albany biodiversity hotspot.

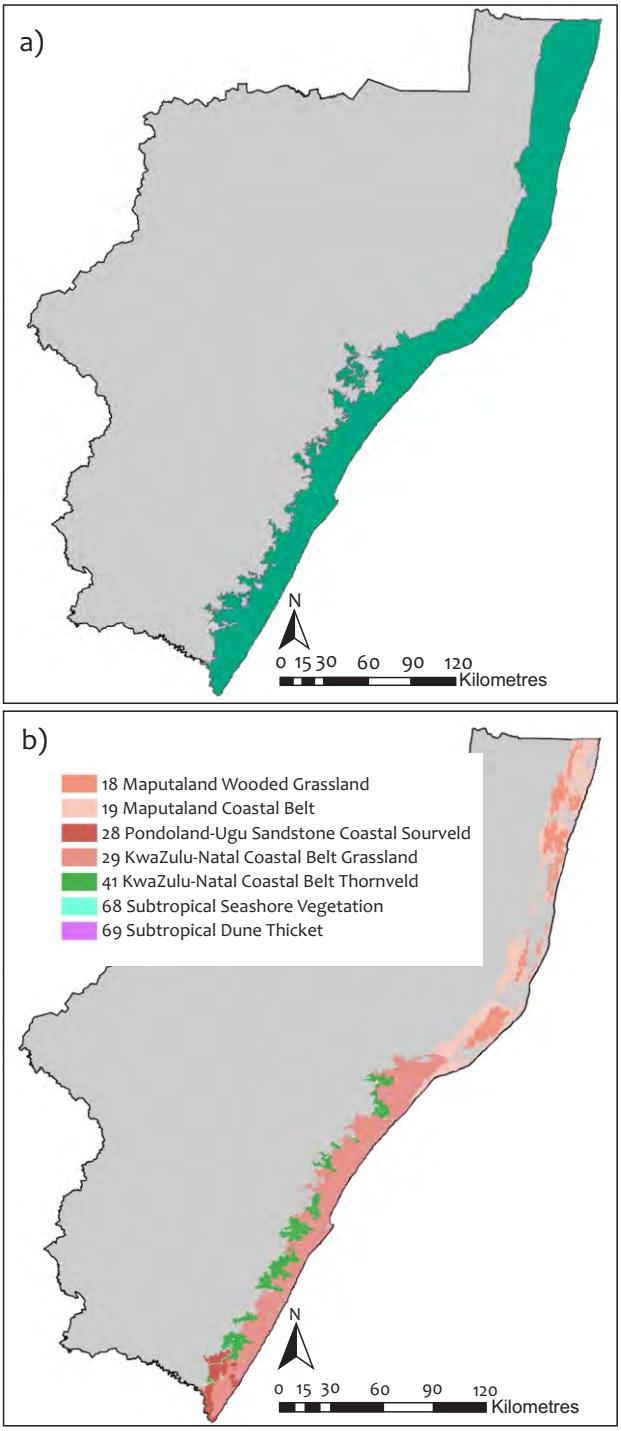

Figure 4.10: a) The boundary of the Indian Ocean Coastal Belt (Mucina and Rutherford 2006) and b) the major vegetation types excluding forests, wetlands and estuaries (EKZNW 2011).

Various local and international legislation and conventions require the monitoring and reporting of the environment. The National Environmental Management: Biodiversity Act (10 of 2004) and the National List of Ecosystems that are Threatened and in Need of Protection (2011)[1] lists threatened ecosystems. The coastal grasslands of KZN are listed as threatened.

South Africa is a signatory to the Convention on Biological Diversity (CBD). Biological diversity underpins ecosystem functioning and the provision of ecosystem services essential for human well-being. It provides for food security, human health, the provision of clean air and water, contributes to local livelihoods, economic development and is essential for the achievement of the Millennium Development Goals, including poverty reduction. Strategic goals have been set, known as the Aichi Biodiversity Targets. Target 5 requires that the rate of loss of all natural habitats is at least halved or brought close to zero by 2020.

Measuring the loss of habitat in the coastal environment is a good indicator of the amount of habitat remaining and the rate of loss of natural habitat. This can inform the achievement of the various goals, provide a threat status and indicate the level of sustainability and resilience achieved.

DRIVERS

Habitat loss and land cover change are currently the leading cause of biodiversity loss worldwide (Jetz *et al.* 2007, MEA 2005, Vitousek 1994). In KZN, 7.6% of natural habitat was lost to anthropogenic conversion in only six years (Jewitt *et al.* 2015a). The major drivers of habitat loss are agriculture, timber plantations, the built environment, dams and mines. The main drivers of landcover change are human responses to economic opportunities which are mediated by institutional factors (Lambin *et al*. 2001). Markets and policies constrain or encourage land-use change. It is essential that decision and policy-makers are cognisant of the full implications that decisions and policy development may have on the rate of habitat loss. It is critical that a longer-term decision and planning framework, that is cognisant of constitutional and international agreements, be adopted.

Greenhouse gas emissions and land conversions are some of the leading causes of anthropogenic climate change, and increasingly has a marked influence on species distributions, phenology and ecosystem composition (Jewitt *et al*. 2015b). Climate change is expected to become the next greatest driver of biodiversity loss.

PRESSURES

The coastal area is very densely populated and is also a popular holiday destination. It is suitable for agricultural production, particularly sugarcane, bananas, cashew and macadamia nuts production and timber plantations. The dunes in the north are mined for titanium, ilmenite, rutile and zircon.

Dune vegetation
Photo: Kierran Allen

[1] *The new threatened ecosystems are out for public comment and are likely to be gazetted following this publication.*

The coastal zone is an important interface between the terrestrial and marine environment. Pollution from the terrestrial environment may be carried to the marine environment via the many rivers entering the Indian Ocean. The estuaries and mangroves are important nurseries for fish, whilst the mangroves and coastal vegetation protect against rising sea-levels and wave damage from storm surges.

STATE

Historic perspective

Historically the area would have been continuous natural vegetation, interspersed with wetlands, grasslands, forests, estuaries and rivers. It would have supported a full complement of biodiversity and ecosystem services. Due to the suitable climatic conditions and arable soils however, the area is highly suited to human settlement and agriculture, leading to massive losses of natural habitat. Remaining portions of natural habitat, outside of Protected Areas, are largely fragmented and small.

Current state

Over time the IOCB has been highly transformed by anthropogenic activities (Table 4.2, Figure 4.11), causing the KZN Coastal Belt Grassland and the Pondoland-Ugu Sandstone Coastal Sourveld to become Critically Endangered in the province. The Maputaland Wooded Grassland and Coastal Belt are Endangered. Only the Subtropical Seashore Vegetation and Dune Thickets are adequately protected in the north, primarily by the iSimangaliso Wetland Park World Heritage Site.

In KZN in 2016, the IOCB had the least remaining natural habitat (24.9%) (Figure 4.12) and the highest annual average rates of habitat loss (2.9%) of the provincial biomes and only 8.2% formally protected (Jewitt 2018). The IOCB requires urgent conservation action. To ensure representivity, each vegetation type should be adequately protected and have the target amount of habitat formally protected. High grazing pressure, unsustainable indigenous resource harvesting as well as alien invasive plants also contribute to the degradation of intact ecosystems and are a major concern for the future.

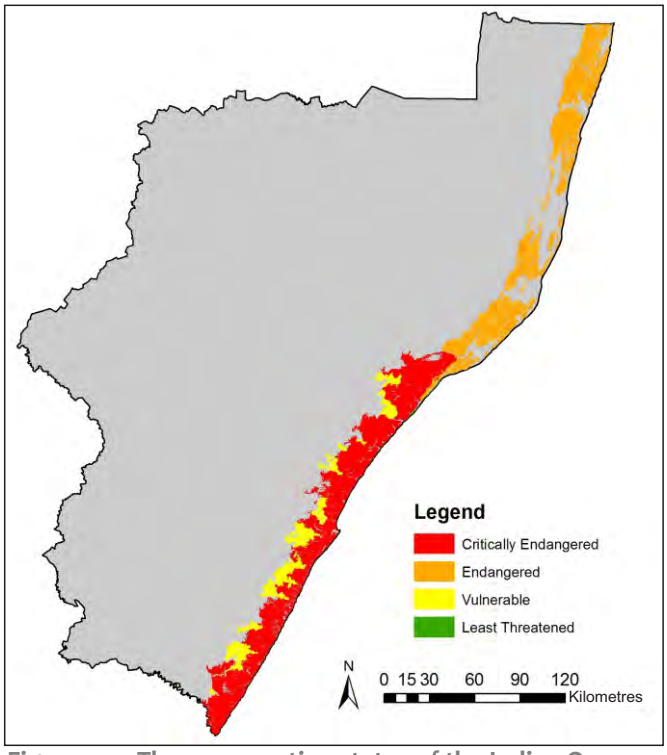

Figure 4.11: The conservation status of the Indian Ocean Coastal Belt vegetation types.

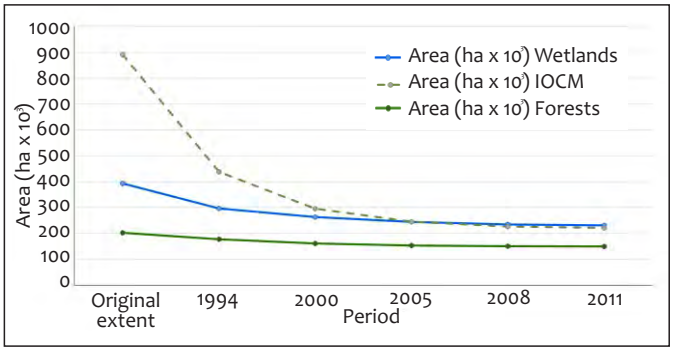

Figure 4.12: The loss of natural habitat over time for the IOCB, Forests and Wetlands in KZN (Jewitt 2018).

Table 4.2: The conservation status, degree of protection and extents of the vegetation types occurring in the IOCB (Jewitt 2020).

KZN VEGETATION TYPE NAME	Conservation target	Provincial area (ha)	Remaining natural habitat (ha)	Conservation status	Degree of protection	Target met by PAs
Maputaland Wooded Grassland	25	1079 29	37 704	Endangered	Moderately Protected	No
Maputaland Coastal Grassland	25	211 194	73 867	Endangered	Moderately Protected	No
Pondolan-Ugu Sandstone Coastal	30	37 245	9 551	Critically Endangered	Poorly Protected	No
KZN Coastal Belt Grassland	25	411 500	55 420	Critically Endangered	Nominally Protected	No
Subtropical Seashore Vegetation	20	52	24	Vulnerable	Fully Protected	Yes
Subtropical Dune Thicket	20	1 245	1 150	Least Threatened	Fully Protected	Yes
KZN Coastal Belt Thornveld	25	111 926	53 657	Vulnerable	Nominally Protected	No

Climate change impacts are substantial in the province: by 2050, an average increase of between 1.5°C and 2.1°C can be expected (Lewis 2011). A generally drying trend is expected by 2050 (Jewitt *et al*. 2015b), although the models are not consistent in their predictions of precipitation responses. Models of environmental domain changes demonstrate a southward latitudinal movement and a westward altitudinal movement (Figure 4.13). The ability of species to track changing environmental domains will be hampered by habitat loss and landcover change, exemplified in fragmented coastal grasslands.

IMPACT

Habitat loss has large, consistently negative effects on biodiversity including loss of species richness, decreased population abundance and distribution, loss of genetic diversity, altered population growth rates, reduced trophic chain length (upper trophic levels are lost first), altered species interactions, reduced number of specialist, large-bodied species, negative breeding success, limited dispersal success, altered predation rates and altered animal behaviour that affects foraging success rate (Fahrig 2003).

Habitat loss and transformation may lead to fragmentation which causes numerous small patches. Species that are unable to cross the non-habitat portion of the landscape (matrix) will be confined to small patches, ultimately reducing the overall population size and probability of persistence. These patches contain more edge for a given amount of habitat which may increase overall mortality rate and reduce the overall reproductive rate of the population. This indicator is therefore a surrogate for the many other elements of biodiversity and ecosystem goods and services (Jewitt 2020).

Pathogen emergence is linked to anthropogenic land conversion (Faust *et al*. 2018). Close to a third of the zoonotic diseases (transmissions from animals to humans) that emerge are linked to large scale land-use change (Padma 2020) with severe negative consequences for conservation, public health and economic prosperity.

Loss of habitat and a fragmented landscape will negatively impact the ability of species to respond to climate change impacts. Ecosystems will need to shift temporally and spatially. The interaction and cumulative impacts of multiple global threats will lead to mass extinctions, a loss of human well-being and a decrease in the provision of free ecosystem services.

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RESPONSE

A target of 50% natural habitat remaining in each vegetation type should be adopted. This will allow for an acceptable level of human livelihoods and simultaneously protect biodiversity and ecosystem service targets.

1. The CBD targets should be implemented, particularly Target 5 (by 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation significantly reduced). This will require extensive governmental interaction across all sectors and stakeholders.
2. Protected Area expansion should occur in vegetation types that are not adequately protected, either by formal state protection or by well-funded Stewardship mechanisms, with skilled human resources.
3. The securing of agreements with the KZN Department of Agriculture and Rural Development and other government departments, that further transformation of highly threatened ecosystems must not be supported.
4. A high-level awareness campaign focussing on human population growth and engagement with provincial and national government to develop plans to curtail human population growth rates.
5. New business and financial models need to be developed that consider biodiversity and fully account for the environment, including the resulting degradation and pollution.

Data Requirements
To report on the amount of natural habitat remaining, the rate of loss and the threat status of the Indian Ocean Coastal Belt biome, the following data are required:

- The KZN provincial vegetation map (EKZNW, 2011).
- The KZN provincial boundary map (EKZNW, 2010).
- A series of landcover data – either the provincial or the national datasets could be used, or a combination thereof. Caution must be applied to the choice of landcover dataset used as some have considerable errors associated with them. The transformation occurring in the landscape needs to be accumulated over time to identify the best remaining natural habitat and to exclude secondary grasslands which have a reduced biodiversity compliment (Jewitt *et al.*, 2015a). In this analysis a combination of the following landcover datasets were used: 1990, 1994, 2005, 2008, 2011 and 2017.
- Latest climate change data will indicate possible future threats to the environment which will allow for proactive planning (Jewitt *et al.*, 2015b). Similarly, the latest protected area coverages will indicate how well the biome is protected.

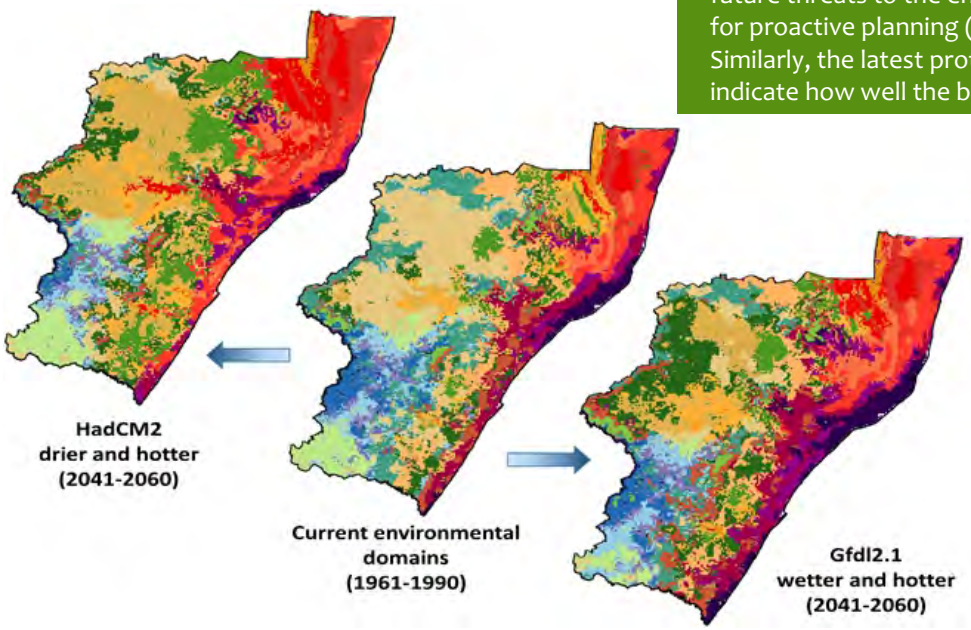

Figure 4.13: Projected climate change impacts on environmental domains in KZN by 2050 (Jewitt *et al.* 2015b).