Chapter 3: Namibia and its Environment

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1 Introduction

Namibia's surface area is 824,268 km^2 with three major categories of land tenure: the so-called commercial farmland with freehold tenure (approximately 42% of the country situated predominantly in the south and centre of Namibia), communal areas which are situated mainly in contiguous blocks in the northern Namibia (approximately 35% of the country), and the state land including conservation areas (approximately 23% of the country).[1]

Namibia has common borders with Angola, Zambia, Zimbabwe, Botswana and South Africa and a coastline of 1,572 km at the Atlantic Ocean to its west. The Ocean with its cold, nutrient rich Benguela Current has a significant influence on Namibia's climate, vegetation and marine life. Main geographical areas in Namibia include two of the largest and most important great deserts, namely the Kalahari Desert in the east, which is dominated by stabilised dunes and the Namib Desert in the west, which comprises a wide range of landscape types. The Central Plateau with its Great Escarpment lying in the inland of the Namib plains and rising up above them is the third great landscape unit in Namibia.[2]

Namibia is one of the driest countries in sub-Saharan Africa with a mean annual rainfall of approximately 270 mm with wide regional and seasonal variation. This is reflected in the country's rivers. Most of the rivers that rise in Namibia such as the Kuiseb are dry for most of the year, they are ephemeral and seasonal. The perennial rivers in Namibia are located on the northern and southern borders and gain their flow in Zambia and Angola and in South Africa respectively. Only three perennial rivers reach the sea, namely the Orange, the Zambezi and the Kunene rivers, while the Okavango and the Kwanda flow into the the Okavango Delta and the Linyanti Swamps in the North of Botswana. Major parts of Namibia are thus predominantly dependent upon ephemeral rivers and groundwater.[3] According to figures from the United Nations[4] and based on the definition on arable land by the Food and Agriculture Organization (FAO)[5] only 2% of Namibia's land surface was arable in 2018.

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1 NSA (2018).
2 See Goudie / Viles (2015:3ff.); see also Mendelsohn *et al*. (2009).
3 See Goudie / Viles (2015:12ff.) and Sweet / Burke (2006).
4 See https://unstats.un.org/unsd/envstats/snapshots/, accessed 19 March 2021.
5 According to which arable land includes land defined by the FAO as land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land

Against the backdrop of variation in climate and aridity in the country, it is explainable that the vegetation cover in Namibia is generally low. The main groups of soils in the country are unconsolidated sand (arenosols) and shallow and weakly developed soils on bedrock (lithosols, xerosols, regosols and yermosols).[6] Owing to very low contents of clay in the soil, the water holding capacity is generally very low. Nonetheless, Namibia has a broad variety of vegetation types including deserts, savannahs (dwarf shrub savannah, various acacia-based tree and shrub savannah associations and the mopane savannah) and dry woodlands. Moreover, Namibia has an abundant dense and diverse mammalian fauna.

The *United Nations Statistics Division* in its *Environment Statistics Country Snapshot Namibia*[7] provides data about the environment for comparative purposes. The country snapshot of Namibia, *inter alia*, reflects the following data:[8]

Land and Agriculture		
Total area (km^2)	823,290	2018
Agricultural land (km^2)	388,100	2018
Arable land (% of agric. land)	2.0	2018
Permanent crops (% of agric. land)	0.0	2018
Permanent pasture and meadows (% of agric. land)	98.0	2018
Change in agricultural land area since 1990 (%)	0.0	2018
Forest area (km^2)	67,809	2018
Change in forest since 1990 (%)	-23	2018
Population		
Population (1,000)	2,495	2019
Population growth rate from previous year (%)	2.0	2019
Air and climate		
Emissions of:		Year
CO_2 (million tonnes)	4.0	2009
CO_2 per capita (million tonnes)	1.8	2016
GHG (million tonnes CO_2 eq.)	9.0	2000
GHG per capita (tonnes CO_2 eq.)	5.0	2000
Ozone depleting CFCs (ODP tonnes)	0.0	2009

under market or kitchen gardens, and land temporarily fallow (land abandoned as a result of shifting cultivation is excluded).

6 Sweet / Burke (2006).

7 Available at https://unstats.un.org/unsd/envstats/snapshots/, accessed 19 March 2021.

8 Unless mentioned otherwise, data in this table is sourced from https://unstats.un.org/unsd/envstats/snapshots/, accessed 19 March 2021.

Biodiversity		Year
Proportion of terrestrial marine areas protected (%)	23	2018
Number of threatened species	120	2019
Fish catch (tonnes)	510,568	2018
Energy		
Total energy supply (petajoules)	82	2017
Energy supply per capita (gigajoules)	32	2017
Electric power consumption (kWh per capita)[9]	1,586	2010
Energy use intensity (megajoules per USD constant 2011 PPP GDP)	62	2017
Renewable electricity production (%)	96	2017
Water and Sanitation		Year
Renewable internal freshwater resources, total (billion cubic meters)[10]	6	2017
Annual freshwater withdrawals, total (billion cubic meters)[11]	0.3	2017
Annual freshwater withdrawals, total (% of internal resources)	5	2017
Proportion of population using an improved sanitation Facility[12]	47	2017
Population with access to improved drinking water source (%)[13]	90	2017

2 Major Environmental Concerns in Namibia

To quite some extent, Namibia faces environmental problems that are similar to those experienced in many parts of Africa; some of the most challenging issues will be pointed out broadly in the subsequent paragraphs in order to give an overview of the importance of taking legal and non-legal measures for environmental conservation.

9 https://databank.worldbank.org/views/reports/reportwidget.aspx?Report_Name=CountryProfile&Id=b450fd57&tbar=y&dd=y&inf=n&zm=n&country=NAM, accessed 21 March 2021.
10 https://data.worldbank.org/indicator/ER.H2O.INTR.K3?locations=NA, accessed 21 March 2021.
11 https://data.worldbank.org/indicator/ER.H2O.FWTL.K3?locations=NA&view=chart, accessed 21 March 2021.
12 https://www.sdg6data.org/country-or-area/namibia#anchor_6.2.1a, accessed 21 March 2021.
13 Ibid.

2.1 Land Degradation and Soil Erosion

Land degradation in Namibia, like elsewhere in the world occurs in different forms and the effects and causes of land degradation are manifold.[14] It is, *inter alia,* caused by climatic variations, especially the high variability of rainfall patterns, and human activities. According to the Namibia Household Income and Expenditure Survey 2015/2016,[15] 22% of Namibian households in rural areas depend on subsistence farming as the main source of income as compared to only 1% of urban households. A total of 10.6% of the entire population thus reported subsistence farming as their main source of income. This figure has decreased from 38% in 1993/1994; 29% in 2003/2004; and 23% in 2009/2010. Still, many Namibians depend – directly or indirectly – more on farming than on any other economic activity.[16] Despite the fact that the whole agriculture and forestry sector, which includes hunting, and fishing, as well as cultivation of crops and livestock production, only made up 6.6% of GDP in 2019,[17] most of the land in Namibia is used for agricultural purposes[18] and in 2019, 21.9% of total employment in Namibia was in the agricultural sector.[19] Agriculture therefore plays a vital role for the livelyhoods in the country.

Overstocking and overgrazing are considered to be the main causes for land degradation in Namibia. Especially in rural areas, poverty forces people into unsustainable environmental management practices such as overstocking and overgrazing in order to ensure food supply. More often than not, the densities of livestock exceed the carrying capacity of the land, which places strain on the environment. Further negative effects on land are caused by the unsustainable harvesting of forest resources, wild plants and game, and the clearing of land for farming or housing purposes.[20]

Land degradation not only has negative economic consequences in that it reduces the country's resources; it also poses a serious threat to food security and rural livelihoods, which particularly affects the most vulnerable groups in Namibia's poor and densely populated areas. The most alarming effects of land degradation are deforestation, decreased availability of palatable grass species, soil erosion, bush encroachment and soil salinisation.[21]

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14 Klintenberg / Seely (2004).
15 NSA (2016:13).
16 Iyambo, N, then Minister of Agriculture, Water and Forestry in his foreword to Mendelsohn (2006).
17 As per World Bank Indicator data available at https://databank.worldbank.org/source/world-development-indicators, accessed 25 March 2021.
18 Mendelsohn (2006:10).
19 World Bank Indicator data available at https://databank.worldbank.org/source/world-development-indicators, accessed 25 March 2021.
20 MET (2006:1ff.).
21 Klintenberg / Seely (2004:7).

2.2 Deforestation

Recent figures assessing global forest resources reveal that in the period from 2010 to 2020, Africa had the highest net loss of forest area.[22] Respective figures pertaining to Namibia confirm this assessment. In 2000, more than eight million ha of Namibia was covered by forests. By 2020, the total forest area has decreased to only 6.6 million ha.[23] While in 1990, the forest area was at 10.6% of the total land area, it was at only 8.2 in 2018.[24]

Major threats to forests in Namibia include the expansion of land for agriculture; the cutting of wood for fuel and for domestic use; clearing for infrastructure development; uncontrolled wildfires; selective logging through timber concessions and unlicensed curio carving; and habitat destruction by elephants.[25]

Forest resources are of essential importance as woodlands stabilise fragile soils. Moreover, forest areas are the home of rich biological diversity. But forests also play a vital role from a socio-economic perspective and especially in the rural areas of Namibia, many are directly or indirectly dependent on the availability of forest resources for browsing, building material for homesteads, fuel wood for cooking, light and heating, and medicines among others.

However, the increase of the population unfortunately goes hand in hand with an increase in an unsustainable use of timber for fuel, housing, fencing, fire, and poses a severe strain on the environment as deforestation not only leads to the loss of resources used for human activities; it also results in desertification and severe degradation of land. "In Africa, the continuation of a high rate of deforestation largely reflects the combined impacts of high population growth and the need to sustain livelihoods with small-scale agriculture."[26]

2.3 Water Scarcity

Water is a critical factor and water supply remains a serious problem throughout Namibia, as the country is considered to be one of the most arid countries in southern Africa. 22% of Namibia can be classified as desert, with a mean annual rainfall of less than 100 mm. About 33% of the country is classified as arid, with a mean annual rainfall of between 100 and 300 mm. 37% is classified as semi-arid, with a mean annual rainfall of between 301 and 500 mm, and 8% as sub-tropical, with a mean annual

22 FAO (2020a:125).
23 FAO (2020b:9).
24 See World Bank data at https://data.worldbank.org/indicator/AG.LND.FRST.ZS?locations=NA, accessed 27 March 2021.
25 Cf. FAO (2005).
26 FAO (2020a:125).

rainfall of between 501 and 700 mm.[27] These low rainfall rates, exacerbated by evaporation rates often higher than the precipitation, a high degree of rainfall variation, and variable rainfall distribution patterns are responsible for the fragility of Namibian water resources. It is estimated that of the water that Namibia receives as precipitation, 97% is lost through direct evaporation and evapotranspiration; only 2% ends up as surface runoff, 1% becomes available to recharge groundwater.[28]

The primary sources of water supply in Namibia are perennial rivers, surface and groundwater storage on ephemeral rivers, and groundwater aquifers. Water is needed in terms of basic sustenance and for agriculture. Sustainable water management is, therefore, a major challenge. Major threats to water availability are population pressure, as well as industrial development and growth. The latter two are causing surface and ground water pollution, resulting in a decrease in water availability and quality, harmful to human and animal health. Environmental law can substantially contribute towards reducing these negative effects, e.g. by limiting the use of pesticides, or by preventing the discharge of waste water or other substances harmful to aquatic systems. Sound water management can for example be enforced by a permit system for the abstraction of water in order to avoid the over-abstraction of water.

Environmental law, an integrated water resource management that promotes the coordinated development and management of water, land and related natural resources, as well as increasing public awareness with regard to water problems is needed, in order to tackle the challenge of equitable access to sufficient water of acceptable quality.

2.4 Climate Change

As mentioned earlier, Namibia is considered to be one of the driest countries in southern Africa. The cold Benguela current along the west coast and Namibia's location traversing the subtropical high-pressure belt greatly influences the main features of the climate. The climate of Namibia is characterised by high variability. This in part, contributes to making Namibia vulnerable to the impact of climate change.

In Namibia's initial communication to the United Nations Framework Convention on Climate Change (UNFCCC) in 2002,[29] it is stated that trends in climate change predict that temperature will increase, specifically in central inland areas, rainfall will be variable and the rainy season is predicted to be shorter. Furthermore, an increase of

27 GRN (2020a:28); GRN (1997a:1); for Namibia's main climatic characteristics (rainfall, temperatures, fog, wind, etc.) see also Goudie / Viles (2015:37ff.) and data on Namibia from the Climate Knowledge Portal of the World Bank available at https://climateknowledgeportal.worldbank.org/country/namibia, accessed 28 March 2021.
28 GRN (2020a:28).
29 GRN (2002d).

potential evaporation at a rate about 5% per degree of warming and a sea level rise of up to 30cm was predicted. Namibia's second national communication to the UNFCCC dated 2011 reveals that: [30]

> The projected temperature increases will result in evaporation and evapotranspiration increases in the range of 5-15%, further reducing water resource availability and dam yields. It is predicted that, even without the additional stresses of climate change on the water resources, demand will have surpassed the installed abstraction capacity.

Namibia's Fourth Communication to the UNFCCC predicts with a high degree of certainty that Namibia can expect an increase in temperature at all localities, with the highest increase in the interior. From the baseline (1981 to 2018) at mid-century (2045 to 2069) and end-century (2070-2099) respectively, the north-eastern parts of the country are expected to experience the highest increases in average annual temperature for both time horizons. It is projected that the mean annual temperature will increase by 2°C and 4°C relative to the baseline under the worst-case scenario.[31]

Climate change in Namibia has an impact on access to water and sanitation, health, agriculture, fisheries and marine ecosystems, forestry, energy, and human settlements.[32] A growing body of evidence has demonstrated that poor and other disenfranchised groups are the greatest victims of environmental degradation. In Namibia, the majority of the population live in rural areas, where poverty is a sad reality and remains one of the greatest challenges in the southern African region. The combined impact of climate change is expected to reduce livelihood opportunities even further, to reduce biodiversity and food security; the prevalence of drought and flooding will increase. Predicted impacts associated with temperature increases include a further rise in sea levels, changes in precipitation patterns, and the resultant threat to food security and sustainable development in general, with more people being caught up in the poverty trap. Limited adaptive management puts Namibia's population and its natural resources at risk. Thus, integrating adaption and mitigation strategies into the legal framework is essential. Additionally, access to information, public participation and the development of an educational approach is called for. Finally, interdisciplinary research into the effects of climate change needs to be consolidated.

2.5 Biodiversity Loss

Namibia has a wide variety of biodiversity. With two global biodiversity hotspots (the *Sperrgebiet* in the Succulent Karoo Biome and the Namib escarpment zone), five Ramsar sites of international importance with a surface area of 676,564 hectares (Orange River Mouth, Bwabwata-Okavango Ramsar Site, Walvis Bay, Etosha Pan, Sandwich

30 GRN (2011a:6).
31 GRN (2020a:138).
32 Karuaihe *et al*. (2007:34ff.).

Harbour),[33] large wildlife populations including world's largest populations of cheetah and free-roaming black rhino, some of the greatest populations of marine life found anywhere in the world in nutrition-rich waters along the coastline, and an exceptional level of plant diversity, of which many plants are endemic, Namibia's biodiversity is a real treasure.[34]

However, the precious biodiversity is confronted with various threats and challenges, including population growth, unsustainable water uses, land degradation and desertification, pollution, climate change, uncontrolled mining and prospecting, poaching and hunting, and human-wildlife conflict. Despite the range of measures that have been put in place to protect Namibia's biodiversity, such as the establishment of conservancies, an elaborated system of environmental management and the development of respective law, policy and strategy, much still has to be done to avoid further (habitat) loss of biodiversity. A total of 132 species have been classified as threatened by the International Union for Conservation of Nature (IUCN);[35] the expansion of mining and prospecting, uncontrolled bushfires, illegal harvesting and trade in wildlife are only some of the aspects that lead to species loss, ecosystem simplification and habitat loss. Therefore, all efforts must be taken to enhance biodiversity conservation.

Considering that "Namibia's unique landscapes and biodiversity support a rapidly developing tourism sector, its contribution estimated for 2016 at N$ 16.7 billion, equivalent to 10.5% of overall GDP and 101,000 jobs equivalent to 14.9% of total employment",[36] the conservation of biodiversity is high on the agenda of government and national and international organisations. Rightly so, as Namibia's biodiversity plays a vital role in the agricultural, fisheries and tourism sectors. The population depends on the natural resource base for their income, food, medicinal needs, and fuel and shelter, among others.

2.6 Waste and Pollution

Namibia in general and Windhoek in particular, are considered to be clean, if compared to many other parts and capital cities in Africa. Yet, growth in development and in population brings about an increase in pollution and waste. More people produce more waste, and economic development inevitably has negative effects on our environment: ground water and air pollution, more generally the toxic contamination of soils, etc.

33 See https://rsis.ramsar.org, accessed 30 March 2021.
34 See https://www.cbd.int/countries/profile/?country=na#facts, accessed 30 March 2021.
35 See the IUCN Red List Table 5 showing the number of threatened species in each major taxonomic group by country in Sub-Saharan Africa available at https://bit.ly/3dGr2s5, accessed 30 March 2021.
36 GRN (2020a:2).

Therefore, waste management and pollution control are essential in terms of environmental protection.

Since 1990, the industrial production has significantly increased in Namibia with an attendant real potential to pollute the environment: the food industry, meat processing and mining all are potential sources of pollution.[37] Carbon dioxide emissions are on the increase due to increasing motorisation, and the amount of household waste is rising too. Household waste accounts for a significant amount of waste produced in all the urban and rural areas of Namibia.[38] Waste mitigation and the management of waste will play a vital role in future, not only with regard to a clean and healthy environment in general but also with a view to efforts aiming to reduce CO_2 emissions.[39]

37 MET (2006:70).
38 Ibid:87.
39 GRN (2020a:204).