Namibia Statistics Agency

ENVIRONMENTAL STATISTICS COMPENDIUM

for Namibia

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ENVIRONMENTAL STATISTICS COMPENDIUM

FOR

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Environmental Statistics Compendium for Namibia: 2020

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Acronyms and Abbreviations

FDES	:	Framework for the Development of Environment Statistics
GHG	:	Green House Gas
EEZ	:	Exclusive Economic Zone
IPPU	:	Industrial Processes and Products
NSA	:	Namibia Statistics Agency
MET	:	Ministry of Environment and Tourism
TAC	:	Total Allowable Catch
SEEA	:	System of Environmental-Economic Accounting

Preface

This is Namibia's first comprehensive environmental statistics compendium. A compendium is a collection of information in which a brief summary on a certain topic is given. In the case of Namibia, this compendium is accompanied by a National Action Plan, that describes Namibia's roadmap to strengthening and developing environmental statistics in line with the methodology, planning and adaption of the Core Set of Environment Statistics of the FDES, the Framework for the Development of Environment Statistics of the United Nations Statistics Division, into the Namibian National Statistical System framework. The Core Set of Environment Statistics of the FDES 2013 identifies those statistics of high-priority and relevance to most countries and have a sound methodological framework. The statistics selected from the Core Set presented in this compendium contains the most important environment statistics to describe environmental topics, thus providing guidance to environmental programs and policies.

In this publication, data is compiled from existing sources of the Namibia Statistics Agency (NSA), administrative sources and ~~data~~ from both government and non-government entities. Data gaps still exist since it was not possible to collect all the data needed. The NSA gratefully acknowledges the support of all the experts and stakeholders who were committed to provide the statistical data and information included in this publication.

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Environmental Statistics Compendium for Namibia: 2020

Introduction

The ongoing environmental challenges faced by modern societies, such as population pressure, energy issues, sustainable development and climate change has increased the demand for environment statistics. The environment is ever more present in public policies and development plans.

The realization that human wellbeing and development depends on the environment has led to an increasing emphasis on environmental and sustainability concerns. Of paramount importance to these actions is the regular production of environment statistics of the highest quality. These statistics portray key information about the state of the environment and its changes through time.

Furthermore, they give information to policy-makers, organizations and the public, and can be used as input and support for fact-based decision-making. As in other developing countries, environment statistics represent a new and emerging domain which is typically endowed with limited (technical, financial and human) resources and is challenged by an institutional setup and inter-institutional coordination that are still in development.

This Compendium is based on the structure of the Framework for the Development of Environment Statistics (FDES 2013) developed by the United Nations Statistics Division (UNSD). The FDES 2013 is a flexible, multi-purpose conceptual and statistical framework that is comprehensive and integrative in nature. It marks out the scope of environment statistics and provides an organizing structure to guide their collection and compilation and to synthesize data from various subject areas and sources, covering the issues and aspects of the environment that are relevant for analysis, policy and decision making.

The components and sub-components of the FDES 2013 are presented below:

The Compendium is structured in 7 sections following the components of the FDES 2013, with tourism added to the FDES 2013 components to reflect its importance to Namibia:

1. Environmental conditions and quality
2. Environmental resources and their use
3. Residuals and waste
4. Extreme events and disasters
5. Human settlements and environmental health
6. Environmental protection, management and engagement
7. Tourism

1. ENVIRONMENTAL CONDITIONS AND QUALITY

Component 1 of the FDES 2013 includes statistics from the Core Set of Environment Statistics covering meteorological, geographical, biological as well as physical and chemical characteristics of the environment and their change over time. Many of these natural conditions change very slowly as a result of natural processes of Earth's atmosphere or human influence. On the other hand, other natural conditions can show immediate and dramatic effects. Importantly, changes in environmental conditions and quality are the result of combined and accumulated impacts of natural and human processes and activities.

1.1 Geological, geographical and geomorphological conditions

(i) Area of country

The Republic of Namibia is located in south-western Africa and covers a land area of 825,418 km^2, with a 1,500 km long coastline stretching along the South Atlantic Ocean (MET, 2011a). It has a population of 2.3 million according to the 2016 Namibia Inter-censal Demographic survey.

Figure 1: The map of Namibia

Source: https://geology.com/world/namibia-satellite-image.shtml

(ii) Main geomorphological characteristics

The Namibian landscape consists generally of five geographical areas, each with characteristic abiotic conditions and vegetation with some variation within and overlap between them: the Central Plateau, the Namib Desert, the Escarpment, the Bushveld, and the Kalahari Desert. Although the climate is generally extremely dry, there are a few exceptions. The cold, north-flowing Benguela current accounts for some of the low precipitation.

1.2. Temperature

Namibia is characterized by high temperatures. Most of the country receives an annual average of more than nine hours of sunlight per day.

Precipitation

Precipitation forms as water vapor condenses, usually in rising air that expands and therefore cools. The upward motion comes from air rising over mountains, warm air riding over cooler air (warm front), colder air pushing under warmer air (cold front), convection from local heating of the surface, and other weather and cloud systems.

Namibia is characterized by a complex earth-atmospheric interactions system of high temperature, low relative humidity, high evaporation, and evapo-transpiration inland; low precipitation, low temperatures, and moist air at the Atlantic coast (Namib Desert); high temperatures and frequent floods in the north-east; and high temperatures and alternating floods and droughts in the central-north.

Of all precipitation received annually in Namibia, about 83% evaporates, 14% is consumed by vegetation, 2% becomes runoff, and 1% recharges groundwater. Due to shortages in surface water, the country relies heavily on groundwater reserves, which are subject to low recharge rates from rainfall and periodic ephemeral floods.

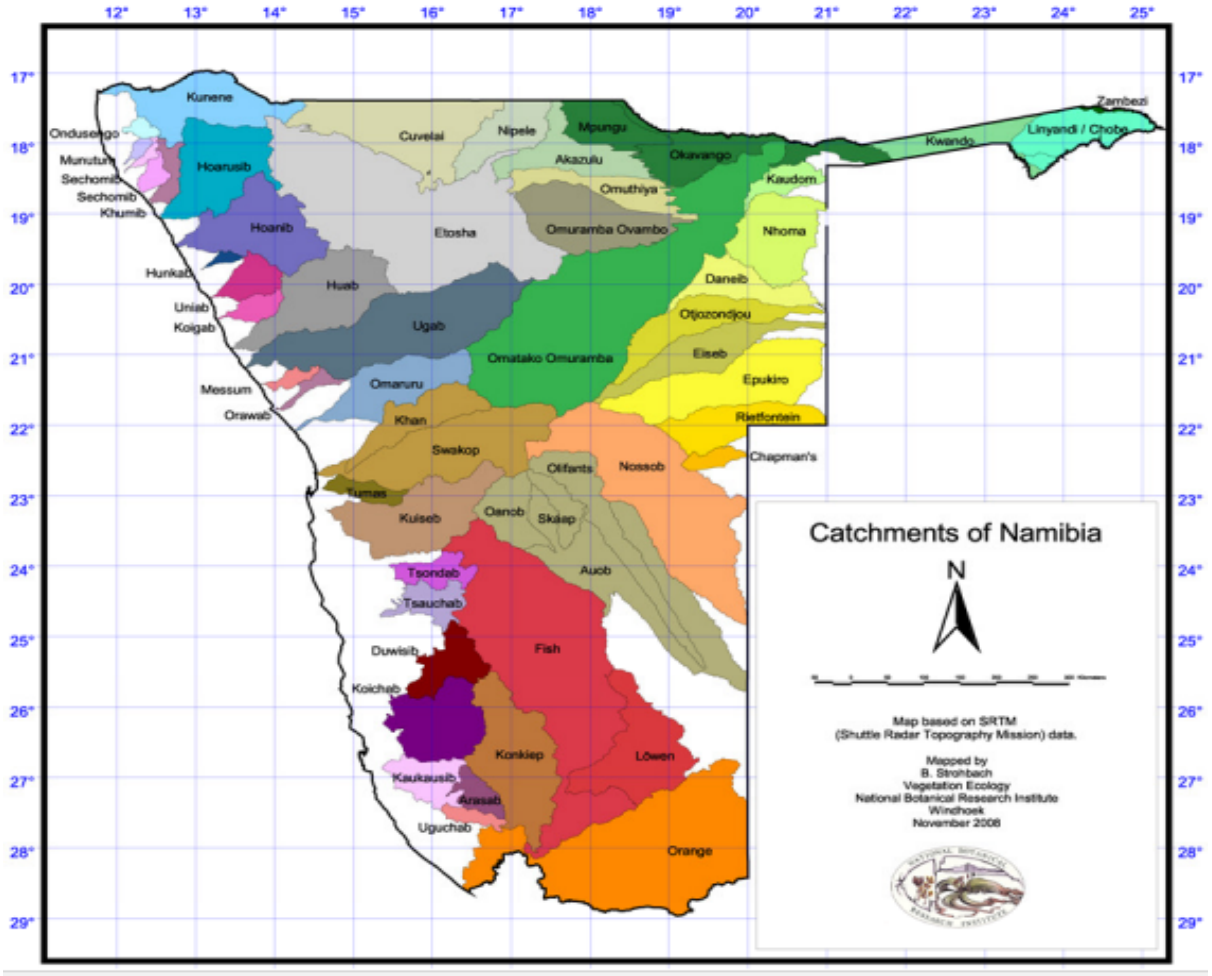
1.3 Rivers, catchment areas and aquifers

(i) Rivers

Perennial rivers are found only on the country's borders; such rivers are the Orange River on the southern border and the Kunene, Okavango, Kwando and Zambesi Rivers on the northern border. In the south the Fish River Canyon is one of the wonders of Africa. The 161 km long, 27 km wide ravine with a maximum depth of 550m is surrounded by high, forbidding cliffs, and is gashed into the plateau with startling

abruptness. The awesome grandeur of the canyon is surpassed only by the Grand Canyon in the United States of America.

Figure 2: Map of major catchment of Namibia



Source: Atmospheric Conditions and Precipitation in Arid Environments: A Case of Namibia, Nnenesi A. Kgabi, Martha Uugwanga, Johanna Ithindi

1.4 Biodiversity

1.4.1 Namibia's Biological Diversity

Namibia's biodiversity is shaped by a diverse range of factors including climate, topography, geology and human influences. As the most arid country south of the Sahara, lack of rainfall and the high variability of

rainfall are perhaps the leading influences on biodiversity. Namibia is characterized by a steep south-west to north-east rainfall gradient. Annual rainfall can be as low as 10mm in the south-west and west, while it averages around 600mm in the north-eastern areas.

A reverse gradient exists in terms of seasonal and daily temperature variations, which are low in the north and north-east and high in the west and south-west. As a result, the greatest overall terrestrial species diversity is found in the more tropical areas of north-eastern Namibia, while areas of high endemism are mainly concentrated in the arid and semi-arid west, central and southern parts of the country.

1.4.1 Diversity of Ecosystems

Namibia is classified into four terrestrial biomes (Desert; Nama and Succulent Karoo; Acacia Savanna; and Broad-leafed Savanna), and two aquatic biomes (Coastal Marine; and Wetlands). Each biome is affected to different extents by land uses such as rangeland farming, agriculture, wildlife production, tourism and recreation, mining and urban development. Namibia's variable environmental conditions have also shaped a large diversity of vegetation zones, which have been divided into 29 units. In general, palaeotropical floral elements are found in the north, cold-temperate elements in the south, and transitional elements between the two. The vegetation zones and biomes are shown in detail in Table 5 below.

Table 5: Brief description of Namibia's biomes.

Terrestrial Biomes in Namibia	
(i) Desert Biome	**(ii) Karoo Biome**
▪ Low rainfall (less than 100mm annually), and lack of surface water ▪ Sparse vegetation dominated by annual grasses and dwarf shrubs ▪ Large habitat diversity including mountains, gravel plains, sandy seas and succulent steppe winter rainfall regions ▪ Coastal fog plays a vital role in supporting many plants and animals ▪ Ephemeral rivers cut across the biome providing linear oases where large trees and water sources support many of the larger mammals and animals	▪ Annual rainfall is 100-200mm ▪ Vegetation dominated by dwarf shrubs or "Karoo bushes" and annual grass species ▪ Harsh climate with large seasonal and daily temperature variations ▪ The fauna in this biome is species poor but supported vast herds of springbok in the past, which were subsequently reduced by hunting and fencing ▪ Sensitive to over-grazing and degradation which can lead to desertification

▪ Systems within this biome are extremely sensitive and fragile and prone to long-term degradation with long recovery periods	
(iii) Acacia Savanna ▪ Annual rainfall of 250-400mm ▪ Dominated and characterized by a wide variety of grass species and acacia species such as camelthorn and blackthorn ▪ Supports a high concentration of various species which are endemic to the region, and supports large plains game including herd animals and predators ▪ Contains the headwaters and catchments of most ephemeral rivers in Namibia ▪ Vulnerable to inappropriate management and over-use resulting in desertification and bush encroachment	**(iv) Broad-leafed Savanna** ▪ Annual rainfall of 450-700mm ▪ High species diversity, especially at the interface with the wetland biome ▪ Deciduous tree species are characteristic including Zambezi teak, mopane and wild seringa ▪ High numbers of large mammals are present including 70% of Namibia's elephant population and the majority of the buffalo and hippopotamus populations ▪ Important to transboundary cooperation as ecosystems are shared and species move across national boundaries ▪ Forest fires are a common occurrence in this biome
Aquatic Biomes in Namibia	
(v) Wetlands ▪ Multiple habitats including perennial rivers, ephemeral rivers, floodplains, pans, sinkholes, estuaries, swamps, marshes, springs and dams ▪ Typically, highly productive systems which provide important sources of freshwater and vegetation • Interact with all other biomes ▪ Important to the hydrology of areas through services such as the recharging of aquifers ▪ Provide important sites for breeding and refuge of wildlife ▪ Vulnerable to over-abstraction of water, alien species and pollution	**(vi) Coastal/Marine** ▪ Characterized by the cold Benguela current which produces a nutrient-rich upwelling system ▪ Highly productive system which supports some of the highest concentrations of marine life in the world ▪ Multiple habitats including the littoral, shelf and abyssal zones, islands, lagoons and estuaries

Source: The Role of Participatory Processes in the Revision of the National Biodiversity Strategies and Action Plans: The Case of Namibia

1.5.1. Species Diversity

As an arid country, Namibia has a relatively low number of species compared to countries with wetter climates. However, it possesses a high level of endemism, with approximately 20% of described species

classified as endemic. Endemism is particularly high in plants, invertebrates, reptiles and frogs in Namibia while it is relatively low for mammals, birds and fish (see Table 1 below).

Table 1: Number of described species in Namibia and levels of endemism[1]

Taxonomic Groups	Number Of Described Species In Namibia	% Of Species Endemic To Namibia
Reptiles	254	28
Insects	6,421	24
Plants	4,334	17
Amphibians	50	12
Arachnids	618	11
Fish	114	8
Mammals	229	7
Birds	676	2

Source: Namibia's Second National Biodiversity Strategy and Action Plan 2013 - 2022

1.5 Protected species and areas

Namibia has a proud record of biodiversity conservation. Since Independence in 1990, the Government has become signatory to the Convention on Biological Diversity (CBD) and other strategic conventions. The formal Protected Area network has been extended to cover about 17 per cent of the country. With the 59 communal conservancies and other forms of conservation areas, the national Protected Areas (PAs) are the Government's key strategy for safeguarding our biodiversity and heritage.

The national Protected Areas also have another critical role – they are tools for national development. The PAs attract nearly one million tourists annually, thus generating income and employment, and reducing poverty in line with national development policies and Vision 2030. These in turn contribute

[1] (Compiled based on information from Simmons and Brown (in press), NNF (undated), and www.biodiversity.org.na).

directly to achievement of CBD global targets and the Sustainable Development Goals (SDGs) at both national and global levels.

Table 2: A brief summary of Namibia's Protected Areas

NAME	GAZETTED SIZE (KM²)
1. /Ai-/Ais Hot Springs / Huns Mountains	4 611
2. Bwabwata National Park	6 274
3. Cape Cross Seal Reserve	60
4. Daan Viljoen Game Park	40
5. Etosha National Park	22 270 (22 935 including Kaross and Koabendes)
6. Gross-Barmen Hot Springs	1
11. Mudumu National Park	1 010 (737 cutline)
12. Namibnaukluft Park	49 768
13. National West Coast Recreational Area (National Park)	7 800
19. Von Bach Recreation Resort	43
20. Waterberg Plateau Park	405

Source: State of Protected Areas in Namibia A review of progress and challenges 2010

2. ENVIRONMENTAL RESOURCES AND THEIR USE

This section discusses statistics falling under Component 2 of the FDES 2013, that covers the living and non-living constituents of the Earth, which together comprise the environment that may provide benefits to humanity. Environmental resources include non-energy and energy minerals, land, soil resources, biological and water resources.

They can be renewable (e.g. fish or water) or non-renewable (e.g. minerals) and are used as important inputs in production and consumption. This component is closely related to the asset and physical flow account of the SEEA,[2] This is partly due to the fact that statistics on environmental resources and their use are focused on measuring stocks and changes in stocks of these resources. In the case of nonrenewable resources, continued extraction usually leads eventually to the depletion of the resource.

2.1. Mineral Resources

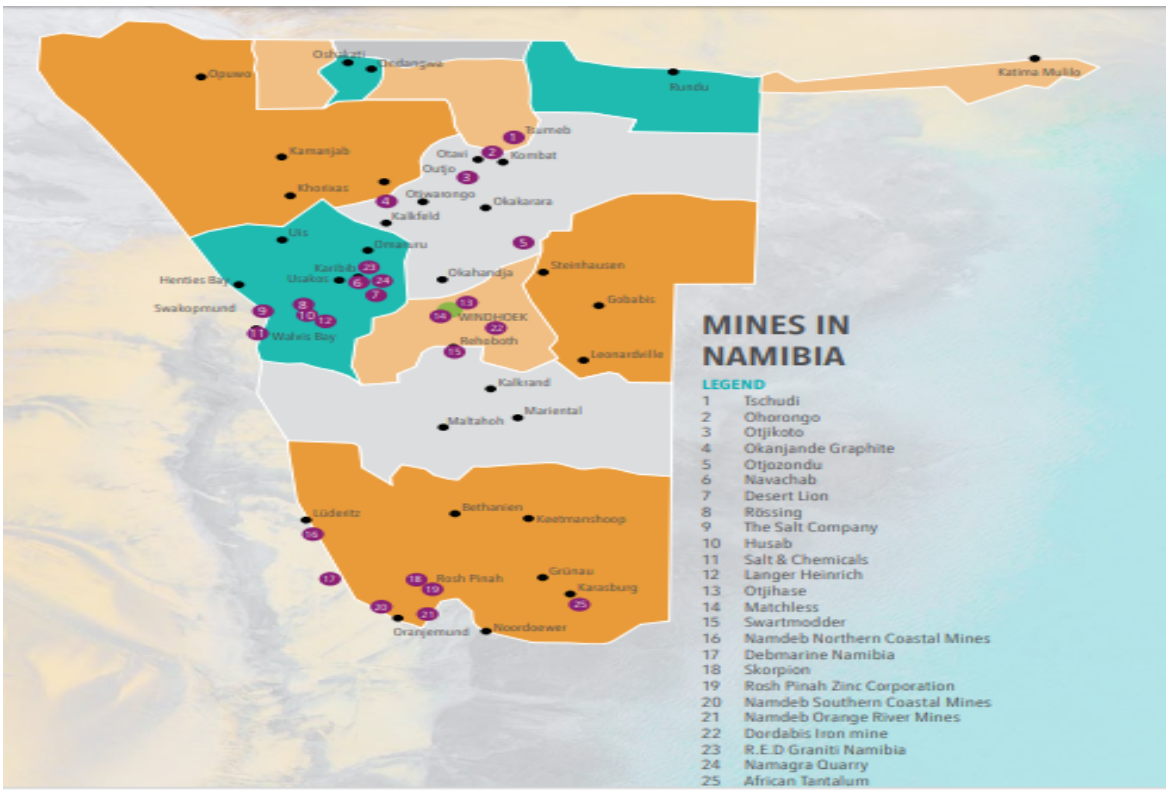
[2] United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organization for Economic Co-operation and Development and World Bank (2014) *System of Environmental-Economic Accounting 2012: Central Framework*. Studies in Methods, Series F, No. 109. Sales No. 12.XVII.12

Stocks of non-energy mineral resources are defined as the amount of known deposits of mineral resources. The minerals in question vary from stone and sand to clay, chemical and fertilizer minerals, salt and various other minerals.

Namibia's economy heavily relies on its mining industry and its mineral resources include diamond, silver, tungsten, lead, zinc, tin, uranium, and copper. Nearly 8% of the GDP and 50% of foreign exchange revenue are contributed by this sector.

The recent economic recession affected the country's economy in the form of decrease in demand for diamond and steep increase in production costs. However, the economy rebounded with the increasing diamond and uranium prices in 2017 and the reopening of copper mines and some new uranium and gold mines. The total earnings from exports as of 2011 were $4.568 billion.

Figure 3: The map of mines in Namibia



Source: Chamber of Mines Annual Reports, 2017

Table 8: Highlights from key mining operations

Minerals	**2016**	**2017**
Diamonds (Carats)	1.57 million	1.8 million
Uranium (Tonnes)	1,850	2,110
Zinc (Tonnes)	85,427	84,215
Lead (Tonnes)	14,862	13,915
Gold (Kg)	4,714	5,429
Copper (Tonnes)	16,391	15,466
Graphite (Tonnes)	---	2,216
Salt (Metric tonnes)	698,590	735,205

Source: Chamber of Mines Annual Reports, 2017

2.2. Energy Resources

Energy production refers to the capture, extraction or manufacturing of fuels or energy in forms which are ready for general consumption (final use). Energy is produced for human consumption in a number of different ways, depending on its source. Energy production, transformation, distribution and consumption are made with different efficiency rates and these processes cause distinct environmental impacts, such as land use change, air pollution, GHG emissions (Greenhouse Gases) and waste. That is why producing statistics to describe these activities is key to environmental sustainability policy (UNSD, FDES 2013).

2.2.1. Energy Stocks

Namibia currently has three electricity power stations, these include: the Ruacana hydroelectric power station with a generation capacity of 240 Mega Watts (MW), which depends on the in-flow of rainfall from the catchment areas in Angola; the Van Eck coal power station with a production capacity of 120 MW,

with coal imports from South Africa; and the Paratus diesel plant with a capacity of 20 MW. This translates to 380 MW in total. The local supply does not meet the demand. Currently, Namibia imports most of this difference from South Africa and other Southern African Development Community (SADC) member states.

2.2.2. Production, trade and consumption of energy

i. Production of Energy

Table 9 below depicts sources of electricity for Namibia. During 2016, Namibia's local sources (NamPower Generation) into the system stands at 31.5%, other regional markets (ZESA, ZESCO, STEM, EDM, and ZPC) makes up 24.8%, IPPs contributed 0.3% while Eskom contributed the largest share of 43.4%. NamPower Generation varied below 1 700 GWh for the period under review, indicating a growing electricity import dependency for Namibia.

Table 9: Namibia Electricity Source

SOURCE	% OF SOURCE
ESKOM	31%
ZESCO	9%
ZESA	17%
RUACANA	38%
VAN ECK POWER STATION	4%
ANIXAS	1%
RENEWABLE SOURCES	1%

Source: ECB Annual Report,2017

ii. Domestic Generation and Import of Energy

The figure below shows the annual imports vs exports of electricity in Namibia. The figure shows that Namibia greatly relies on imports of electricity that is consumed locally. This is due to ever increasing demand of electricity in the country as seen. The drought also has an impact on the exportation of electricity to neighboring countries.

Table 10: Domestic vs Import

	LOCAL GENERATION (%)	IMPORT (%)
2012/13	38	62
2013/14	32	68
2014/15	42	58
2015/16	48	52
2016/17	44	68

Source: ECB Annual Report, 2017

2.3. Biological resources

Biological resources refer to renewable resources capable of regeneration through natural processes. These include timber and aquatic resources, and other animal and plant resources such as livestock and crops.

(i) Crop farming

The area under crop production and yield by type of crop are presented in Table 11 below. Millet/mahangu is the major crop for the majority of households (129,029) which is seven times more than the households indicating maize (17,620) as a major crop and five times more than households indicating sorghum 24,646 as their major crop.

With respect to the area under crop production, the majority of the areas remain under production of millet/mahangu (421,212.6 ha) with an estimated production of 408,576.22 tonnes (t). Similarly, sorghum is produced in 7,043 ha of land with an estimated production of 8,733.32 tonnes while maize is third with an area of 34,991 ha and a production of 55 985.60 tonnes.

Table 11: Area under crop production and yield by type of crop

CROP	NUMBER OF HOUSEHOLD	AREA UNDER CROP (HA)	YIELD	PRODUCTION (TONNES)
Maize	17,620	54,991	1.60	55,981.60
Sorghum	24,646	7,043	1.24	8,733.32
Millet/Mahangu	129,029	421,212.6	0.92	408,576.22
Total		**463,247.6**		**473,295.1**

Source: Namibia Census of Agriculture 2013/2014, Communal Sector Report, November

(ii) Forest

This section discusses one of the important resources the country is endowed with, namely forestry. Forests conserve soil and water, maintain biological diversity, and provide many products such as wood and food. Without forests, large areas of Namibia would become deserts, and the people in those areas, and the country as a whole, would suffer in various ways.

Table 12 presents the estimates of area of forest and other wooded land. The table reveals that the primary land use covers about 1 387 081 ha which accounted for 607 132 ha of forest. Similarly, that of secondary land use covers an area of 606 015ha, of which 233 317 ha covered in forest.

Table 12: Estimate of area of forest land by type of land use

FOREST TYPE	MAIN USE		
	Total Area (ha)	Primary Land use (ha)	Secondary land use (ha)
Forest	840,449	607,132	233,317
Other Woodland	1,152,647	779,949	372,698
Total	1,993,096	1,387,081	606,015

Source: Namibia Census of Agriculture 2013/2014, Communal Sector Report, November 2015

(iii) Livestock Farming

The annual livestock census conducted in 2015 showed a decline in all species except poultry. The possible reason for decline in cattle, sheep, goats and donkeys was drought, which caused death and also forced many farmers to destock. (see table below).

Table 13: Livestock Census Summary for 2014 and 2015

SPECIES	2014	2015	% CHANGE
Cattle	2,882,489	2,770,545	-4
Sheep	2,044,156	1,973,393	-3
Goats	1,892,439	1,868,535	-1
Horses	55,241	47,151	-15
Donkeys	159,028	148,859	-6

Pigs	68,710	62,945	-8
Poultry	3,436,430	4,054,529	18
Dogs	135,549	129,313	-5

Source: Namibia Census of Agriculture 2013/2014, Communal Sector Report, November 2015

(iv) Fish Production

Namibia's fishing grounds stretch up to 200 nautical miles, also known as the Exclusive Economic Zone (EEZ). Over 20 fish species are landed using various fishing methods. To prevent overexploitation and to promote economic viability in the industry, the Ministry issues rights of exploitation, fishing vessel licenses, and in some fisheries, total allowable catch (TACs).

Namibia is also the top African fishing country by production value and exports and her estimated national fish reserves are the biggest in Southern Africa. The industry employs about 8,000 workers, of which about 40% are seagoing personnel and 60% are involved in onshore processing. The industry involves catching, processing and marketing of fish and fish products. About 85% of the fish landed is processed in Namibia and then exported.

The Namibian fishing industry is based on the Benguela Current System, one of the four eastern boundary up-welling systems in the world (the others are off north West Africa, off California and off Peru). These systems support rich stocks of demersal and small pelagic species.

The Namibian EEZ's commercial species comprises small pelagic species (pilchard, anchovy and juvenile mackerel) and lobster along the shallower onshore waters on the continental shelf, as well as large pelagic species including adult mackerel, demersal hake and other deep sea species (monkfish, sole and crab) in the waters further offshore.

Table 14: Namibia Total Allowable Catch (TACs) set by year, 1991 - 2002 (tonnes).

	Pilchard	Hake	Horse Mackerel		Crab	Rock Lobster	Alfonsino	Orange Roughy	Monk
1990	40 000	60 000	150 000		n.a.	n.a.	n.a.	n.a.	n.a.
1991	60 000	60 000	465 000		6 000	1 200	n.a.	n.a.	n.a.
1992	80 000	90 000	450 000		6 000	100	n.a.	n.a.	n.a.
1993	115 000	120 000	450 000		4 900	300	n.a.	n.a.	n.a.
1994	125 000	150 000	500 000		4 900	130	n.a.	n.a.	n.a.
1995	40 000	150 000	400 000	(50 000)	3 000	230	n.a.	n.a.	n.a.

1996	20 000	170 000	400 000	(90 000)	2 500	250	n.a.	n.a.	n.a.
1997	25 000	120 000	350 000	(100 000)	2 000	260	10 000	12 000	n.a.
1998	65 000	165 000	375 000	(75 000)	2 000	300	0	12 000	n.a.
1999	45 000	275 000	375 000	(50 000)	2 000	350	n.a.	6 000	n.a.
2000	25 000	194 000	410 000	(50 000)	2 000	350	n.a.	2 400	n.a.
2001	10 000	200 000	410 000	(50 000)	2 100	400	n.a.	1875	13 000
2002	0	195 000	350 000	(40 000)	2 200	400	n.a.	2 400	12 000

Source: Ministry of Fisheries and Marine Resources (MFMR), FAO - http://www.fao.org/fi/oldsite/FCP/en/NAM/body.htm

(v) Crops

Table 15: National Cereal Production Statistics Trend (in '000 metric Ton)

	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	18-YEAR AVERAGE
Maize (Communal)	5.2	4.6	2.5	5.2	1.4	1.2	6.3	6.7
Maize (Commercial)	48.0	63.2	72.4	71.3	38.9	42.4	64.8	40.7
Pearl Millet	41.1	55.9	24.7	44.1	15.3	19.4	57.6	56.2
Sorghum	5.8	7.7	2.2	4.1	1.7	1.5	2.8	7.4
Wheat	11.5	11.9	14.8	11.3	11.6	9.8	6.1	9.5
Aggregate	11.6	143.4	116.6	136.1	68.9	74.3	137.6	120.6

Source: Crop Prospects, Food Security & Drought Situation Report, 2018

3. RESIDUALS

3.1. Emission to air

This section gives us information about the amount and characteristics of residuals generated by human production and consumption processes, their management and their final release to the environment. Residuals are solid, liquid and gaseous substances that are discarded, discharged or emitted directly to the environment, or captured, collected, treated or reused. The main groups of residuals are emissions, wastewater and waste.

(i) Emission of Greenhouse Gases (GHGs)

A special category of air emissions is the emissions of GHGs. Emission inventories of GHGs are compiled according to the guidelines developed by the IPCC, under the auspices of the UN Framework Convention on Climate Change (UNFCCC). GHGs include both direct and indirect GHGs, such as sulphur dioxide (SO_2) and nitrogen oxides (NO_x). The most important GHGs are direct and are carbon dioxide (CO_2) and methane (CH_4).

The Republic of Namibia aims to reduce greenhouse gas (GHG) emissions by approximately 89 percent by 2030 relative to a business-as-usual scenario. Increased adaptive capacities and reduced vulnerabilities are of central importance for Namibia and two-thirds of all required finance is focused on adaptation to climate change. Namibia contributes less than 0.1 percent to global emissions and per capita carbon dioxide (CO_2) emissions are around a quarter of the global average. Namibia's carbon dioxide-equivalent (CO_2) emissions profile stands at around 63 percent CO_2, 21 percent methane (CH_4), and 16 percent nitrous

oxide (N_2O). The discussion below is adapted from the National GHG Inventory Report NIR 2 2000 – 2012, that was published in 2016.

(ii) Trends of emissions by source category

Total national emissions increased by 12.1 % over 13 years. The Agriculture, Forest and Other Land Use (AFOLU) sector remained the leading emitter throughout this period followed by Energy, Waste and Industrial Process and Product Use (IPPU) for most of the years under review. Emissions from the AFOLU sector increased slightly from 25 274 Gg CO_2-eq in 2000 to 27 028 Gg CO_2-eq in 2012, representing a progression of 6.9 % from the 2000 level. In 2012, the share of GHG emissions from AFOLU amounted to 88.1 % of total national emissions.

Energy emissions increased from 1995 Gg CO_2-eq (7.3 %) of national emissions in 2000 to 2979 Gg CO_2-eq (9.7 %) in 2012 as depicted in Table 3.2. During the period 2000 to 2012, the average annual increase of GHG emissions was 4.1 %. The contribution of the IPPU sector in total national emissions increased from 25 Gg CO_2-eq in 2000 to 523 Gg CO_2-eq in 2012 (Table 3.2). On average, the GHG emissions from the industrial processes sector increased by 166 % annually following the industrialization of the country.

Waste emissions on the other hand varied slightly over this period with the tendency being for a slight increase over time. Emissions from the waste sector increased from the 2000 level of 96 Gg CO_2-eq to 162 Gg CO_2-eq in 2012, representing a 68.8 % increase.

Table 16: National GHG emission (Gg, CO_2-eq) by sector (2000-2012)

SOURCE CATEGORIES	2000	2002	2004	2006	2008	2010	2011	2012
Total Emissions	23,789	27,772	28,336	28,532	29,394	28,414	30,206	30,692
Energy	1,995	2,269	2,562	2,795	2,981	2,904	2,851	2,979
Industrial Process	25	26	235	255	291	302	421	523
AFOLU	25,274	25,378	25,427	25,359	25,992	25,062	26,779	27,028
Waste	96	99	113	130	130	145	155	162

Source: National GHG Inventory Report NIR 2 2000 – 2012, 2016

(iii) Trend in Emissions of Direct GHGs

The share of emissions by gas has not changed during the period 2000 to 2012. The main contributor to the national GHG emissions remained CO_2 followed by CH_4 and N_2O. In 2012, the share of the GHG emissions was as follows: 69.6 % CO_2, 18.8 % CH_4 and 11.6 % N_2O. The trend of the aggregated emissions

and removals by gas is given in Table 17 and 18. The share of CO_2 has decreased while those of CH_4 and N_2O have increased respectively over the period 2000 to 2012.

Table 17: Aggregate emissions and removal (Gg) by gas (2000-2012)

GHG	2000	2002	2004	2006	2008	2010	2011	2012
Total GHG Emissions (CO_2.EQ)	27389	27772	28336	28532	29394	28414	30206	30692
Removal (CO_2) (CO_2-eQ)	-44459	-41501	-34781	-34781	-31641	-28534	27118	25452
Net Removal(CO_2-eq)	-17070	-13729	-9371	-6249	-2246	-121	3088	5240
(CO_2)	20197	20470	20965	21214	21432	21366	21435	21385
CH_4 ((CO_2-eq)	4651	4505	4545	4504	4928	4336	5427	5756
N_2O(CO_2-eq)	2541	2796	2827	2814	3034	2712	3345	3551

Source: National GHG Inventory Report NIR 2 2000 – 2012, 2016

(iv) Trends for Indirect GHGs and SO_2

Emissions of indirect GHGs (CO, NO_X and NMVOC) and SO_2, have also been estimated and reported in the inventory. Indirect GHGs have not been included in national total emissions. Emissions of these gases for the period 2000 to 2012 are given in the Tables below.

Table 18: Emissions (Gg) of indirect GHGs and SO_2 (2000 – 2012)

GASES	2000	2002	2004	2006	2008	2010	2011	2012
NO_X	31.5	34.7	36.0	35.2	34.6	35.2	36.0	36.3
CO	349.9	366.9	371.6	373.8	375.6	375.3	367.5	369.2
NMVOC	19.5	20.5	21.2	21.8	22.9	22.0	21.5	21.6
SO_2	2.2	2.8	3.6	4.2	4.2	2.8	3.3	2.9

Source: National GHG Inventory Report NIR 2 2000 – 2012, 2016

3.2. Generation and management of wastewater

Generated wastewater can be discharged in two ways: directly to the environment by the generator, or by being collected in sewerage systems and being treated in wastewater treatment plants. The collection and treatment of wastewater in Namibia is very important, especially because of the fact that high concentrations of nutrients, such as ammonia and nitrates, can be a serious problem for the countries coral reefs and thus its (diving) tourism and fisheries.

(i) Management of Waste

This topic includes statistics on the amount of waste collected and transported to treatment facilities or their final disposal. It also includes the amount treated by type of treatment or disposal, like recycling, incineration and landfilling. Waste covers discarded materials that are no longer required by the owner or user. It includes materials that are in solid or liquid state, but excludes wastewater and emissions.

(ii) National Solid Waste Management Strategy

The Ministry of Environment and Tourism (MET) has recognized the urgent need to improve solid waste management in Namibia and has recently rolled out the first National Solid Waste Management Strategy. This strategy aims to ensure that the future directions, regulations, funding and action plans to improve solid waste management are properly coordinated and consistent with national policy, and to facilitate cooperation between stakeholders.

Below is a snapshot of 2016 waste statistics from the City of Windhoek:

Waste Quantities : Kupferberg landfill		
	Gen (tonnes)	**Haz (tonnes)**
Jan-16	6491.61	1533.69
Feb-16	6127.90	1093.60
Mar-16	6245.95	1168.38
Apr-16	6280.44	1186.63
May-16	6025.03	955.22
Jun-16	7038.24	1173.42
Jul-16	6613.41	1089.53
Aug-16	7041.99	1058.75
Sep-16	6811.07	1062.60
Oct-16	6360.31	873.46
Nov-16	7313.01	1114.71
Dec-16	6223.10	802.90
Total	**78,572.06**	**13,112.89**
Average	**6,547.67**	**1,092.74**

Source: City of Windhoek

4. EXTREME EVENTS AND DISASTERS

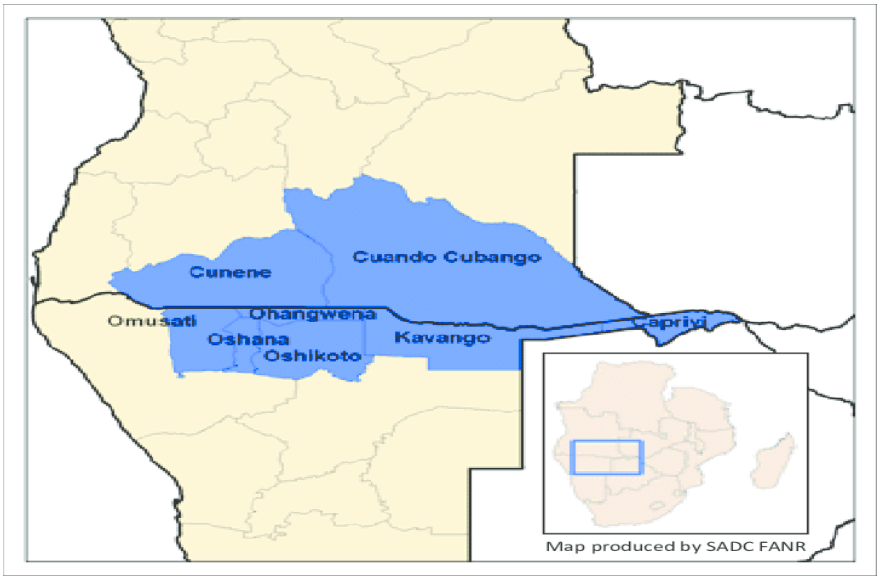
This component contains statistics regarding the occurrence and impact of extreme events and disasters on human wellbeing and the infrastructure. It consists of two subcomponents: Natural Extreme Events and Disasters: frequency and intensity of extreme events and disasters deriving from natural phenomena,

as well as their impact on human lives and habitats and the environment as a whole. Technological Disasters: occurrence and impact of disasters arising because of human intent.

(i) Hazard

A hazard is a potentially damaging event of varying magnitude and frequency. If a particular hazard event leads to loss of life, significant damage, social or economic disruption or environmental degradation, then it may be declared an emergency or a disaster. The most common hazards in Namibia are droughts, floods, health epidemics, climate change, environmental degradation, livestock epidemics, wild fires and traffic accidents.

Figure 4: Geographical map of flood prone areas in Namibia.



Source: SADC FANR

5. HUMAN SETTLEMENTS AND ENVIRONMENTAL HEALTH

This component contains statistics on the environment in which humans live and work, particularly with regard to living conditions and environmental health. They are important for the management and improvement of conditions related to human settlements, safe water, sanitation, and health, particularly in the context of rapid urbanization, increasing pollution, environmental degradation, disasters, extreme events and climate change.

5.1 Human settlements

Namibia's population was estimated to be 2 280 716 people living in 544 655 households, with an average of 4.2 persons per household as shown in the Table 19below. The majority of the population (53.1 percent) lives in rural areas, while 46.9 percent live in urban areas.

A shift in the households from rural to urban areas have been observed since 2009/2010. The most populated region is Khomas accounting for 17.5 percent of the population, followed by Ohangwena and Omusati regions with a share of 11.1 and 10.9 percent respectively. Omaheke is the least populated region accounting for 3.2 percent of the population.

Table 19: Households and Population by urban/rural and region

	Household		*Population*		*Average Household size*
	Number	%	Number	%	Size
Namibia	544,658	100	2,280,716	100	4.2
Urban	294,827	54.1	1,068,625	46.9	3.6
Rural	249,827	45.9	1,212,091	53.1	4.9

Source: NHIES, 2016

Among the regions, Erongo has the lowest average household size with an average of 3.0 which was the same case in 2009/2010 when Erongo region had the lowest average of household size of 3.5 persons per household. Kavango East and Kavango West have the highest share of average household size with an average of 5.8 and 6.1 persons per household, respectively.

(i) Access to water, sanitation

This topic includes information about access to water, sanitation and energy. Access to these basic services can have a positive effect on human health and wellbeing, thereby contributing to improved environmental quality. Relevant statistics on this topic include "population using an improved drinking water source," as well as "population using an improved sanitation facility."

The source of drinking water is an indicator of whether the households have access to safe water for drinking. Table 20 indicates that at national level, 84.4 percent of households have indicated piped water as their main source of drinking water, followed by boreholes or protected wells with 7.5 percent. The least source of water for drinking is stagnant water with 0.8 percent. The table further indicates that most households with piped water are found in urban areas with 97.7 percent compared to 68.6 percent in rural areas. Kavango West, Kunene and Kavango East reported the lowest proportion of households having access to piped water, with 60, 60.5 and 63.4 percent respectively.

About 25.5 percent of households in Kavango West use flowing water as their main source of drinking water, followed by Omusati and Zambezi each with 3.8 percent. The table also indicates that Khomas region has the highest percentage of households with access to piped water with 97.5 percent, followed by Oshana with 96.5 percent then Erongo with 94 percent.

Table 20: Source of drinking water

	Piped Water (%)	*Boreholes/ protected wells (%)*	*Stagnent Water (%)*	*Flowing Water (%)*	*Other Source (%)*	*Number of Households*
Namibia	84.4	7.5	0.8	2.1	5.2	544,655
Urban	97.7	0.6	0.0	0.2	1.4	294,827
Rural	68.6	15.7	1.7	4.4	9.5	249,827

Source: NHIES,2016

(ii) Human condition

Table 21: Households by selected indicators on housing condition

	% of Improvised Housing	*Number of Households*
Namibia	20.2	544,655
Urban	29.6	294,827
Rural	9.1	249,822

Source: NHIES, 2016

6. ENVIRONMENTAL PROTECTION, MANAGEMENT AND ENGAGEMENT

A country's engagement in the protection and management of the environment, and therefore the amount of resources it dedicates to the task, is especially important because it is related to information, awareness and the ability to finance environment protection activities and participate in efforts (sometimes international) directed at these activities.

The component of environment protection and management organizes information on environment protection and resource management expenditure with the aim of improving the environment and maintaining the health of ecosystems. Statistics about environmental governance, institutional strength, enforcement of regulations and extreme-event preparedness are also considered.

This component also contains information on a wide variety of programs and actions to increase awareness, including environmental information and education, as well as activities aimed at diminishing environmental impacts and improving the quality of local environments.

(I) Government protection expenditures

This topic includes government expenditure primarily aimed to protect the environment and manage resources. Government expenditure to protect the environment is usually calculated by identifying and aggregating the expenditures considered to be primarily for environment protection and resource management purposes.

These expenditures can be found by examining official government finance statistics found in government budgets and/or administrative reports on actual government expenditure incurred. The main institutional partners are the official institutions in charge of reporting government expenditure. National accounts and government finance statistics are typically the divisions in statistical offices which need to be involved when developing these figures.

7. TOURISM

Tourism is one of the most important activities in Namibia, contributing significantly to the economies. Tourism industries also contribute through the creation of jobs in tourist-related sectors such as security, construction and transportation. However, this key sector also exerts significant pressure on scarce resources such as land, reefs, water and energy.

In addition, it also generates a large amount of waste. The indicators under this theme seek to measure and quantify the environmental and social implications such as accommodation, transportation and employment.

Table 21: Tourist arrival

YEAR	ARRIVAL
2012	1,078,935
2013	1,176,041
2014	1,320,062
2015	1,387,773
2016	1,469,258

Source: Tourism Satellite Account, 2017

The Travel & Tourism sector saw consistent growth over the last four years, not least because of sustained growth in number of tourist arrivals to Namibia. Real growth of tourism value added in 2015 was a strong 11.4 percent and we expect this positive trend to have continued into 2016 (up 5.9 percent).

The outlook remains fairly positive with an average annual growth of 6.5 percent in the next four years. These projections are consistent with an increase of foreign tourist arrivals from 1,387,773 in 2015 to 1,724,000 in 2020.

Table 22; Top Ten Tourist Market

COUNTRY	ARRIVALS
Angola	398,939
South Africa	342,044
Zambia	190,457
Germany	122,142
Zimbabwe	83,287
Botswana	50,665
UK	31,558
USA	27,264
France	23,484
Netherlands	20,169

Source: Tourism Satellite Account, 2017

The Angolan tourist market remains the major African market although there is a fall of about 11% as compared to 2015. The South African and Zambian tourist market maintained their second and third position since 2015. On the other hand, the German market showed dominance in the overseas tourist market with a large 35% increase from 2014, while the UK and USA took second and third place respectively.

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