Kingdom of Lesotho

Bureau of Statistics

Statistical Report
No 13: 2021

2019 Environment Report

Bureau of Statistics
P.O. Box 455
Maseru 100
Lesotho
Tel: +266 22 323 852/22 326 393
Fax: +266 22 310 177
E-mail: ees@bos.gov.ls
Website: www.bos.gov.ls

Mission: To coordinate the National Statistical System (NSS) and produce accurate, timely and reliable culturally relevant and internationally comparable statistical data for evidence-based planning, decision making, research, policy, program formulation and monitoring and evaluation to satisfy the needs of users and producers.

Table of Contents

List of Figures iv
List of Tables v
CHAPTER 1: WATER AND SANITATION 1
1.0 Introduction 1
1.1 Scope and coverage 1
1.2 Results 1
1.2.1 Domestic Water Production and Consumption 1
1.2.2 Sectors Water Consumption 2
1.2.3 Urban Water Consumption 3
1.2.4 Maseru Water Consumption 4
1.3 Water connections 4
1.4 Wastewater 5
1.5 Water Exports 6
1.6 Water Flows 6
1.7 Sanitation 8
1.8 Summary 9
CHAPTER 2: LAND USE AND COVER 10
2.0 Introduction 10
2.1 Scope and Coverage 10
2.2 Results 10
2.3 Forests and other Wooded Land Area 10
2.3.1 Forests Area 10
2.3.2 Other Wooded Land Area 11
2.4 Land under Roads 12
2.5 Summary 13
CHAPTER 3: AIR AND CLIMATE CHANGE 14
3.0 Introduction 14
3.1 Scope and Coverage 14
3.2 Climate Change 14
3.3 Results 14
3.3.1 Maximum and Minimum Temperatures 14

3.3.1.1 Monthly Mean Maximum and Minimum 15
3.3.1.2 Annual Mean Maximum and Minimum Temperatures 16
3.3.2 Precipitation 17
3.3.3 Airborne Diseases 19
3.3.4 Ozone Depleting Substances and Alternatives 19
3.3.5 Refrigerant 20
3.3.6 Summary 21
CHAPTER 4: BIODIVERSITY 22
4.0 Introduction 22
4.1 Scope and coverage 22
4.2 Results 22
4.3 Animal Species 22
4.3.1 Vertebrates' Status 23
4.4 Plant Species 23
4.5 Invasive Alien Species (IAS) 23
4.6 Ecosystems 24
4.6.1 Wetlands 24
4.6.1.1 Sub-Catchment Areas 25
4.7 Rangelands 26
4.7.1 Rangeland fires 26
4.8 Botanical Gardens 26
4.8.1 Plants propagation 26
4.8.1.1 Plant Species 27
4.9 Protected areas 29
4.9.1 Biosphere Reserves 30
4.9.1.1 Floral species uses 30
4.9.1.2 Faunal species 31
4.9.1.3 Forms of insects 32
4.10 Conserved Catchment Areas 33
4.11 Summary 34
ANNEX 35
REFERENCES 38

List of Figures

Figure 1.1: Quarterly Water Consumption (kilolitres '000) – 2019/2020 2
Figure 1.2 Volume of Water Consumed (kilolitres '000) by Sector – 2019/2020 3
Figure 1.3: Urban water consumption (kilolitres) – 2019 3
Figure 1.4: Water Consumption (kilolitres '000) of Maseru from 2015 to 2019 4
Figure 1.5: Cumulative Urban Water Connections - 2015/2016 to 2019/2020 5
Figure 1.6: Urban Wastewater (kiloliters) generated - 2015 to 2020 5
Figure 1.7 Water Exports in Million Cubic Meters (mm^3) – 2019 6
Figure 1.8: Mean Annual Flow (m^3/s) for Mohokare/Caledon catchment 7
Figure 1.9: Mean Annual Flow (m^3/s) for Makhaleng Catchment 7
Figure 1.10: Mean Annual Flow for Senqu Catchment 8
Figure 2.1: Area Planted Forest Trees in Hectares by Period (2015/2016 - 2019/2020) 11
Figure 2.2: Area Planted Fruit Trees in Hectares by Period (2015/2016 - 2019/2020) 12
Figure 3.1: Monthly Mean Maximum Temperatures - 2020 15
Figure 3.2: Monthly Mean Minimum Temperatures -2020 16
Figure 3.3: Monthly Mean Rainfall for the year 2020 18
Figure 4.1: Total Area (ha) of Monontša, Tšehlanyane and Matsieng Sub-Catchments -2014/2015 25
Figure 4.2: Number of Seedlings Propagated at Katse Botanical Garden - 2015/2016-2019/2020 27
Figure 4.3: Number of Seedlings Propagated at Katse Botanical Garden-2015/2016-2017/2018 29
Figure 4.4: Number of Conserved Catchment Areas by Districts - 2019/2020 33

List of Tables

Table 1.1: Number of Spring Catchments Constructed - 2015 to 2019 9
Table 1.2: Number of Standpipes Constructed - 2015 to 2019 9
Table 2.1: Road Lengths in kilometers (km) by Description and Year (2015-2019) 12
Table 3.1: Annual Mean Maximum Temperature (ºC) by Sub-Stations - 2016-2020 16
Table 3.2: Annual Mean Minimum Temperature (ºC) by Sub-Stations - 2016-2020 17
Table 3.3: Annual Mean Rainfall (mm) by Sub-stations and year -2016-2020 18
Table 3.4: Number of Patients with Airborne Diseases by Type of Disease – 2020 19
Table 3.5: Type of Imports of ODS Gases by Cylinders and Quantity (grams) – 2020 20
Table 3.6: Type of Refrigerant and Quantity (grams) -2019/2020 20
Table 4.1: Number of Alien Invasive Species by Type in Terrestrial and Aquatic Environment-2005 24
Table 4.2: Area (ha) of Wetlands and Catchments -2014/2015 25
Table 4.3: Area (ha) Burned by Districts-2013 26
Table 4.4: The Most Propagated Plant Species at Katse Botanical Garden - 2017/2018 27
Table 4.5: The Most Propagated Plant Species at Katse Botanical Garden-2019/2020 28
Table 4.6: Number of Seedlings Propagated at Katse Botanical Garden- 2015/2016-2019/2020 28
Table 4.7: Types of Floral Species at Tšehlanyane and Bokong Reserves for 2020 30
Table 4.8: Uses and Number of Floral Species at Tšehlanyane and Bokong Reserves-2020 31
Table 4.9: Faunal Species by Group and Number at Tšehlanyane and Bokong Reserves-2020 31
Table 4.10: Invertebrates Species by Type and Number –Tšehlanyane and Bokong Reserves-2020 32
Table 4.11: Insects Observed by Form and Number at Tšehlanyane and Bokong Reserved-2020 32

CHAPTER 1: WATER AND SANITATION

1.0 Introduction

Water is a key resource that is fundamental to the progress of every economy in the world. Every economic sector, big or small, has a certain degree of reliance on water. Some of these sectors produce millions of litres of wastewater every year. This wastewater first has to be cleaned before it could be absorbed back into the natural environment. Hence the life cycle of water has to be properly monitored so as to maintain proper balance in the environment.

Clean water is imperative to the hygiene of every individual. Each country through its relevant departments or ministries undertakes to ensure access to clean water for their citizens, and Lesotho is no different. In Lesotho, Water and Sewerage Company (WASCO) is responsible for servicing the urban population with clean water. The Department of Rural Water Supply is tasked with providing the rural population with clean water. Both these arms of Government maintain a strict standard of water quality.

Water quality changes over time. Water quality should constantly be tested to assess whether water conforms to the said standards. Parameters tested for water quality include pH level, turbidity, temperature, salinity, phosphates and nitrates www.scribd.com/document/184226181/water-quality-parameters-pfd.

1.1 Scope and coverage

Secondary data has been used in this chapter. The data was sourced from the Department of Rural Water Supply, Department of Water Affairs, Water and Sewerage Company and the Lesotho Highland Development Authority. The data analyzed is from the year 2015 to 2019.

1.2 Results

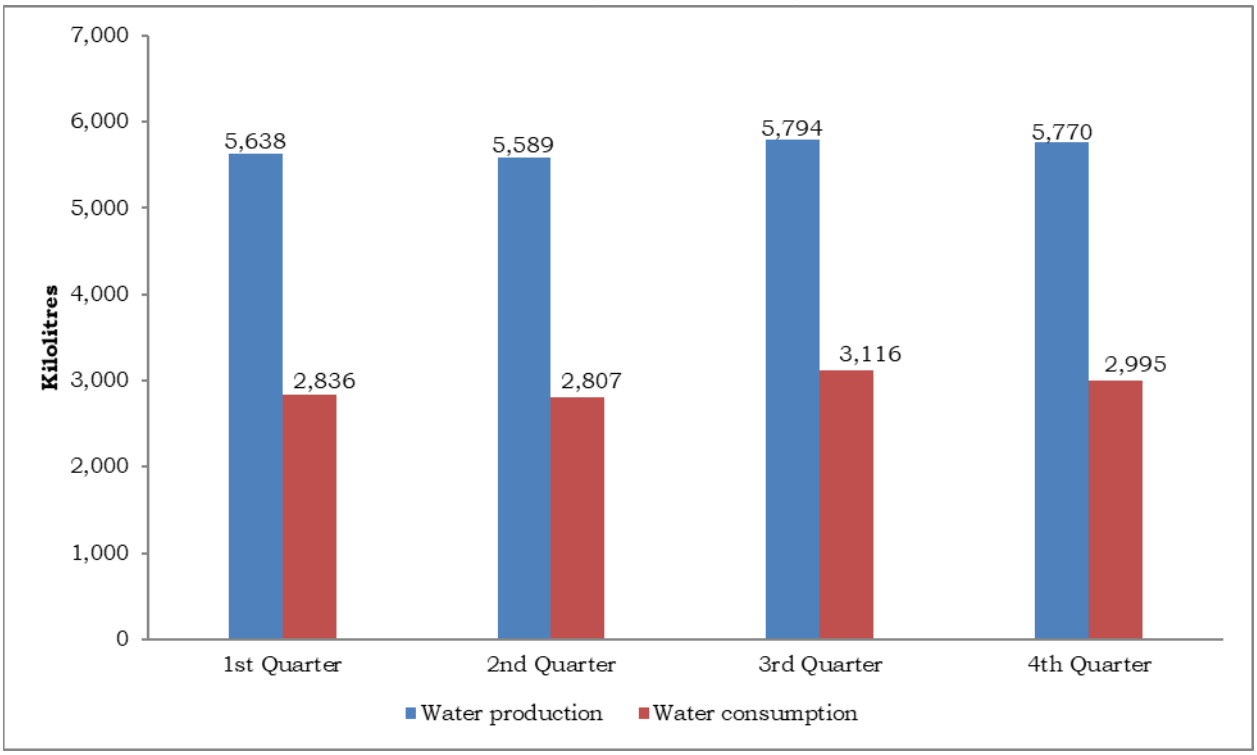
The data presented in the chapter includes water consumption, water revenue and other important water indicators. The data has been graphically presented and tabulated. A summary at the end of the chapter gives a comprehensive picture of water dynamics in the country.

1.2.1 Domestic Water Production and Consumption

Water productions can be best defined as the amount of water source from the natural environment in a particular year. Water sourced from the environment can be classified into two categories, namely surface water and groundwater. Water consumption is the measure of all the water utilized by households and industries in the country. In households, water is used for cooking, washing and drinking. Water is used during production processes in many industries e.g., Mining, Agriculture etc.

Figure 1.1 depicts quarterly water production and consumption (kilolitres) for the period 2019/2020. It can be observed from the figure that during all four quarters of 2019/2020 there was water surplus. The maximum water production was in the 3rd quarter with 5,794 thousand kilolitres hence the highest water consumption at 3,116 thousand kilolitres. The least production of water was in the 1st quarter with 5,637 thousand kilolitres.

Figure 1.1: Quarterly Water Consumption (kilolitres '000) – 2019/2020

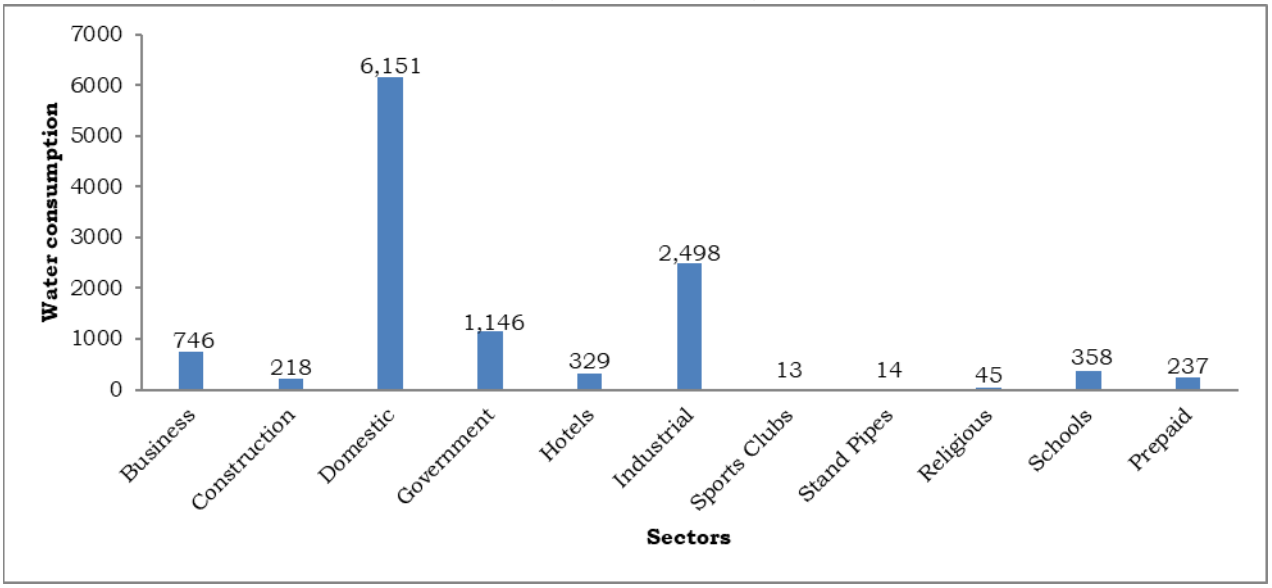


Source: Water and Sewerage Company

1.2.2 Sectors Water Consumption

Figure 1.2 portrays the volume of water consumed by sector for the period 2019/2020 in kilolitres. Households consumed the highest volume of water as compared with other sectors, at 6,151 thousand kilolitres. Industries follow suite with 2,498 thousand kilolitres. The industry that consumed the least volume of water was Sports Club with 13 thousand kilolitres.

Figure 1.2 Volume of Water Consumed (kilolitres '000) by Sector – 2019/2020

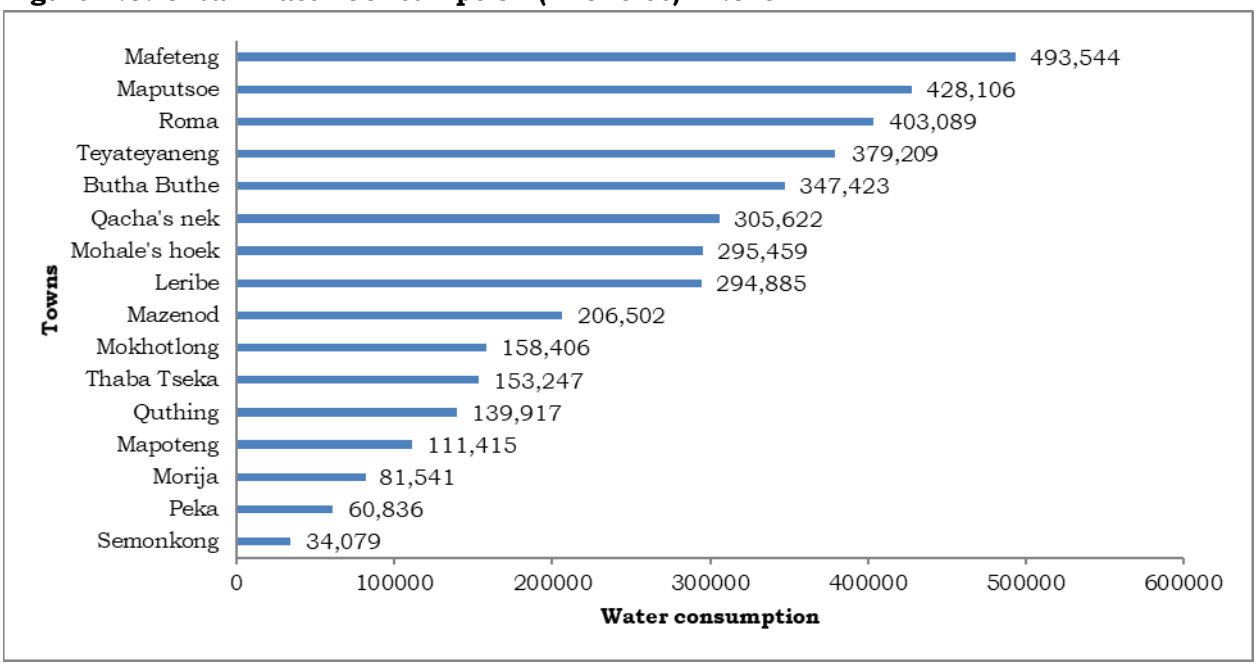


Source: Water and Sewerage Company

1.2.3 Urban Water Consumption

Figure 1.3 displays the urban water consumption (kilolitres) in 2019, excluding the capital town of Maseru. The urban regions of Mafeteng consumed 493, 544 kiloliters of water in 2019, the highest compared to other districts' urban regions. Semonkong consumed 34,079 kilolitres in 2019, the lowest of all the urban regions.

Figure 1.3: Urban Water Consumption (kilolitres) – 2019

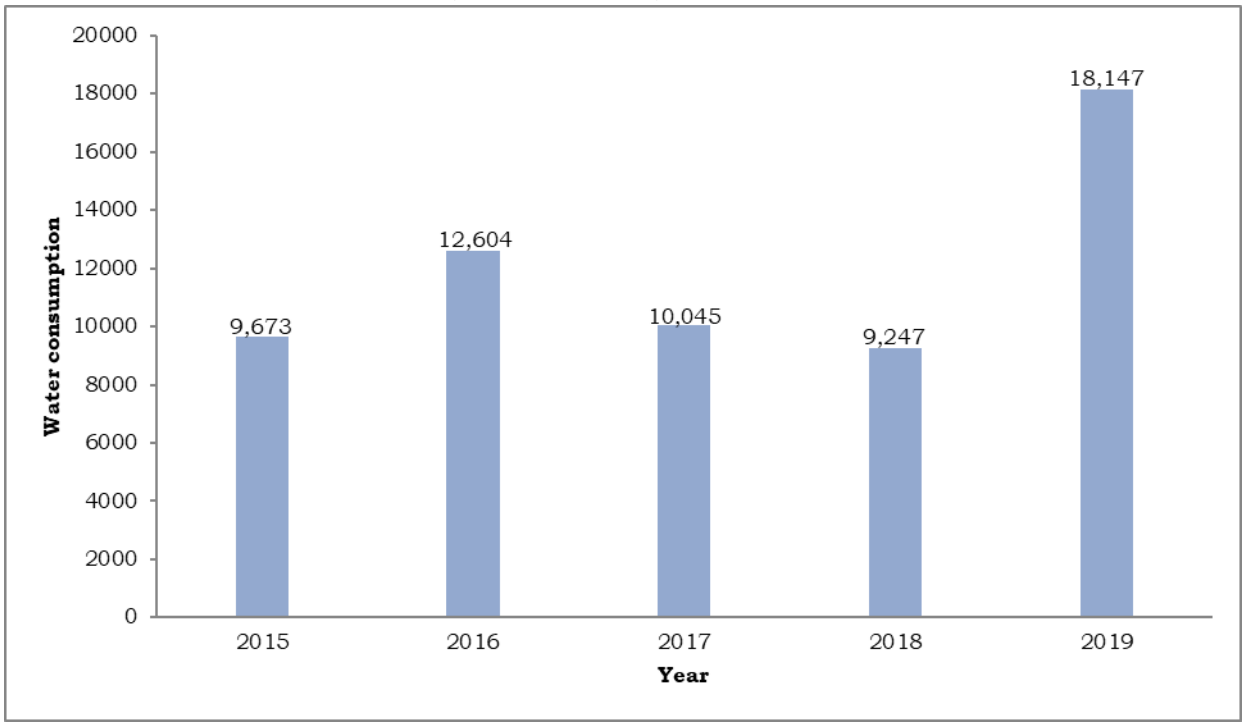


Source: Water and Sewerage Company

1.2.4 Maseru Water Consumption

Figure 1.4 demonstrates the water consumption of the capital town Maseru from 2015 to 2019. During the year 2019, the capital town Maseru consumed 18,147 thousand kiloliters of water. The highest water consumption recorded during the five years. The lowest water consumption was recorded in 2018, at 9,247 thousand kilolitres.

Figure 1.4: Water Consumption (kilolitres '000) of Maseru from 2015 to 2019



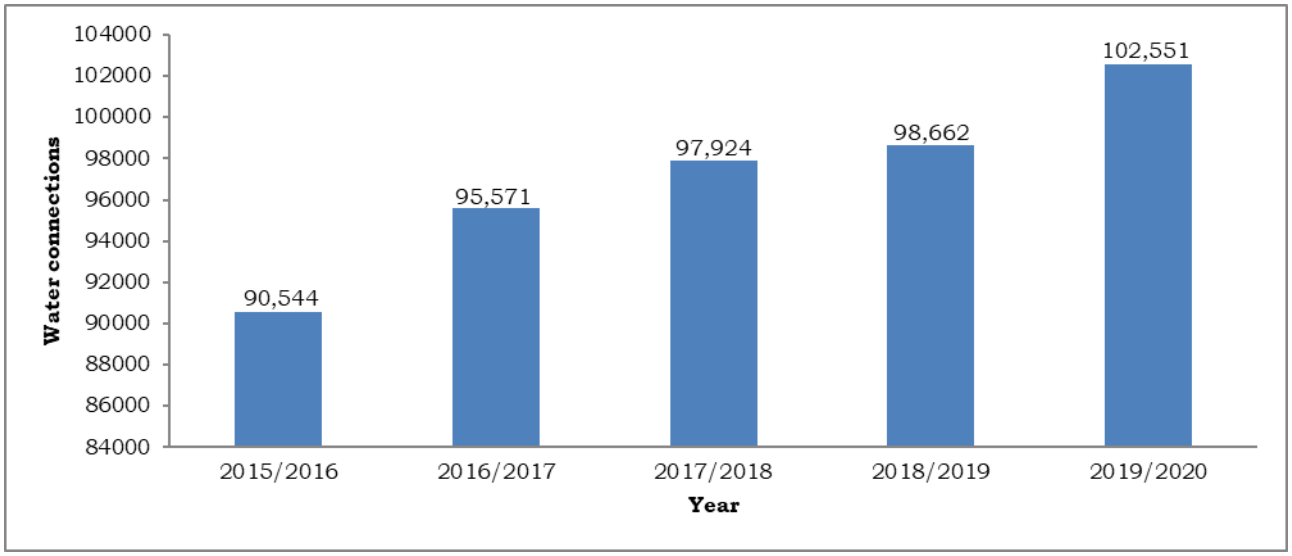
Source: Water and Sewerage Company

1.3 Water Connections

Water connections in this section refer to new households or communities connected to WASCO clean water lines.

Figure 1.5 depicts the cumulative number of urban water connections from 2015/2016 to 2019/2020. In 2015/2016 there were 90,544 urban water connections. The number steadily increased to 102,551 connections at the end of 2019/2020.

Figure 1.5: Cumulative Urban Water Connections - 2015/2016 to 2019/2020



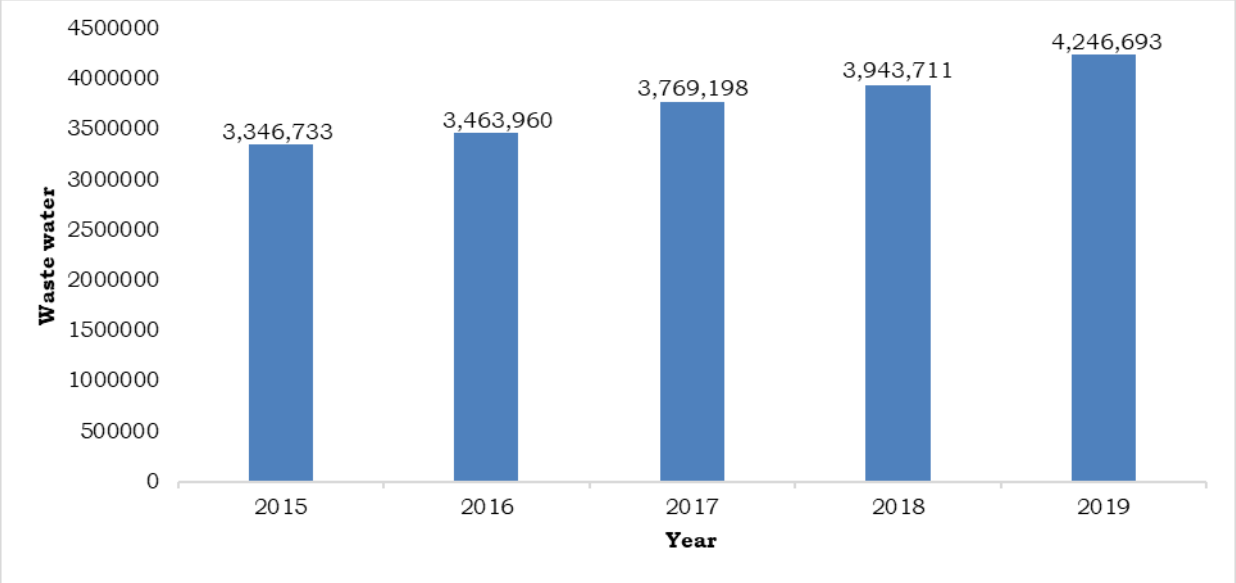
Source: Water and Sewerage Company

1.4 Wastewater

Water disposed by households and industries is wastewater. Wastewater is taken to the WASCO wastewater treatment plant through the sewerage system and by tankers. Millions of litres of wastewater are generated every year.

Figure 1.6 displays urban wastewater (kilolitres) generated for the years 2015 to 2019. The amount of wastewater generated has been steadily increasing from 2015 to 2019. The most wastewater of 4,246,693 kiloliters was generated in the year 2019.

Figure 1.6: Urban Wastewater (kiloliters) Generated - 2015 to 2020



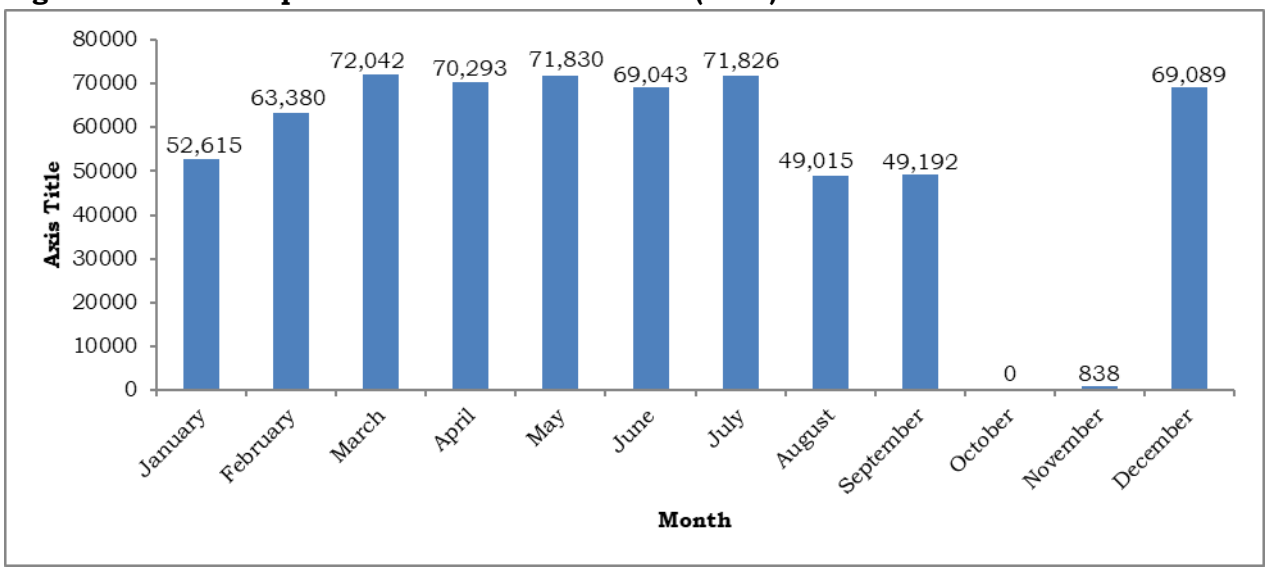
Source: Water and Sewerage Company

1.5 Water Exports

Lesotho exports water to the Republic of South Africa. The entity tasked with facilitating these water exports is the Lesotho Highlands Development Authority (LHDA).

Figure 1.7 illustrates water exports in million cubic meters (mm^3) during 2019. The highest quantity of water exported in 2019 was in March at 72, 042 mm^3. Water exports were lowest during November with 838 mm^3.

Figure 1.7 Water Exports in Million Cubic Meters (mm^3) – 2019



Source: Lesotho Highlands Development Authority

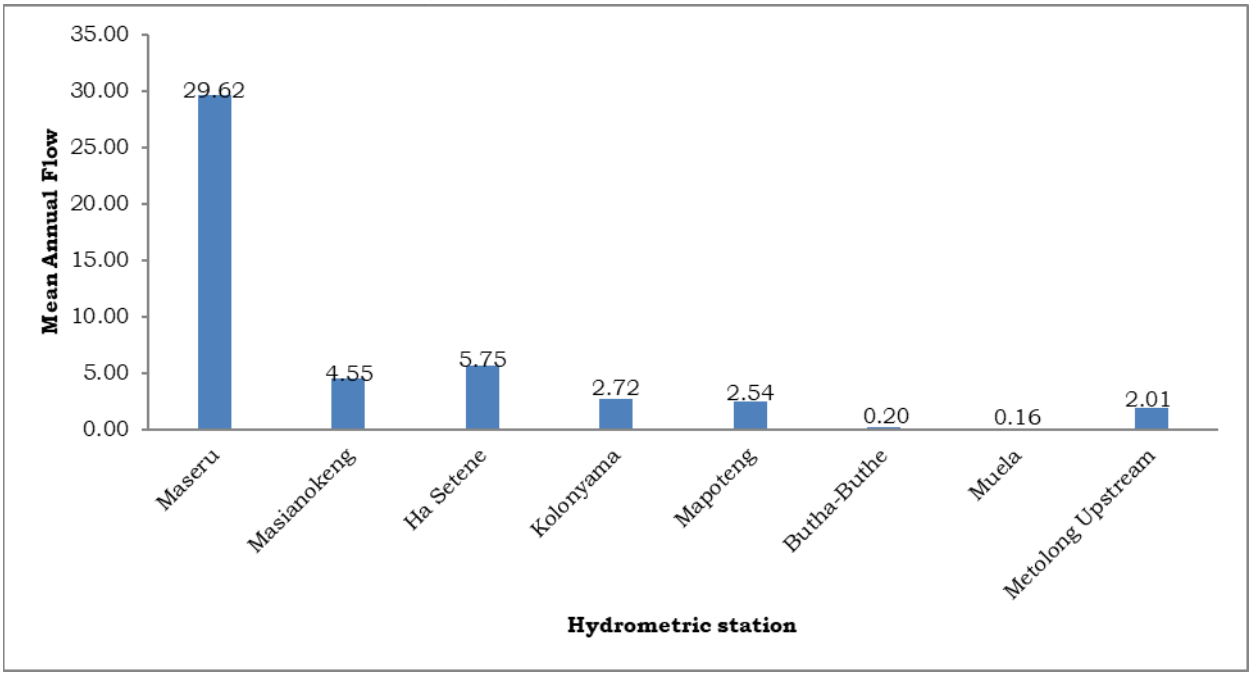
1.6 Water Flows

'Water flow measures the flow rate-volume of water crossing a section of a stream for one unit of time, expressed in cubic meters per second (m^3/s). Predicting and managing river flows is a necessity for flood control, water supply, agriculture and energy production' www.encyclopedie-environment.org/en/water/hydrometry-measuring-flow-why-how.

Water flow has been collected since 1956 by the Department of Water Affairs. Data has been collected up to 2018. Water flow data is collected at hydrometric stations located along three catchments; namely Mohokare/Caledon, Makhaleng and Senqu. The water flow presented for each hydrometric station is the average water flow from the first time the data was collect at that particular station up until 2018.

The mean annual flow for Mohokare/Caledon (m^3/s) catchment from 1956 to 2018 is depicted in figure 1.8. The highest mean annual flow was 29.62 m^3/s, at Maseru hydrometric station. The lowest mean annual flow was at Botha Bothe hydrometric station with 0.20 m^3/s.

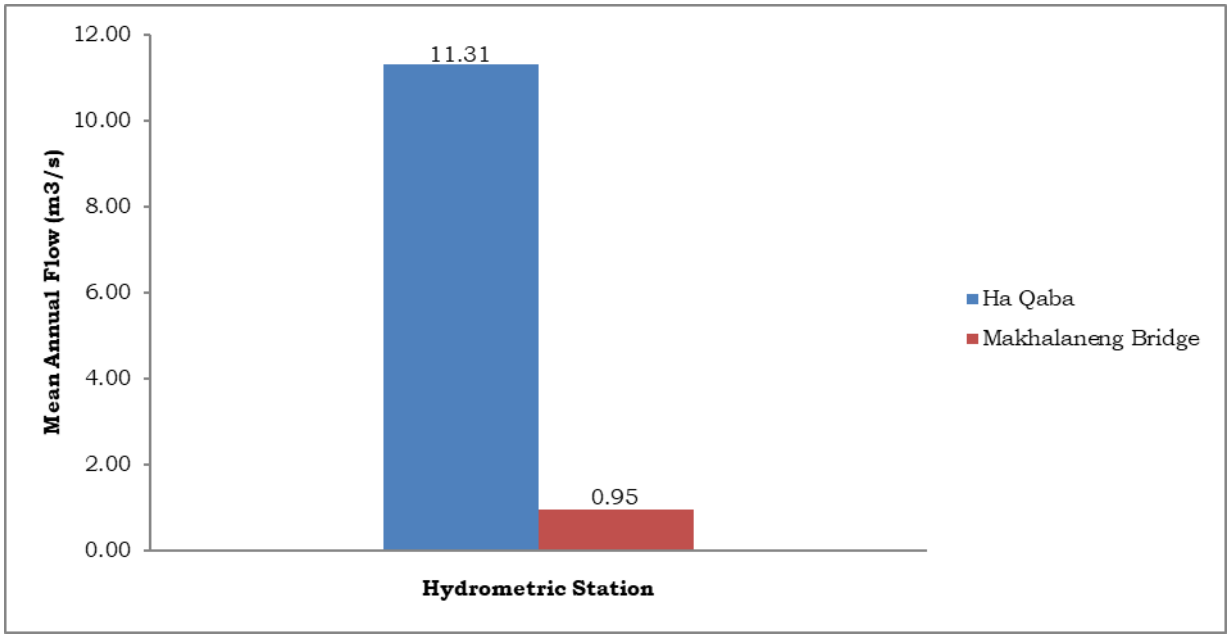
Figure 1.8: Mean Annual Flow (m^3/s) for Mohokare/Caledon Catchment



Source: Department of Water Affairs

Figure 1.9 displays the mean annual flow (m^3/s) for Makhaleng catchment. The hydrometric station with the highest mean annual flow was Ha Qaba, with 11.31 m^3/s. The least mean annual flow was 0.95 m^3/s at Makhaleng (Makhaleng Bridge).

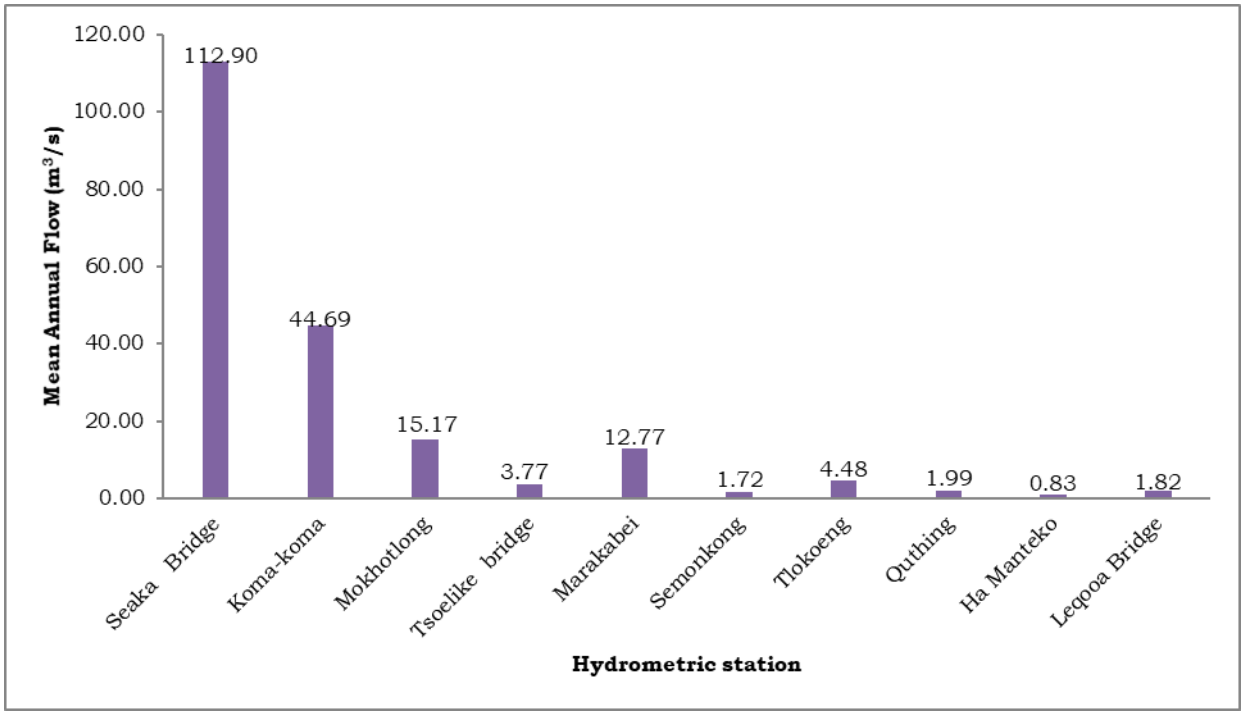
Figure 1.9: Mean Annual Flow (m^3/s) for Makhaleng Catchment



Source: Department of Water Affairs

Figure 1.10 demonstrates the mean annual flow for Senqu catchment. The highest mean annual flow was at the Seaka Bridge hydrometric station with 122.90 m^3/s. The least mean annual flow was at Ha Manteko hydrometric station (0.83 m^3/s).

Figure 1.10: Mean Annual Flow for Senqu Catchment



Source: Department of Water Affairs

1.7 Sanitation

Sanitation has to do with the availability of clean drinking water and the proper disposal of waste. The proper systems should be in place to ensure that either solid waste or wastewater does not contaminate clean water meant for consumption. Contaminated water may cause disease if consumed e.g. cholera. At the time of compilation of this chapter, sanitation data on other districts was not available.

Table 1.1 indicates the number of spring catchments constructed from 2015 to 2019. During 2015, the most Spring Catchments constructed were in Quthing with 41 while the least were 7 in Qacha's Nek. The greatest number of spring catchments constructed (10) in 2019 were in Berea and the least were in Quthing with 8.

Table 1.1: Number of Spring Catchments Constructed - 2015 to 2019

District	2015	2016	2017	2018	2019
Maseru	-	29	8	7	-
Berea	-	-	3	-	10
Qacha's Nek	7	2	-	9	-
Quthing	41	17	5	6	8
Total	**48**	**48**	**16**	**22**	**18**

Source: Department of Rural Water Supply

Table 1.2 shows the number of standpipes constructed from 2015 to 2019. The greatest number of standpipes (104) were constructed in Quthing during 2015 and the least (21) were in Quthing. In 2018, Maseru had the highest number of standpipes constructed with 161. During 2019, the maximum number of standpipes (50) were constructed in Berea and Quthing had the least number of 22.

Table 1.2: Number of Standpipes Constructed - 2015 to 2019

District	2015	2016	2017	2018	2019
Maseru	97	-	75	161	-
Berea	-	51	16	-	50
Qacha's Nek	21	5	-	24	-
Quthing	104	57	16	24	22
Total	**222**	**113**	**107**	**209**	**72**

Source: Department of Rural Water Supply

1.8 Summary

During the 2019/2020, the domestic water productions was 22, 791, 426 kilolitres and total domestic water consumption 11, 754, 110 kilolitres. Households remain the highest consumers of water when compared to other sectors. The country exported 639, 163 mm^3 of water in 2019. Water exports still remain one of the country's important sources of foreign revenue.

Two methods of channeling wastewater to treatment plants include tanks and sewerage lines. About 18, 770, 295 kilolitres of wastewater were generated and treated in 2019.

A total of 62, 605 persons were serviced with standpipes and ventilated pit latrines from 2015 to 2019 (for the district which have been covered in the sanitation section).

CHAPTER 2: LAND USE AND COVER

2.0 Introduction

Land is a unique environmental resource that delineates the space in which economic activities and environmental processes take place and within which environmental resources and economic assets are located. The two primary aspects of land are land cover and land use. These aspects are strictly related: while land cover describes the biophysical aspect of land, land use refers to the functional aspects of land.

Land use reflects both the activities undertaken and the institutional arrangements put in place for a given area for the purposes of economic production, or the maintenance and restoration of environmental functions. Land being "used" means the existence of some kind of human activity or management. Consequently, there are areas of land that are "not in use" by human activities. These areas are important from an ecological point of view. Land use statistics cover both land in use and land not in use (Framework for the Development of Environment Statistics, 2014).

2.1 Scope and Coverage

This chapter consists of secondary data collected from Roads Directorate and Ministry of Forestry and Land Reclamation. The results covered are for the entire country and range from 2015/2016 to 2019/2020.

2.2 Results

The results show the land under forests and other wooded land. Land under build-up and related land (road lengths) and land degradation is also covered.

2.3 Forests and other Wooded Land Area

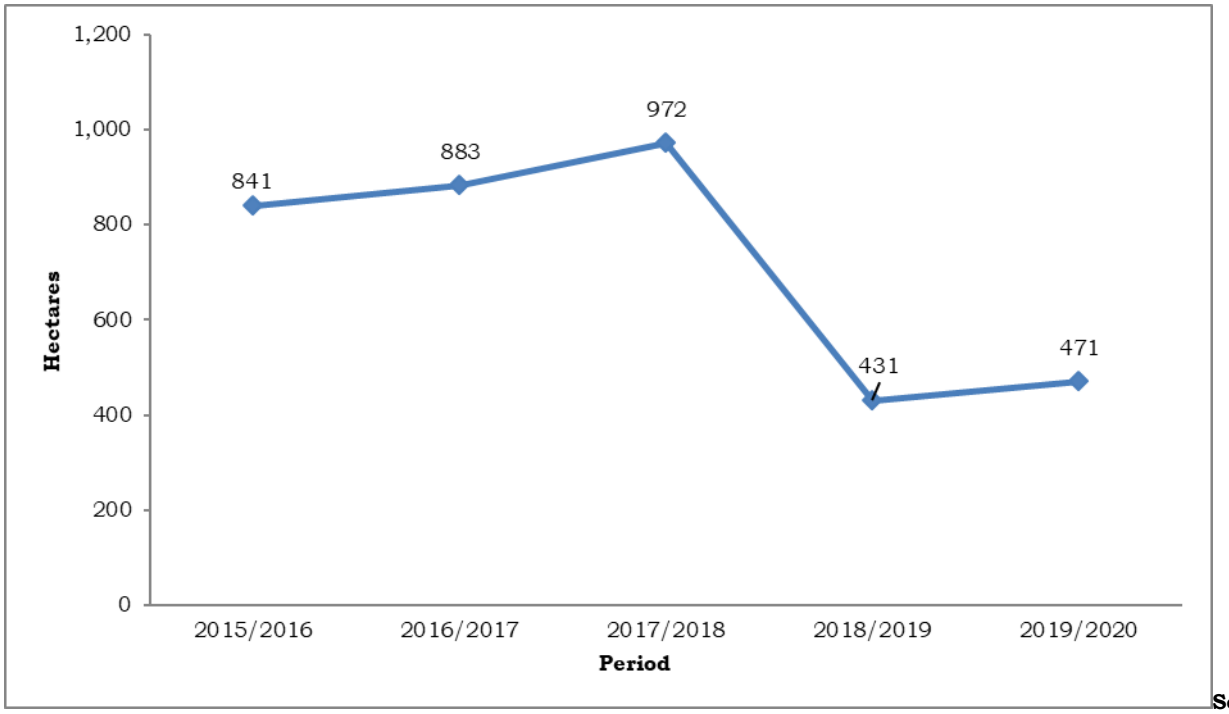
A forest is a complex ecosystem consisting of trees buffer the earth and support a myriad of life forms. The trees help create a special environment which, in turn, affects the kinds of animals and plants that can exist in the forest. http://edugreen,teri.res.in

2.3.1 Forests Area

Area covered by forests refers to land under forestry or no land use, spanning more than 0.005 km^2 (0.5 hectares); with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. Lesotho forest cover is 34,404 ha.

Figure 2.1 depicts the area planted forest trees in hectares for the period 2015/2016 to 2019/2020. Area planted forest trees increased from 841 hectares in 2015/2016 to 972 hectares in 2017/2018. It then decreased to 431 hectares in 2018/2019.

Figure 2.1: Area Planted Forest Trees in Hectares, 2015/2016 - 2019/2020



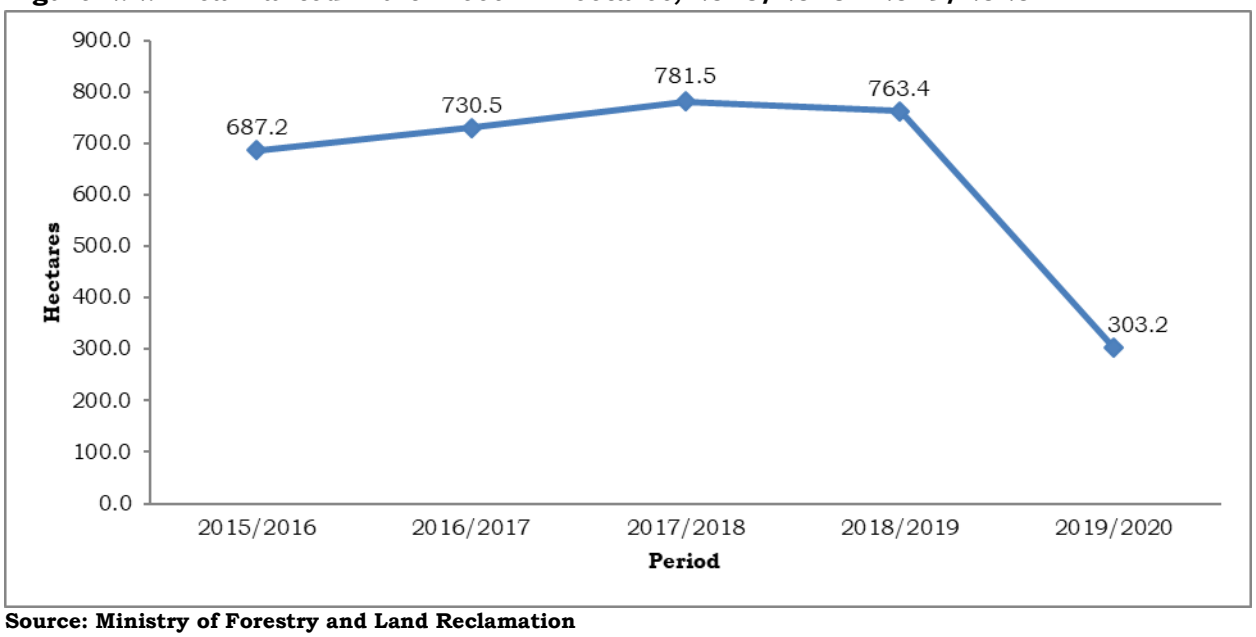
Source: Ministry of Forestry and Land Reclamation

2.3.2 Other Wooded Land Area

Area covered by other wooded land refer to land under forestry or no land use, spanning more than 0.005 km^2 (0.5 hectares); with trees higher than 5 meters and a canopy cover of 5-10 percent, or trees able to reach these thresholds in situ; or with a combined cover of shrubs, bushes and trees above 10 percent.

Figure 2.2 shows area planted fruit trees in hectares for the period 2015/2016 to 2019/2020. It is observed that the area planted fruit trees increased from 687.2 hectares in 2015/2016 to 781.5 hectares in 2017/2018, then decreased to 763.4 hectares in 2018/2019. The least area planted fruit trees was 303.2 hectares in 2019/2020.

Figure 2.2: Area Planted Fruit Trees in Hectares, 2015/2016 - 2019/2020



Source: Ministry of Forestry and Land Reclamation

2.4 Land under Roads

The lengths of roads were split into surfaced and un-surfaced (gravel and earth roads). These road lengths are for the roads that link the districts within the country (municipal roads are not included). Roads Undergoing equipment-based maintenance are roads maintained using machinery while no machinery/ equipment used in Roads Undergoing labour-based maintenance.

Table 2.1 shows the road lengths in kilometers (km) by description for the years 2015 to 2019. It is observed that the longest road lengths surveyed "Undergoing equipment-based maintenance" were found in 2019 (2,286.00km), while the longest roads "Undergoing labour – based maintenance" were in 2015 (2,106.55km). The shortest "Roads not surveyed/ not analysed" were in 2015 (362.92km)

Table 2.1: Road Lengths in kilometers (km) by Description and Year (2015-2019)

Year	Undergoing equipment-based maintenance	Undergoing labour-based maintenance	Roads not surveyed /not analysed	Total kilometres
2015	2,155.28	2,106.55	362.92	4,624.75
2016	2,256.01	1,835.47	533.27	4,624.75
2017	2,095.29	1,813.61	1,956.01	5,864.91
2018	2,149.00	1,920.00	1,847.00	5,916.00
2019	2,286.00	1,965.00	1,754.00	6,005.00

Source: Roads Directorate

2.5 Summary

Area planted forest trees was larger in 2017/2018 with 972 hectares and in the same year, area planted fruit trees was larger constituting 781.5 hectares. The longest road lengths surveyed 'Undergoing equipment-based maintenance' were found in 2019 (2,286.0km) while the longest roads "Undergoing labour – based maintenance" were in 2015 (2,106.55km).

CHAPTER 3: AIR AND CLIMATE CHANGE

3.0 Introduction

The United Nations Framework Convention on Climate Change, in its Article 1, defines climate change as: "a change of climate which is attributed directly or indirectly to human activity that alter composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time period".

Lesotho is highly vulnerable to the impacts of climate change, droughts, increasing frequency of extreme weather events, rising temperatures and extreme rainfall. UN News, 18 June 2018 on Climate Change indicates that, subsistence and small livelihood systems in Lesotho experience a number of stressors, in addition to climate change and climate variability. Since the poor do not have sufficient income to prepare and protect themselves from these adverse effects of climate change, they suffer tremendously, thus forcing more people to migrate and new conflicts are being triggered.

3.1 Scope and Coverage

The chapter consists of the following sections; rainfall changes, Ozone Depleting Substances (ODS) and/or Alternatives as well as airborne diseases from the Ministry of Health. This chapter comprises of secondary data of temperatures and precipitates from Lesotho Meteorological Service and ODS primary data collected from suppliers and technicians as well as domestic refrigerants collected from outlets in 2020.

3.2 Climate Change

The climate of Lesotho is continental temperate with distinct seasons of spring (September, October and November), summer (December, January and February), autumn (March, April and May) and winter (June, July and August) as well as some alpine characteristics that distinguish it from the rest of the Southern Africa sub-continent (LMS 2013).

3.3 Results

The results of monthly and annual mean (maximum and minimum) temperatures and rainfall are discussed, as well as ozone depleting substances and airborne diseases for the year 2020.

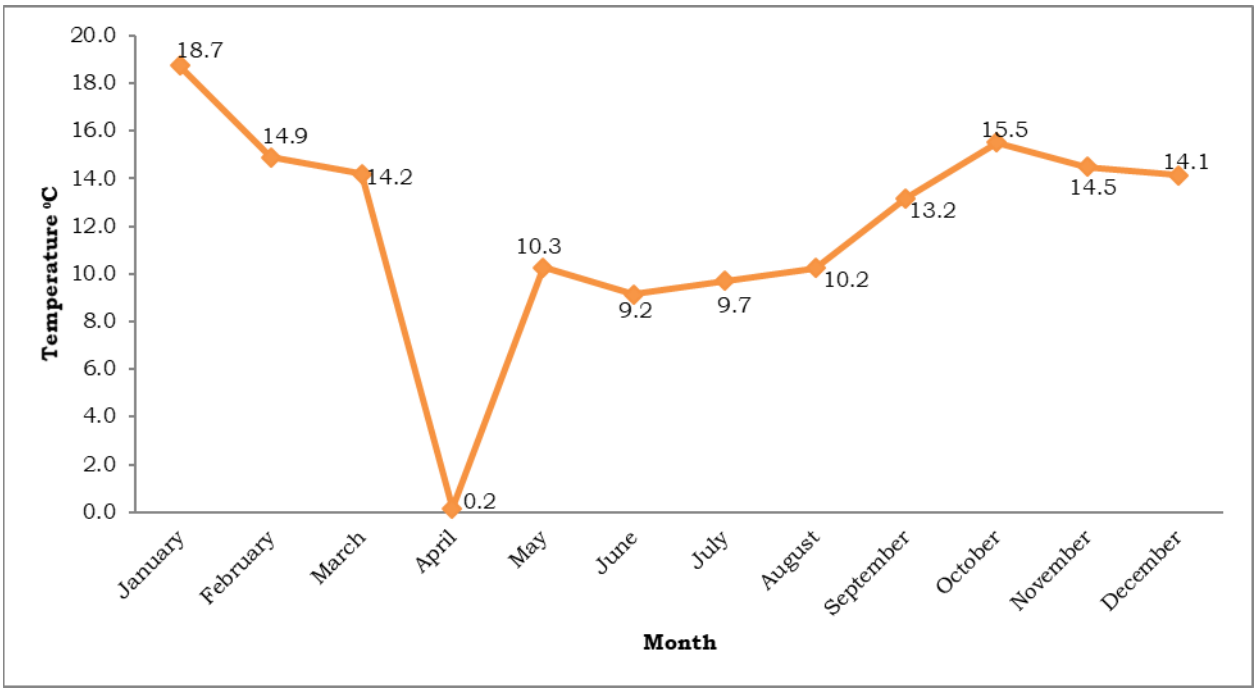
3.3.1 Maximum and Minimum Temperatures

World Meteorological Organization (1992) defines temperature as a physical quantity characterizing the mean random motion of molecules in a physical body. Temperature is characterized by the behavior whereby two bodies in thermal contact tend to an equal temperature. Air temperatures are usually observed at the site.

3.3.1.1 Monthly Mean Maximum and Minimum

Figure 3.1 depicts Monthly Mean Maximum Temperature in degrees Celsius (ºC) for the year 2020. The highest monthly mean maximum temperature for the year 2020 was observed in January with 18.7 ºC. There was a sharp decline of 98.6 percent of mean maximum temperature between March and April. The lowest monthly mean maximum temperature in 2020 was observed in April with 0.2 ºC.

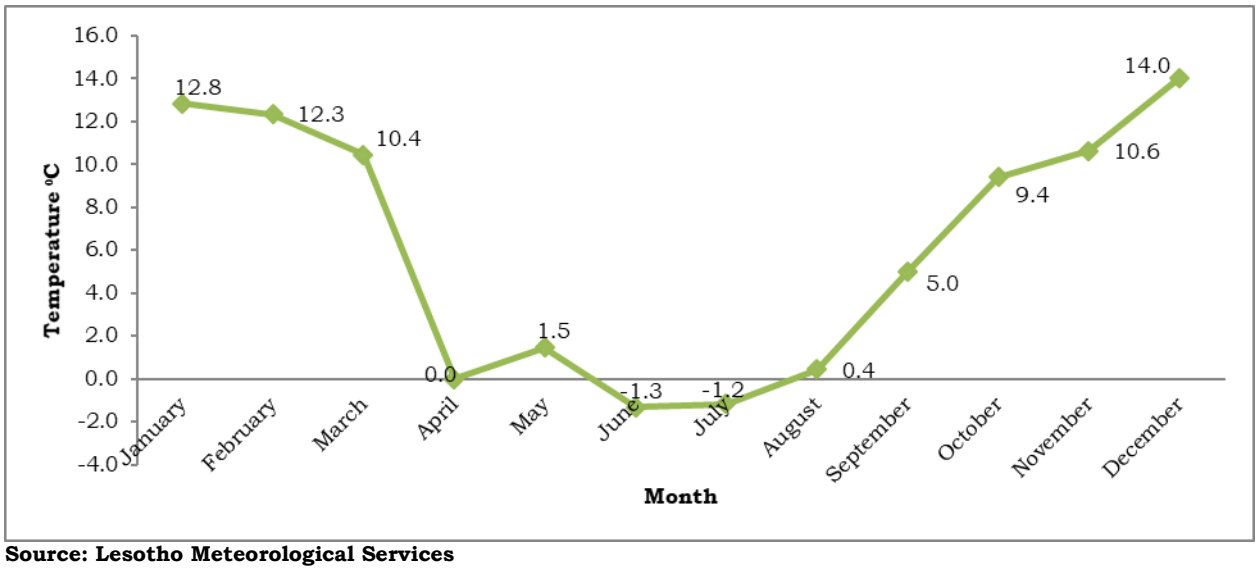
Figure 3.1: Monthly Mean Maximum Temperatures - 2020



Source: Lesotho Meteorological Services

Figure 3.2 portrays Monthly Mean Minimum Temperature in degrees Celsius (ºC) for the year 2020. The highest monthly mean minimum temperature for the year 2020 was observed in December and January with 14.0 ºC and 12.8 ºC respectively. The lowest monthly mean minimum temperatures were observed in June and July recording -1.3 ºC and -1.2 ºC respectively. The mean monthly temperatures began to rise above 0 ºC from August to December.

Figure 3.2: Monthly Mean Minimum Temperatures -2020



Source: Lesotho Meteorological Services

3.3.1.2 Annual Mean Maximum and Minimum Temperatures

Table 3.1 conveys Annual Mean Maximum Temperature in degrees Celsius (°C) by Sub-Stations for the year 2016 to 2020. From 2016 to 2020, Oxbow sub-Station had the lowest mean maximum temperature ranging from 15 °C to 15.8 °C when compared to other sub-Stations in the year followed by Semonkong sub-Station with mean maximum temperature ranging from 17 °C to 18.1 °C. It is worth noting that Qacha's Nek sub-Station recorded the highest mean maximum temperature of 25.7 °C in the year 2020 when compared to other stations for the same year.

Table 3.1: Annual Mean Maximum Temperature (°C) by Sub-Stations - 2016-2020

	Year				
Sub-Stations	**2016**	**2017**	**2018**	**2019**	**2020**
Botha-Bothe	21.3	22.3	22.0	22.7	22.0
Leribe	22.1	22.3	23.0	23.4	22.5
Mafeteng	22.8	21.8	23.0	23.5	22.6
Mejametalana	23.3	22.7	23.0	23.7	0.0
Mohale'sHoek	23.9	23.6	22.0	23.1	23.3
Mokhotlong	20.9	20.6	18.0	18.8	0.0
Moshoeshoe1	23.2	22.9	23.0	23.9	22.8
Oxbow	15.3	15.8	15.0	15.8	15.3
Phuthiatsana	24.9	21.5	23.0	24.3	23.6
Qacha's Nek	21.5	22.2	19.0	19.5	25.7
Quthing	22.9	22.0	21.0	22.1	22.4
Semonkong	17.5	17.1	17.0	18.1	17.4
Thaba-Tseka	20.1	18.6	18.0	19.2	0.0
Average Maximum	**21.5**	**21**	**20.5**	**21.4**	**16.7**

Source: Lesotho Meteorological Services

Table 3.2 shows Annual Mean Minimum Temperature (°C) by Sub-Stations for the years 2016 to 2020. The annual mean minimum temperature was least in 2017 with 7.1 °C. The highest values of the average annual mean minimum temperature were observed in 2019 and 2016 with 8.3 °C and 8.0 °C respectively.

Table 3.2: Annual Mean Minimum Temperature (°C) by Sub-Stations - 2016-2020

	Year				
Sub-Stations	**2016**	**2017**	**2018**	**2019**	**2020**
Botha-Bothe	10.0	7.9	8.0	9.1	7.7
Leribe	8.9	7.8	9.0	9.9	7.5
Mafeteng	7.5	9.2	10.0	11.1	7.9
Mejametalana	8.5	10.8	10.0	10.5	10.6
Mohale'sHoek	9.6	9.2	9.0	10.2	8.6
Mokhotlong	6.1	5.4	4.0	5.8	5.7
Moshoeshoe1	9.9	9.2	10.0	10.1	9.1
Oxbow	2.3	2.2	3.0	4.2	1.0
Phuthiatsana	13.2	9.1	10.0	10.4	8.9
Qacha's Nek	7.3	0	5.0	6.3	8.2
Quthing	10.1	11.7	9.0	9.2	9.2
Semonkong	4.1	3.4	4.0	4.9	4.6
Thaba-Tseka	6.7	6.0	5.0	6.0	6.2
Average Minimum	**8.0**	**7.1**	**7.4**	**8.3**	**7.3**

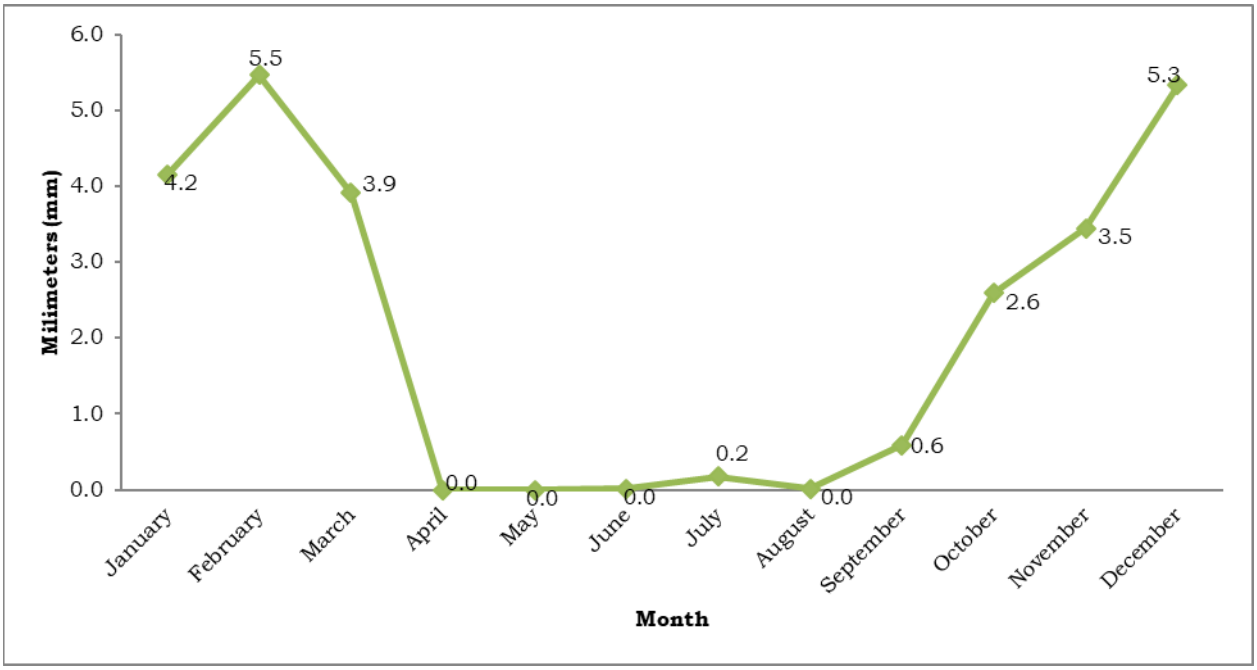
Source: Lesotho Meteorological Services

3.3.2 Precipitation

Precipitation is any liquid or frozen water that forms in the atmosphere and falls back to the Earth. It comes in many forms, like rain, sleet, and snow. Along with evaporation and condensation, precipitation is one of the three major parts of the global (https://www.nationalgeographic.org/encyclopedia/precipitation).

Figure 3.3 illustrates Monthly Mean Rainfall for the year 2020. The maximum monthly mean rainfall is observed to have been in February and December with 5.5 and 5.3 mm of rainfall respectively. There had been a decline of monthly mean rainfall from March to April. The lowest monthly mean rainfall was below 1 mm from April to August with a slight increase in July. Thereafter, an increase in monthly mean rainfall was observed from August to December.

Figure 3.3: Monthly Mean Rainfall for the year 2020



Source: Lesotho Meteorological Services

Table 3.3 displays Annual Mean Rainfall in millimeters (mm) by Sub-Stations for the year 2016 to 2020. The least average (1.9 mm) annual mean rainfall was observed in 2019 followed by 2.0 mm and 2.4 mm both calculated for 2017 and 2020 respectively. In 2018 the highest average annual mean rainfall was 8.5 mm.

Table 3.3: Annual Mean Rainfall (mm) by Sub-stations and year -2016-2020

	Year				
Sub-Stations	**2016**	**2017**	**2018**	**2019**	**2020**
Botha-Bothe	3.5	1.8	2.4	1.5	2.5
Leribe	4.8	2.0	7.8	1.8	2.4
Mafeteng	1.6	1.7	11.3	1.9	2.4
Mejametalana	2.4	1.8	7.6	2.7	2.3
Mohale'sHoek	2.4	1.8	10.6	2.2	2.2
Mokhotlong	1.5	1.6	6.9	2.0	2.3
Moshoeshoe1	2.3	1.8	8.2	2.1	2.3
Oxbow	3.8	2.9	10.7	2.0	3.5
Phuthiatsana	1.6	1.5	11.6	1.9	1.7
Qacha's Nek	2.4	3.1	9.0	2.4	2.7
Quthing	1.9	1.9	9.1	1.2	2.8
Semonkong	2.3	2.2	8.8	1.4	2.3
Thaba-Tseka	1.6	1.6	6.1	1.8	1.7
Average rainfall	**2.5**	**2.0**	**8.5**	**1.9**	**2.4**

Source: Lesotho Meteorological Services

3.3.3 Airborne Diseases

Airborne diseases are caused by pathogenic microbes small enough to be discharged from an infected person via coughing, sneezing, laughing and close personal contact or aerosolization of the microbe. The discharged microbes remain suspended in the air on dust particles, respiratory and water droplets. Illness is caused when the microbe is inhaled or contacts mucus membranes or when secretions remaining on a surface are touched https:// www.maine.gov /dhhs/mecdc /infectiousdisease /epi/airborne/ index.shtml.

Table 3.4 indicates Number of Patients with Airborne Diseases by Type of Disease for the year 2020. It is shown from the table that in 2020, the greatest number of patients were diagnosed with Tuberculosis with 571 patients followed by Whooping Cough with 34 patients. The airbone disease with the least number of patients was Rubella (8 patients).

Table 3.4: Number of Patients with Airborne Diseases by Type of Disease – 2020

Diagnosis	Patients
Diphtheria	14
Whooping Cough	34
Rubella	8
Tuberculosis	571
Measles	28

3.3.4 Ozone Depleting Substances and Alternatives

Emissions to air are gaseous and particulate substances released to the atmosphere by establishments and households as a result of production and accumulation activities. Ozone Depleting Substances (ODS) is another important category of emissions that is actively monitored by the Montreal Protocol (Revised Framework for the Development of Environment Statistics, 2012). However, as emissions of these substances are difficult to measure directly, countries report on the apparent consumption of ODS. ODS Alternatives are substances that are climate-friendly whereas ODS are opposite.

Table 3.5 shows type of ODS gases imported by number of cylinders bought and quantity for the year 2020. The most imported ODS gas by quantity is R22 with 10.844.90 grams, followed by R404A and R410A with approximately 8,198.70 grams and 6212.45 grams respectively. The least imported gas is R406 with 40 grams.

Table 3.5: Type of Imports of ODS Gases by Cylinders and Quantity (grams) – 2020

Type of ODS	No of cylinders	Quantity
R134a	207.00	5,410.14
R22	153.00	10,844.90
R290	32.00	152.58
R404A	126.00	8,198.70
R406	3.00	40.00
R408	5.00	57.40
R410A	101.00	6,212.45
R507	8.00	450.50
R600a	104.00	1,441.80
Other Specify	6.00	60.97

3.3.5 Refrigerants

A refrigerant is a substance used in a heat cycle to transfer heat from one area, and remove it to another. It is usually a gas at room temperature. It is found in pretty much everything that cools, and sometimes in things that heat, most commonly air conditioners, fridges, freezers, and vehicle air conditioners.

http://www.ecofeet.com.au › services › whatisrefrigerant.

Table 3.6 shows the Type of Refrigerant and Quantity collected from outlets in 2019/2020. R600 was the most collected refrigerant followed by NH_3 with 30,642 grams and 5,869 respectively. The least gas collected is Propane with 6 grams.

Table 3.6: Type of Refrigerant and Quantity (grams) -2019/2020

Refrigerant type	Quantity (Grams)
Butane	68
NH_3	5,869
Propane	6
R134a	754
R600	30,642

3.3.6 Summary

The highest monthly mean maximum temperature for the year 2020 was observed in January with 18.7 °C. The highest monthly mean minimum temperature for the year 2020 was observed in January and December with 13.3 °C and 13.1 °C respectively. Oxbow sub-Station had the lowest mean maximum temperature ranging from 15 °C to 15.8 °C when compared to other sub-Stations in the year followed by Semonkong sub-Station with mean maximum temperature ranging from 17 °C to 18.1 °C.

The greatest number of patients were diagnosed with Tuberculosis with 571 patients followed by Whooping Cough with 34 patients. R600 was the most collected refrigerant followed by NH_3 with 30,642 grams and 5,869 respectively. The least gas collected is Propane with 6 grams.

CHAPTER 4: BIODIVERSITY

4.0 Introduction

Biodiversity refers to all variety of life that can be found on earth as well as the communities they form and the habitats in which they live. It is comprised of several levels starting with genes, individual species, communities of creatures and their ecosystems where life interplays with the physical environment (Carrington, 2018).

Biodiversity is important for mankind and serves as a 'natural capital' for sustainable development. It supports lives and livelihoods through supply of supporting, provisioning, regulatory and cultural ecosystem goods and services. Lesotho lies entirely within the Grassland Biome and is incredibly rich in natural and cultural diversity, has unique habitats and high levels of endemism (Mucina and Rutherford, 2006). Thirty percent of endemism falls within the biodiversity hotspot area of the Drakensberg Alpine Center (DAC). Biodiversity plays a pivotal role in sustaining Basotho's wellbeing, particularly for the poor and unemployed (LAFSIP, 2014). Many Basotho, especially those living in rural areas depend heavily on rangelands, indigenous plant species, wetlands and eco-tourism.

Keeping biodiversity intact is also vital for ensuring ongoing provision of ecosystem services such as provision of clean water from wetlands. Despite the value of biodiversity to Lesotho's socio-economic growth, several threats undermine the resilience of ecosystems to provide goods and services for Basotho. Most of these threats are anthropogenic in nature, whether directly or indirectly, and include over-exploitation, overgrazing, wild fires, loss or modification of natural habitat including rivers, climate change and invasion by alien species.

4.1 Scope and coverage

The results from this chapter are for the entire country and the data used is secondary collected from different ministries.

4.2 Results

The analysis on this chapter is presented by charts and tables. The results indicate the number of different animal species, plant species, invasive alien species, conserved catchments, wetlands and protected areas.

4.3 Animal Species

Humans make use of many other animal species for different purposes, such as for food (including meat, milk, and eggs), for materials (such as leather and wool), and also as pets, and for transport, as well as working animals. Dogs have been used in hunting, while many terrestrial and aquatic animals were hunted for sports.

The last inventory of animal species in Lesotho was done in the year 2000 by Ministry of Tourism, Environment and Culture – Department of Environment (**refer to annex A table 1).**

4.3.1 Vertebrates' Status

Vertebrates' status refers to the availability of vertebrates in every living day. For the discussion of the present status of vertebrates, the convenient and simple coding was used as follows; Abundant (species likely to be encountered in significant or even large numbers throughout Lesotho or in certain areas of Lesotho), Common (species frequently encountered), Uncommon (species infrequently encountered, or species common only in a restricted location), Rare (species for which there have been less than 10 reliable records since 1950), Single Record (species for which there has been only a single record since 1950), and Historical (all records for species in Lesotho that are earlier than 1950) (**Refer to annex A table 2)**

4.4 Plant Species

Plants are a group of living organisms that are typically characterized by their green colour. They include common groups such as trees, herbs, flowers, ferns and algae. Different types of plants are discussed as the following; Thallophytes (referred to as lower plants and these are organisms that includes micro-organisms such as yeasts, as well as more familiar mushrooms), Bryothytes (refer to all land plants that do not have true vascular tissue), Pteridophytes (plants with tissues which conduct water and nutrients), Gymnosperms (seed bearing but non-flowering plants) and Angiosperms (flowering plants). (**Refer to annex A table 3).**

4.5 Invasive Alien Species (IAS)

The invasive alien species as those plant or animal life that have been introduced deliberately or unintentionally outside their natural distribution where they have the ability to establish themselves, invade, out-compete native species and take over environments or ecosystems and threaten biological diversity (The National Environment Secretariat (2005)). Invasive alien species are thought to be the most significant driver of the decline of plant and animal populations and species extinctions (United Nations Environment Program, 2003).

Table 4.1 shows number of invasive alien species by type in terrestrial and aquatic environment. Plants constitute the most common type of alien invasive species with 51 species on terrestrial and 3 in aquatic environment. There are 4 aquatic fauna invasive alien species.

Table 4.1: Number of Alien Invasive Species by Type in Terrestrial and Aquatic Environment- 2005

Species	Terrestrial	Aquatic
Plants	51	3
Birds	2	
Invertebrates	3	-
Mammals	1	-
Aquatic fauna		4
Micro-organisms	1	-

Source: Department of Environment

***Note (-) data not available**

4.6 Ecosystems

An ecosystem is a community of living organisms (biotic) in conjunction with the non-living components (abiotic) of their environment, interacting as a system. (https://en.m.wikipedia.org, n.d.).

4.6.1 Wetlands

Wetlands are areas where water is the primary factor controlling the environment and the associated plant and animal life. They occur where the water table is near the surface of the land or where the land is covered by the water (Ramsar, 1979). The wetlands facilitate sustained flow, clean water for Lesotho and much of Southern Africa. Wetlands fall under three categories: palustrine, lacustrine system and riverine system (Lesotho Environment Outlook Report, 2014).

Land use practice in Lesotho, mainly in highlands is non-sustainable. Despite the importance of the high mountain wetlands as local and regional water services, they continue to be degraded, mainly because of uncontrolled livestock grazing and trampling, infrastructure development, siltation and erosion, encroachment, cultivation and over exploitation of resources hence the need for their monitoring.

Table 4.2 shows area of wetlands and catchments in hectares (ha). Matsoku wetland has the largest area of 77,300 hectares and the catchment area of 743 hectares followed by Mokhotlong wetland with an area of 8,164 hectares. Khalong-la-lithunya wetland has the least area of 404 hectares.

Table 4.2: Area (ha) of Wetlands and Catchments -2014/2015

	Area	
Wetland Name	**Wetlands**	**Catchments**
Matsoku	77,300	743
Khalong –la- lithunya	404	28,717
Mokhotlong	8,164	87,900

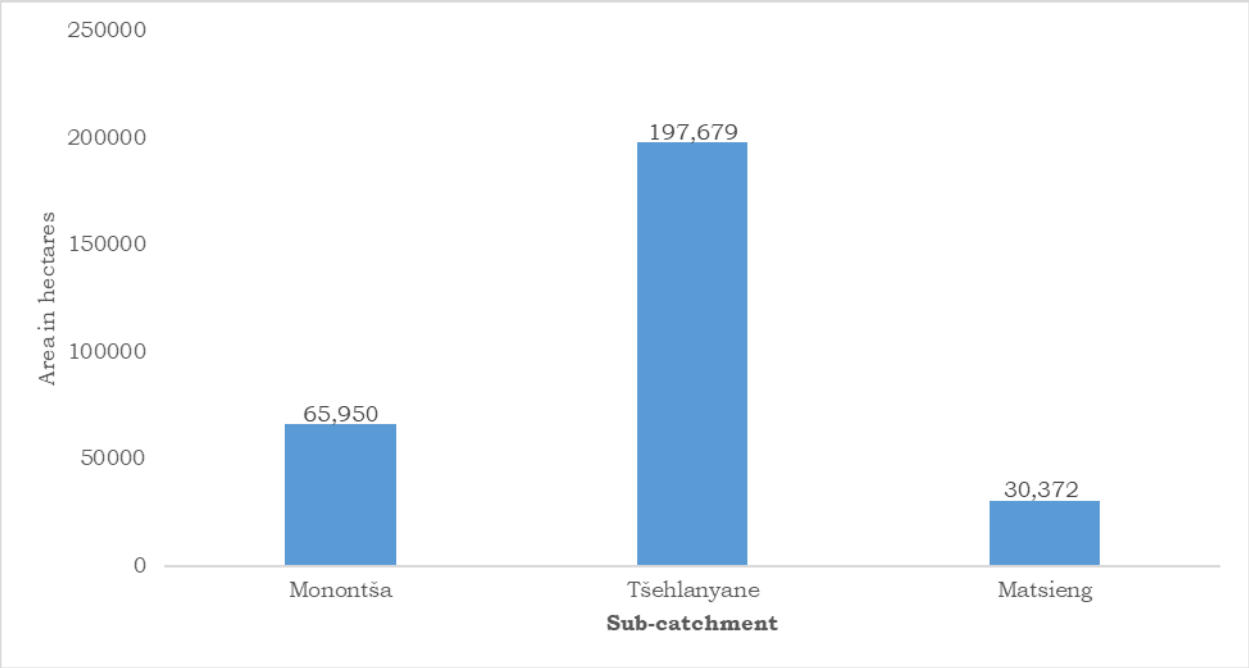
Source: Department of Water Affairs

4.6.1.1. Sub-Catchment Areas

Sub-catchment area refers to a smaller area within the catchment that bears similar characteristics with the main catchment.

The total area of Monontša, Tšehlanyane and Matsieng sub-catchments in hectares is portrayed in figure 5.1. Tšehlanyane sub-catchment forms the largest area of 197,679 hectares. Matsieng has the least area of 30,372 hectares.

Figure 4.1: Total Area (ha) of Monontša, Tšehlanyane and Matsieng Sub-Catchments - 2014/2015



Source: Department of Water Affairs

4.7 Rangelands

Many Basotho depend on rangelands making them one of the important ecosystems for sustaining livelihoods. Rangelands provide resources such as grasses which serve as forage for livestock.

4.7.1 Rangeland Fires

Fires in the Grassland biome occur as a natural regime which is useful to biodiversity in that biome. Fire is a part of the grassland ecosystem and helps maintain its health and vigor. It warms up the soil and reduces the leaf litter that accumulates the soil each year allowing sunlight to penetrate. Warming the soil increases microbial activity which releases nutrients from decaying plant material that new grasses and flowers need to grow. Thus, radical deviation in the natural fire regime such as total exclusion of fires for long periods of time, very frequent fires or seasonal fires will have an impact on the current biodiversity (Lesotho Environment Outlook Report, 2014).

Table 4.3 shows area burned in hectares by districts in 2013. Qacha's Nek experienced more fires with the largest burnt area of 7,213 hectares followed by Botha-Bothe with 5,431 hectares. Mafeteng had the least burned area of 21 hectares.

Table 4.3: Area (ha) Burned by Districts-2013

Districts	Area burned
Botha-Bothe	5,431
Leribe	2,091
Berea	687
Maseru	2,275
Mafeteng	21
Mohale's Hoek	794
Quthing	279
Qacha's Nek	7,213
Mokhotlong	5,517
Thaba-Tseka	1,910

Source: Department of Environment

4.8 Botanical Gardens

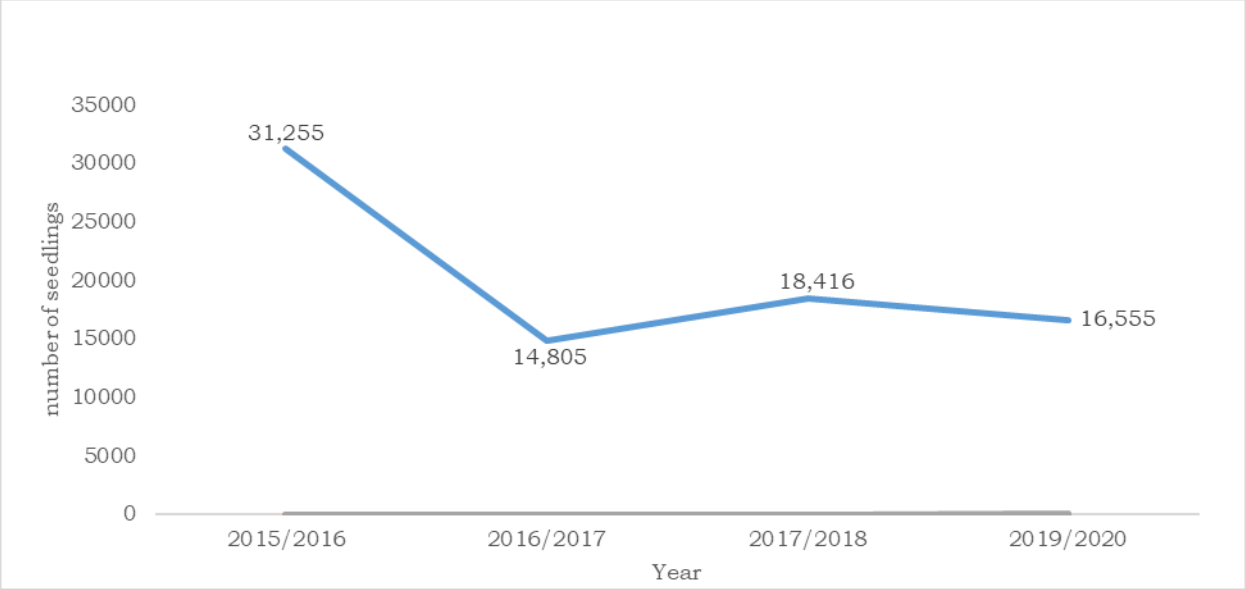
Botanical gardens are gardens where plants are gathered together for systematic study. They play a major role in conserving rare and endangered species and preserving the threatened habitats (Soderstrom.M, 2008).

4.8.1 Plants Propagation

Plants propagation is the process which grows new plants from a variety of sources: seeds, cuttings and other plant parts.

Figure 4.2 illustrates the total number of propagated seedlings at Katse Botanical Garden for the period 2015/2016 to 2019/2020 with 2018/2019 excluded due to unavailability of data. The highest total number of propagated seedlings was recorded in 2015/2016 with 31,255 species, followed by 18,416 seedlings in 2017/2018. The lowest number of recorded seedlings propagated was observed in 2016/2017 with 14,805 species

Figure 4.2: Number of Seedlings Propagated at Katse Botanical Garden - 2015/2016-2019/2020.



Source: Katse Botanical Garden

4.8.1.1 Plant Species

The most propagated plant species at Katse botanical garden for the year 2017/2018 are shown in table 4.4. Asparagus Asparagiodes (sethota-sa-mathuela) was the most propagated with 5,977 species followed by Aloe Polyphylla (kharetsa) with 4,046 species seedlings. There were 788 species of Phylegius Capensis (Mafifi-matso) propagated.

Table 4.4: The Most Propagated Plant Species at Katse Botanical Garden - 2017/2018

Plant species	Number
Asparagus Asparagiodes	5,977
Aloe Polyphylla	4,046
Galtonia Viridiflora	1,631
Tulbaghia Alliacea	1,347
Leucosidea Sericea	1,202
Hesperantha Coccinea	1,014
Phylegius Capensis	788

Source: Katse Botanical Garden

Table 4.5 presents the most propagated plant species at Katse Botanical Garden for the year 2019/2020. Leucosidea Sericea (cheche) was the most propagated with the highest number (8,809) followed by Aloe Ecklonis (moroba-lihale) with 3,494 species. Olea Africana (mohloare) had 363 species.

Table 4.5: The Most Propagated Plant Species at Katse Botanical Garden-2019/2020

Plant species	Number
Leucosidea Sericea	8,809
Aloe Ecklonis	3,494
Aloe Polyphylla	733
Withania Somnifera	735
Heteromorpha Trifoliata	639
Euthobia Clavariodes	598
Diospyros Austro Africana	488
Olea Africana	363

Source: Katse Botanical Garden

Table 4.6 reveals the number of seedlings propagated at Katse botanical garden for the period 2015/2016 to 2019/2020. The number of Leucosidea sericea seedlings propagated was higher in 2019/2020 (8,809) followed by 2016/2017 (2,637). In 2017/2018 a decrease from 2,637 to 1,202 seedlings was observed which constitutes a decline of 54.0 percent. The number of Hesperantha coccinea had increased from 2015/2016 (719) to 2016/2017 (953) by 234 seedlings. A major decline was observed in 2019/2020 whereby the number of seedlings propagated decreased from 1014 to 5 species indicating a decrease by almost 100.0 percent.

Table 4.6: Number of Seedlings Propagated at Katse Botanical Garden- 2015/2016-2019/2020

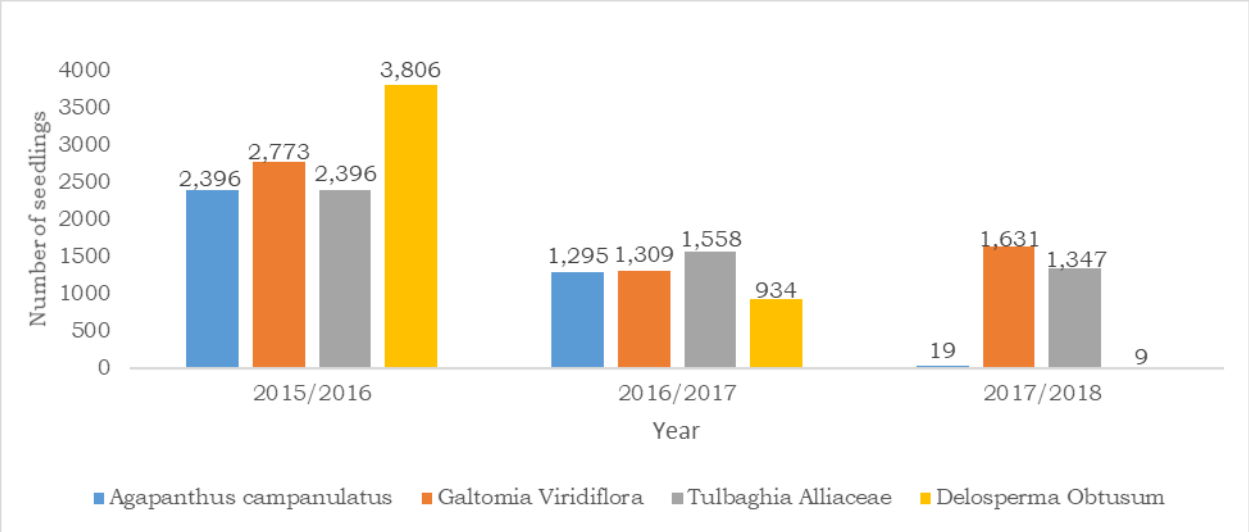
Plant species	2015/2016	2016/2017	2017/2018	2019/2020
Aloe polyphylla	106	693	4,046	733
Leucosidea sericea	1,837	2,637	1,202	8,809
Cortiledon orbiculata	3,786	1,025	289	90
Heteromorpha trifoliate	3,457	358	38	639
Eucomis automnalis	78	516	767	120
Hesperantha coccinea	719	953	1,014	5

Source: Katse Botanical Garden

Note: Data not available for 2018/2019

Figure 4.3 depicts the number of seedlings propagated for the period 2015/2016 to 2017/2018. In 2015/2016 there were 3,806 seedlings of Delosperma Obtusum propagated. There was a decrease in the number of Delosperma Obtusum seedlings propagated in 2016/2017 (934) and in 2017/2018 (9) which accounted for a decrease of 75.0 percent and 99.0 percent respectively. Overall, a decline in the number of seedlings propagated in all the years was observed except in 2017/2018 where the number of Galtomia Viridiflora seedlings propagated increased from 1309 to 1631 in 2017/2018.

Figure 4.3: Number of Seedlings Propagated at Katse Botanical Garden-2015/2016-2017/2018



Source: Katse Botanical Garden

4.9 Protected Areas

Protected areas are a mainstay of biodiversity conservation, while also contributing to people' livelihoods, particularly at the local level. Protected areas are at the core of efforts toward conserving nature and the services it provides: food, clean water supply, medicines and protection from the impacts of natural disasters (International Union for Conservation of Nature, 2008).

Lesotho has very little area under protection with only 14,299 hectares of it being formally protected. The three formal protected areas: Sehlabathebe National Park, Bokong Nature Reserve and Tšehlanyane National Park are currently the only effective conservation areas in Lesotho (Lesotho Environment Outlook, 2014).

4.9.1 Biosphere Reserves

Biosphere reserves are areas of terrestrial and coastal ecosystems promoting solutions to reconcile the conservation of biodiversity with its sustainable use (http://www.fundy-biosphere.ca, n.d.)

The proposed Matšeng Biophere Reserve report 2020 indicates that, a total of 380 floral species were recorded at the biosphere reserves which encompasses: Tšehlanyane and Bokong reserves of which 30 are locally protected. A total of 16 mammal species were recorded ranging from rats, jackals, dassies, rabbits as well as the baboons.

Table 4.7 displays the types of floral species at Tšehlanyane and Bokong reserves. The Herbs had the highest number (185) followed by Shrubs with 65 species. Sedge had the lowest number (3).

Table 4.7: Types of Floral Species at Tšehlanyane and Bokong Reserves for 2020

Types	Number
Trees	23
Herbs	185
Grass	38
Forbs	34
Succulent	14
Shrubs	65
Orchid	7
Ferns	5
Sedge	3
Other	6
Total	**380**

Source: Department of Environment

4.9.1.1 Floral Species

Rural people in Lesotho and most of southern Africa depend heavily on biological resources for their livelihoods. Plants, in particular, are used for food, medicine, construction, handicrafts, and many other needs that the government and the social welfare system cannot meet (Letsela, 2004).

Table 4.8 shows the uses and number of floral species at Tšehlanyane and Bokong reserves. It is observed that the use of Medicinal plants was highest (131) followed by Firewood and Grazing with 30 species each. Other uses (28) comprise: brooms, ornaments, tobacco, fumigant, poles, parasitic, fishing, ointment, handicrafts, dye, ropes, grains protector, whistles (pilopilo), cosmetics, hedge, mats and hats.

Table 4.8: Uses and Number of Floral Species at Tšehlanyane and Bokong Reserves- 2020

Uses of Plant Species	Number
Firewood	30
Medicinal	131
Grazing	30
Eaten	13
Thatching	8
Other uses	28

Source: Department of Environment

4.9.1.2 Faunal species

Animals (fauna) species are classified into vertebrates (with backbone) and invertebrates (without backbone). Vertebrates consist of five classes: reptiles, amphibians, fish, mammals, and birds.

Table 4.9 shows the faunal species by group and number at Tšehlanyane and Bokong reserves. There are 129 faunal species at the biosphere reserve. Birds have the highest number of species (53) followed by the Invertebrates with 47. Fish had the least number of species (2).

Table 4.9: Faunal Species by Group and Number at Tšehlanyane and Bokong Reserves- 2020

Faunal Species	Number
Reptiles	7
Birds	53
Amphibians	4
Fish	2
Mammals	16
Invertebrates	47
Total	**129**

Source: Department of Environment

Table 4.10 presents the invertebrates' species by type and number at Tšehlanyane and Bokong reserves. The Insects constitute the largest number (43) of the invertebrates. The Crustaceans and Arachnids' species have the smallest number (1). The total number of the invertebrate species is 47.

Table 4.10: Invertebrates Species by Type and Number –Tšehlanyane and Bokong Reserves- 2020

Type of invertebrates	Number
Insects	43
Crustaceans	1
Myriapods	2
Arachnids	1
Total	**47**

Source: Department of Environment

4.9.1.3 Forms of insects

Insects come in all shapes and sizes. Most of them come from one of the main groups: beetles, bees and their relatives, bugs, flies, crickets and dragonflies.

Table 5.11 shows the insects observed by form and number at Tšehlanyane and Bokong reserves. Butterflies make up the largest number (8) followed by Betle with 7 species. Dragonfly, Cockroach, Ant, Wasp and Mantid had the least number (1). There is a total of 43 insects.

Table 4.11: Insects Observed by Form and Number at Tšehlanyane and Bokong Reserved- 2020

Forms of Insects	Number
Butterfly	8
Grasshopper	4
Dragonfly	1
Cockroach	1
Weevil	2
Beetle	7
Ant	1
Bee	3
Locust	4
Moth	6
Bug	2
Wasp	1
Fly	2
Mantid	1
Total	**43**

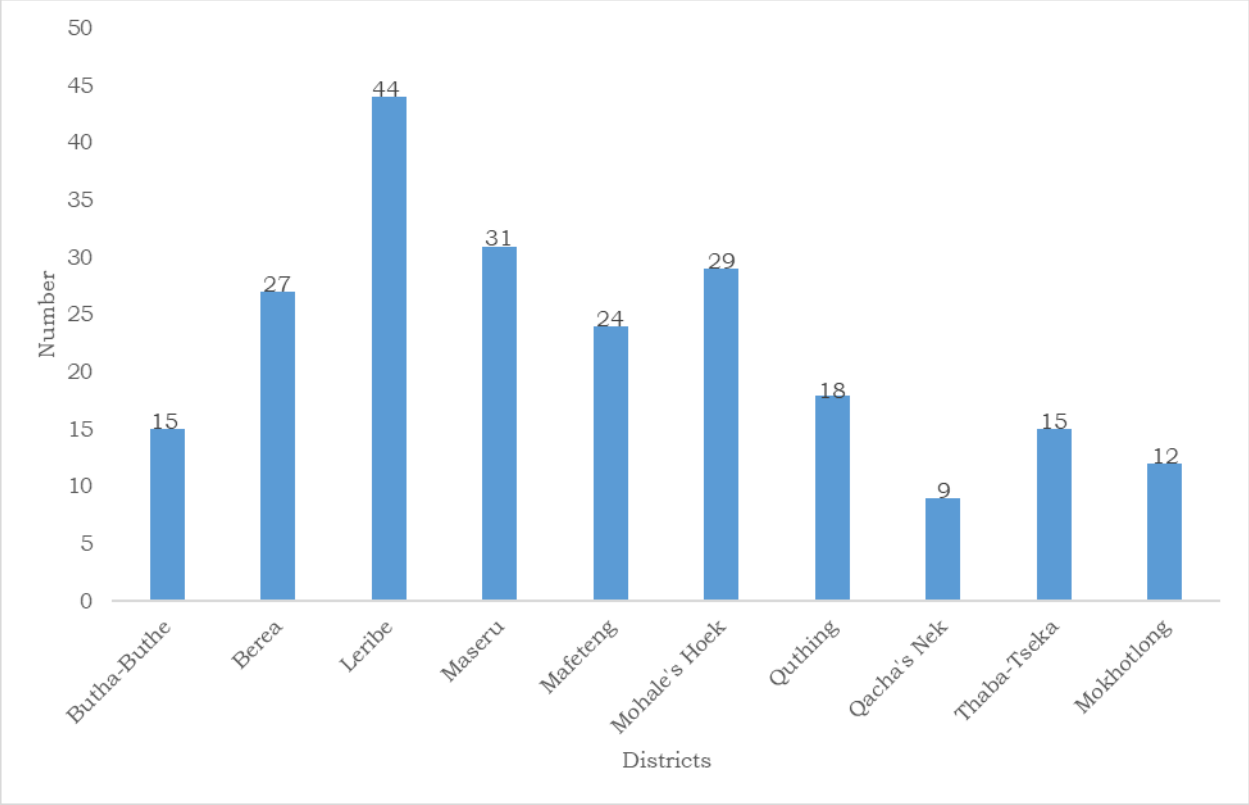
Source: Department of Environment

4.10 Conserved Catchment Areas

Soil that has been heavily eroded does not tend to hold onto water very well. This can lead to an increased risk of flooding, which can in turn lead to even more erosion of remaining soil, negatively impacting the biodiversity of an ecosystem. The areas that are identified as eroded are conserved using structures such as, silt traps, diversions and stone lines.

Figure 4.4 portrays the number of conserved catchment areas by districts for the year 2019/2020. It was observed that, the number of conserved catchment areas was higher in Leribe with 44 areas followed by Maseru with 31conserved catchment areas. Qacha's Nek had the lowest number (9) of conserved catchment areas.

Figure 4.4: Number of Conserved Catchment Areas by Districts - 2019/2020



Source: Department of Soil and Water Conservation

4.11 Summary

Plants constitute the most common type of invasive alien species with 51 species on terrestrial and 3 in aquatic environment. Matsoku wetland has the largest area of 77,300 hectares followed by Mokhotlong wetland with an area of 8,164 hectares. The district which experienced more fires in 2013 was Qacha's Nek with the largest burned area of 7,213 hectares. Mafeteng had the least burnt area of 21 hectares.

The highest total number of propagated seedlings at Katse Botanical Garden was recorded in 2015/2016 (32,255) and the lowest recorded number was observed in 2016/2017 (14,805). A decrease in the number of Leucosidea sericea seedlings propagated was observed in 2017/2018 which constituted a decline of 54 percent.

A total of 380 floral species and 129 faunal species were recorded at Tšehlanyane and Bokong reserves. Leribe has the highest number of conserved catchment areas and Qacha's Nek had the lowest number (9) of the conserved catchment areas.

ANNEX

Table 1: Animal Species by Type and Number - 2000

Type of Species	Number of current Species	Number of historical species
Mammals	63	19
Birds	318	22
Reptiles	40	3
Amphibians	19	*
Fish	14	*
Invertebrates	1,279	*
Total	**1,733**	**44**

Source: National Environment Secretariat

Table 2: Vertebrates Status by Type - 2000

	Status						
Vertebrates Type	**Abundant**	**Common**	**Uncommon**	**Rare**	**Single record**	**Historical**	**Total**
Mammals	3	10	15	27	8	19	**82**
Birds	30	86	81	80	41	22	**340**
Reptiles	3	11	1	16	9	3	**43**
Amphibians	6	2	4	5	2	*	**19**
Fish	1	8	5	*	*	*	**14**

Source: National Environment Secretariat

Table 3: Plant Species by Type and Number - 2000

Type of Plant Species	Number of Species	Number of Subspecies
THALLOPHYTES (Algae and Fungi)	132	*
BRYOTHTES (Mosses, Liverworts and Hornworts)	279	3
PTERIDOPHYTES (Ferns and Fern Allies)	85	1
GYMNOSPERMS	62	1
ANGIOSPERMS	2,535	172
Total	**3,093**	**177**

Source: National Environment Secretariat

Table 4: 2017/2018 Seedling Propagation of Rare and Threatened Plant Species in the KBG Nursery Site

Seed sown	Total
Eucomis automnalis	767
Delosperma obtusum	9
Aloe broomii	322
Aloe polyphylla	4,046
Tulbaghia alliancea	1,347
Kniphofia caulescence	128
Kniphofia ensfolia	18
Agapanthus campanalatus	19
Heteromorpha tripholiata/aboresence	38
Galtonia veridiflora	1,631
Cotyledon orbiculata	289
Sutherlandia montana	146
Elephantina elephantoriza	68
Diarma spp.	269
Asparagus asparagoides	5,977
Diospyros austro-africana	177
Dicoma anomala	47
Phygelius capensis	788
Leucosidea sericea	1,202
Hesperantha coccinea	1,014
Aloe ferox	56
Boophane disticha	10
Brunsvigia grandiflora	23
Olea Africana	13
Euphobia clavaroides	12
Total	**18,416**

Table 5: Propagation of Seeds in Katse Botanical Garden 2019/2020

Species	Number of Seedlings
1.Leucosedia sericea	8,809
2.Dicoma anomala	35
3.Eucomis automnalis	120
4.Cotyledon orbiculata	90
5.Haemanthus humilis	1
6.Xysmalobium	15
7.Olea africana	363
8.Buddleja loricata	36
9.Diospyros austro africana	488
10.Moraea huttonii	53
11.Aloe ecklonis	3,494
12.Elephantorizha elephantina	40
13.Aloe ferox	55
14.Hetermopha tripholiata	639
15.Kniphofia northiae	4
16.Aloe polyphylla	733
17.Euphobia clavaroides	598
18. Diospyros lycioides	125
19. Protea subvestiva	41
20. Hypoxis iridifolia	11
21. Hesperantha coccenia	53
22. Sutherlandia montana	17
23. Withania somnifera	735
Total	**16,555**

REFERENCES

1. Carrington, D. (2018, March 12). What is Biodiversity and why does it matter. htt://www.theguardian.com

2. Framework for the Development of Environment Statistics, 2014

3. http://edugreen,teri.res.in 21 May2021 12:40pm

4. http://www.fundy-biosphere.ca. (n.d.).

5. https://en.m.wikipedia.org. (n.d.). Ecosystems.

6. https:// www.maine.gov /dhhs/mecdc /infectiousdisease /epi/airborne/ index.shtml

7. Land Degradation Neutrality Target Setting Report, 2019

8. Lesotho Environment Outlook Report 2014. Department of Environment.

9. Letsela, T. (2004). Sustainable Utilisation of Communal Plant Resources within the Tšehlanyane-Bokong Biosphere reserves in Lesotho. Johannesburg.

10. Matšeng Biosphere Reserve Application 2020.

11. National Environment Secretariat. (2005). Invasive Alien Species in Lesotho. Lesotho: Morija Printing Works.

12. Ramsar, I. (1979). What are Wetlands. Ramsar Information Paper no.1.

13. Soderstrom.M. (2008). Encyclopedia of Ecology. Retrieved from google: https://www.sciencedirect.com

14. UNCCD, 2017. The Global Land Outlook, first edition. Bonn, Germany. https://global-land-outlook.squarespace.com/the-outlook/#the-bokk) April 8, 2021

15. UNEP. (2003). Pilot Assessments -the ecological and socio-economic impact of invasive alien species on island ecosystems. Subsidiary Body on Scientific, Technical and Technological Advice. Ninth Meeting, Montriel, 10-14 N

16. www.scribd.com/document/184226181/water-quality-parameters-pfd

17. www.encyclopedie-environment.org/en/water/hydrometry-measuring-flow-why-how.