Kingdom of Lesotho

Bureau of Statistics

Statistical Report
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2021 Environment Report

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CHAPTER 1: WATER AND SANITATION

1.0 Introduction

The chapter seeks to address the Sustainable Development Goal 6 which highlights the access to safe water, sanitation and hygiene. Billions of people will lack access to these basic services in 2030 unless progress quadruples. Demand for water is rising owing to rapid population growth, urbanization and increasing water needs from agriculture, industry, and energy sector. https://www.un.org/sustainabledevelopment/water-and-sanitation

Credible and timely water and sanitation data provide numerous social, economic, and private sectors, such as stronger political accountability and commitment, as well as public and private investment. It also enables evidence based policy making, regulations, planning and investments at all levels, to ensure the most effective deployment of resources. https://www.unwater.org/publications/summary-progress-update-2021-sdg-6-water-and-sanitation-all

Water and sanitation are a basic human need. Soap and water need to always be available for consistent hygiene, so does proper sanitation facilities. The annual Water and Sanitation chapter assesses the state of the country's efforts in this regard.

1.1 Scope and Coverage

Secondary data for this chapter was obtained from Department of Water Affairs, Department of Rural Water Supply and Lesotho Highlands Development Authority.

1.2 Results

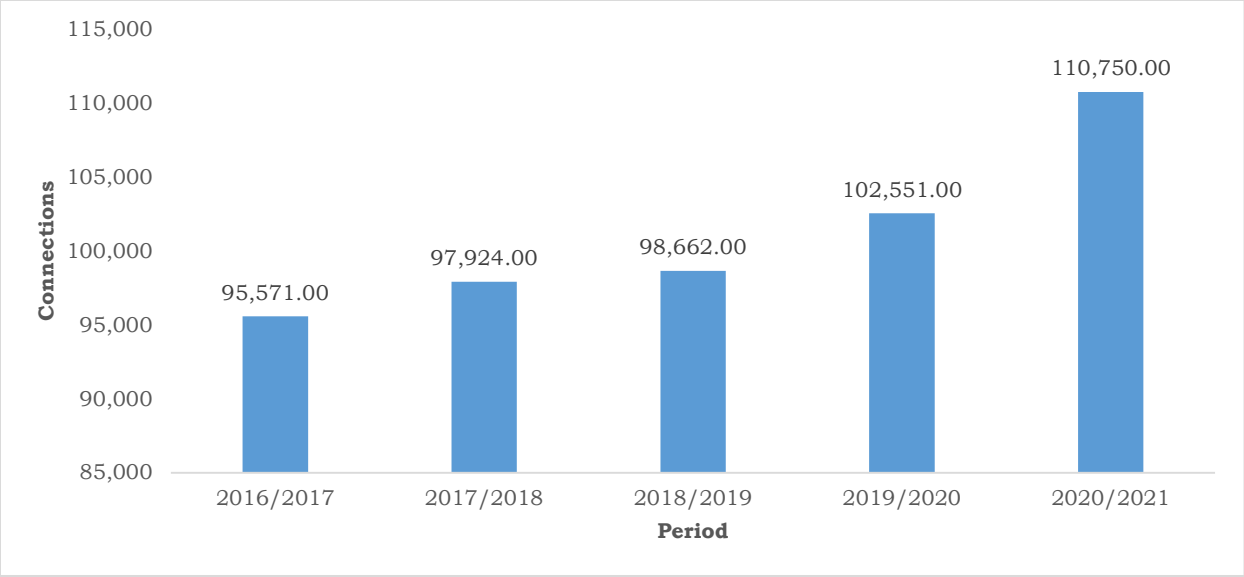
Graphs and tables are used to present the data. Analysis is on Water Consumption and Production, water imports and exports as well as water quality.

1.2.1 Water Connections

Pipe structures which carry water from treatment plants to households (or water consumers) can be referred to as water connections.

Figure 1.1 illustrates the number of cumulative water connections from 2016/2017 to 2020/2021.Water connections increased by 8,199 from 2019/2020 to 2020/2021, reflecting the biggest increase of the five periods. The lowest water connection increase was between 2017/2018 and 2018/2019 accounting for 738 connections.

Figure 1.1: Number of Cumulative Water Connections, 2016/2017 to 2020/2021



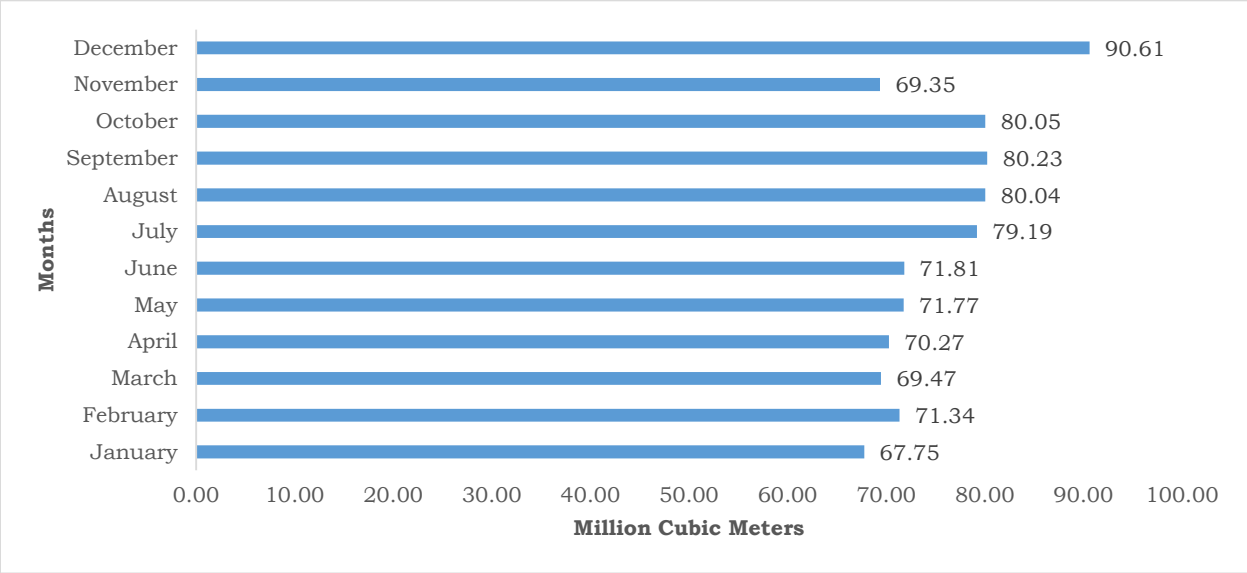
Source: Water and Sewerage Company

1.2.2 Water Exports

Lesotho exports water to the Republic of South Africa.

Figure 1.2 portrays water exports in million cubic meters for 2021. The highest quantity (90.61 million cubic meters) of water was exported in December. The lowest million cubic meters (67.75) of exported water was in January.

Figure 1.2: Water Exports in Million Cubic Meters – 2021



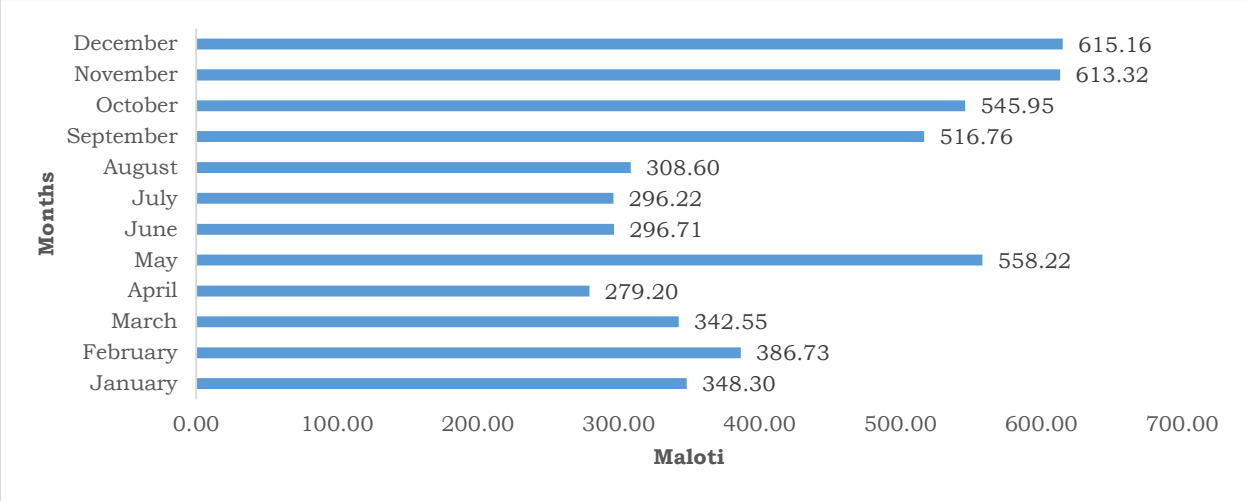
Source: Lesotho Highlands Development Authority

1.2.3 Water Imports

Bottled water is imported into the country. In this section, bottled water is classified as sweetened and non-sweetened water.

Figure 1.3 depicts non-sweetened bottled water imports in maloti ('000) for 2021. The highest amount spent on imported non-sweetened bottled water was M615,160 in December. The lowest amount spent on imported non-sweetened water was M279, 200 in April.

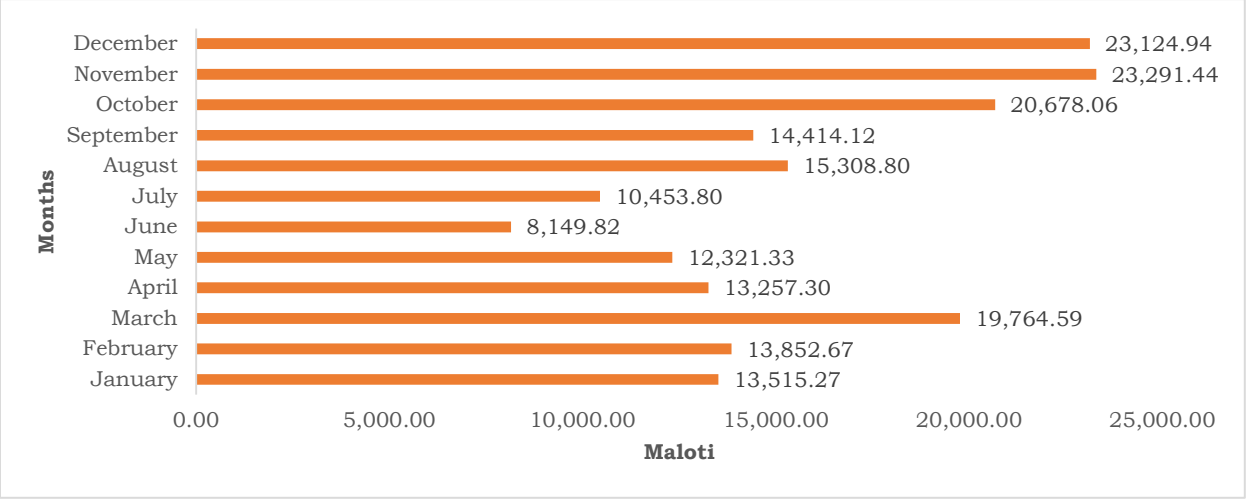
Figure 1.3: Non-Sweetened Bottled Water Imports in Maloti ('000) – 2021



Source: Revenue Services Lesotho

Figure 1.4 demonstrates sweetened bottled water imports in maloti ('000) for 2021. The highest amount spent on sweetened water imports was in November accounting for M23, 291.44. The lowest amount spent was M8, 149.82 in June.

Figure 1.4: Sweetened Bottled Water Imports in Maloti ('000) – 2021



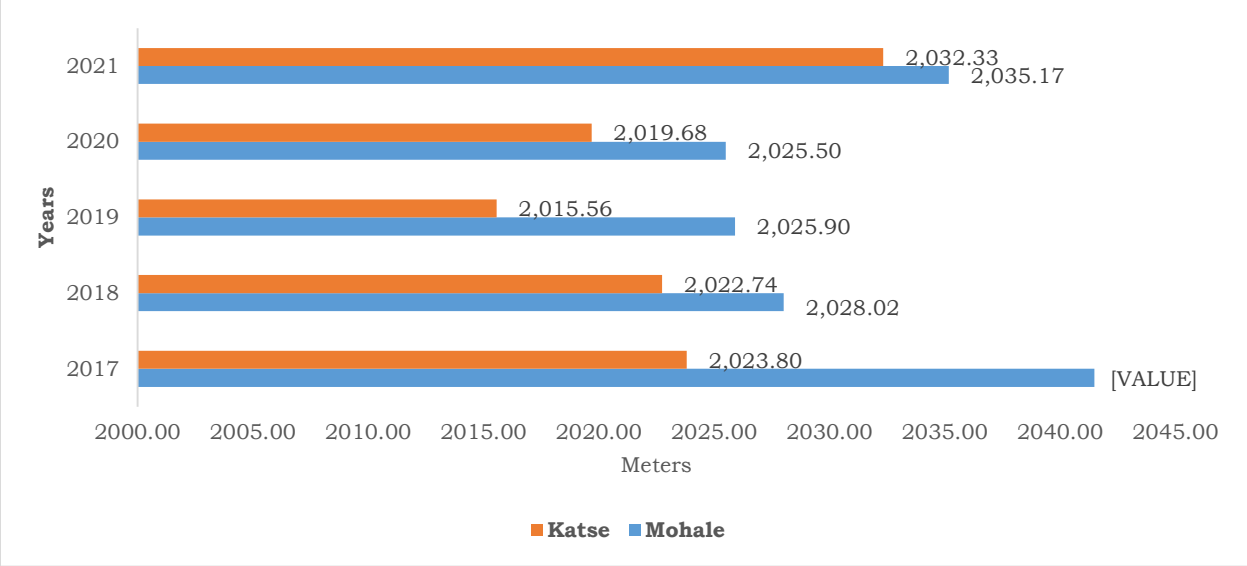
Source: Revenue Services Lesotho

1.2.4 Dam Levels

The dam height of Mohale and Katse dams is measured in meters above sea level. The dam wall of Katse dam is 185 meters, while the dam wall of Mohale dam is 145 meters. The amount of water in both dams is measured in million cubic meters. https://en.wikipedia.org/wiki/Mohale_Dam.

Figure 1.5 depicts the average elevation of Mohale and Katse dams in meters above sea level from 2017 to 2021. The highest average water level of 2,041.49 was recorded at Mohale dam in 2017. The lowest average meters above sea level (2,025.50) was recorded at Mohale dam in 2020. At Katse dam, the highest average dam level recorded was in 2021 at 2,032.33 meters above sea level.

Figure 1.5: Average Elevation (meters above sea level) of Mohale and Katse Dams - 2017 to 2021



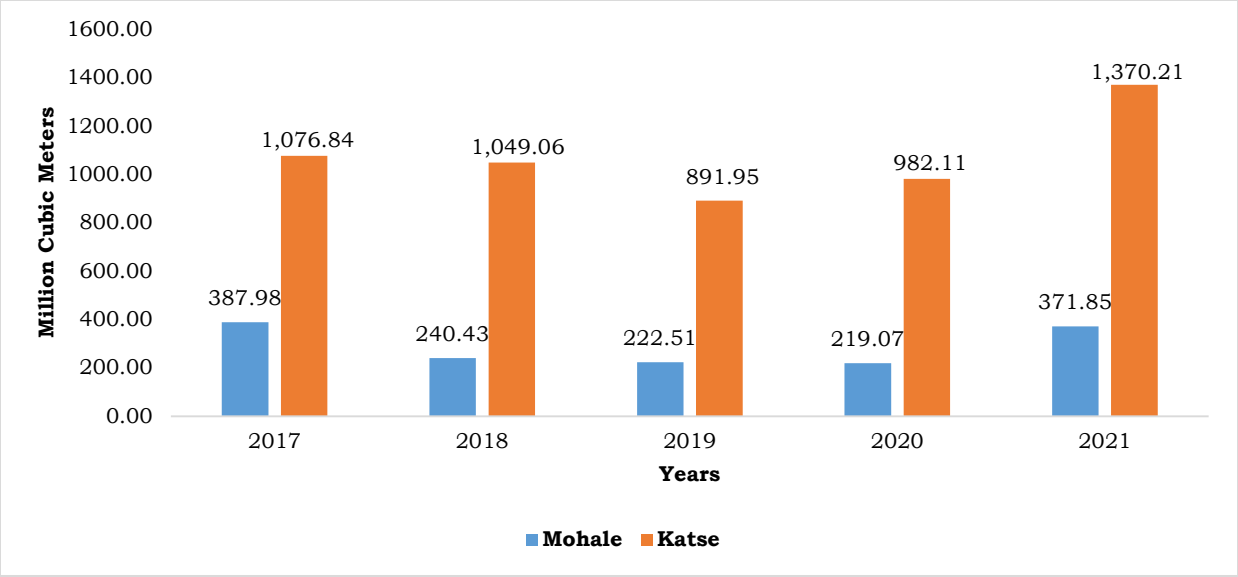
Sources: Lesotho Highlands Development Authority

1.2.5 Dam Volume

Dam volume gives the amount of water stored. It is measured in cubic meters. When calculations are carried out, the shape of the dam has to be taken into account. The dam shape may be circular, rectangular or take the shape of a gully. The dam volume can be simplified as the area of the trapezoidal end times the length. https://calculator.agriculture.vic.gov.au/fwcalc/information/dam-volume.

Figure 1.6 indicates the average volume of water at Mohale and Katse dams in million cubic meters from 2017 to 2021. The highest average volume of water in the Mohale dam was in 2017 at 387.98 million cubic meters. The lowest average volume (219.07 million cubic meters) of water at Mohale dam was recorded in 2020. The highest average volume of water recorded in Katse dam was in 2021 at 1,370.21 million cubic meters.

Figure 1.6: Average Volume (million cubic meters) of Water at Mohale and Katse Dams - 2017 to 2021



Source: Lesotho Highlands Development Authority

1.2.6 Water Quality

Color in water may be caused by the presence of foreign material in water e.g algae. Color test indicate the efficacy of water treatment systems. Turbidity in water is because of suspended solids in water. Other parameters which are measured include pH balance, dissolved oxygen, temperature and chlorine. https://www.fao.org/.

Table 1.1 shows the water quality parameters for monitored wetlands in Mafeteng district for the year 2021. The highest recorded temperature was in Mosoang 1 wetland (26.4°C) while the lowest temperature was recorded in Hermon wetland (22,5°C). Hermon wetland had a pH balance of 8.48, which is beyond the national guideline.

Table 1.1: Water Quality Parameters for Monitored Wetlands in Mafeteng District - 2021

Parameter (units)	Guidelines			Wetlands					
	National	WHO	SA	Duma Lake	Duma wetland	Skanka lake	Mosoang 1	Mosoang 2	Hermon
Temperature (°C)			25	22.9	23.4	23.3	26.4	25.4	22.5
pH	6 - 8	6.5	6 - 9	7.62	6.52	7.60	7.71	7.79	8.48
Electrical Conductivity (µS)	700	250	700	93	55	117	117	118	347
Total Dissolved Solids(mg/l)			300	46	26	57	58	59	175

Source: Department of Water Affairs

Table 1.2 tabulates the water quality parameters for Katse dam (wall surface) from 2017 to 2021. The highest temperature was recorded in 2020 at 22.50 degrees Celsius. The lowest temperature was recorded in the following year (2021), at 18.00 degrees Celsius. In 2020, the highest pH balance of 10.20 was recorded. The lowest pH balance was recorded in 2018 at 8.30.

Table 1.2: Water Quality Parameters for Katse Dam - 2017 to 2021

Date	Temperature °C	pH	TDS mg/l	Turbidity NTU
2017/01/12	20,90	9,40	32,00	0,85
2018/01/11	19,13	8,30	61,00	1,20
2019/01/29	18,96	8,90	83,00	0,89
2020/01/09	22,50	10,20	24,00	8,90
2021/04/08	18,00	9,20	74,00	1,70

Source: Lesotho Highlands Development Authority

Table 1.3 shows the water quality parameters for urban water sources in 2020/2021. In all the samples tested, 94.0 percent of them conformed to the said microbiological water quality standards. With regards to turbidity, 98.0 percent of tested water samples were within acceptable standards.

Table 1.3: Water Quality Parameters for Urban Water Sources - 2020/2021

Indicators			Annual Performance
Quality Tests	Potable Water	Microbiological	94%
		Residual Chlorine	86%
		Turbidity	98%

	Effluent	Suspended Solids	41%
		Chemical Oxygen Demand	27%

Source: Water and Sewerage Authority

1.3 Summary

Water quality must be conducted on a regular basis to ensure that the standard of safe and clean water is maintained. The data collected on water quality from the different water stakeholders indicates that water quality is of the required standard. Water imports to the Republic of South Africa have ranged between 67.75 million cubic meters and 90.61 million cubic meters in 2021. Water imports totaled M386, 479,696.00 in 2021. These water imports comprised sweetened and non-sweetened bottled water.

CHAPTER 2: SOLID WASTE

2.0 Introduction

Surendra (2009) defines solid waste as any unwanted residual material which cannot be discharged directly or after suitable treatment to the atmosphere or to receiving water. These residuals are ultimately released to the environment.

Solid waste dumps are seriously spoiling the environment conditions in developing countries. Cities are facing miserable solid waste management crises due to rapid industrialization, urbanization and insufficient funding. Improper solid waste dumping causes infectious diseases on land, water pollution, obstruction of drains and loss of biodiversity.https://www.academia.edu/35413813/Impacts_of_solid_waste_management_in_Pakistan_a_case_study_of_Rawalpindi_city

The International Plastic Bag Free Day is celebrated every year on 3 July, with an aim to raise awareness about the issues of plastic pollution and its harmful impact on the natural environment. Plastic waste is dumped in landfills and proves harmful to the marine creatures if it gets washed into oceans. https://nationaldaycalendar.com/international-plastic-free-day-may-25/

2.1 Scope and Coverage

This chapter includes scrap metal, hotels waste and e-waste data. Scrap metal waste data was collected from the specified establishment in Maseru.

2.2 Results

The results of scrap metal waste data for the year 2020/2021 will be discussed, while accommodation and food service activities waste (e-waste) data are for 2017.

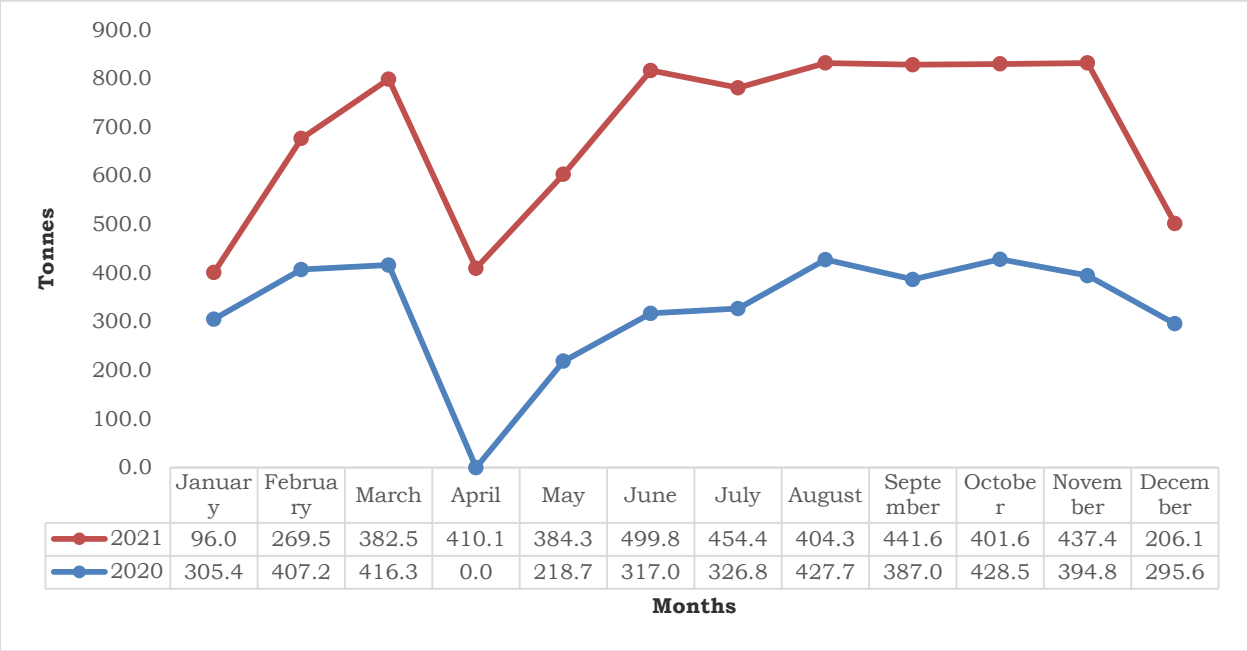
2.2.1 Scrap Metal Waste

Scraps are recyclable materials left over from product consumption. The major component of scrap metal waste involves iron sheet, aluminum, copper, cans and brass etc.

Figure 2.1 portrays scrap metal waste (tonnes) collected in Maseru by month for the years 2020 and 2021. The highest waste collection was in October with 428.5 tonnes for the year 2020 followed by August collection with 427.7 tonnes. The lowest was in May amounting to 218.7 tonnes. There were no records of scrap metal waste collection in April.

The figure further depicts that the greatest waste collection was in June accounted for 499.8 tonnes followed by July with 454.4 tonnes in 2021. The least waste collection was 96.0 tonnes, observed in January.

Figure 2.I: Scrap Metal Waste in Tonnes by Month - 2020 and 2021



	January	February	March	April	May	June	July	August	September	October	November	December
2021	96.0	269.5	382.5	410.1	384.3	499.8	454.4	404.3	441.6	401.6	437.4	206.1
2020	305.4	407.2	416.3	0.0	218.7	317.0	326.8	427.7	387.0	428.5	394.8	295.6

2.2.2 Waste Collection

Waste collection is the collection and transport of waste to the place of treatment or discharge by municipal services or similar institutions, or by public or private corporations, specialized enterprises or general government. https://www.google.com/search?q=what+is+waste+collection

This section focuses on waste of different types of establishments such as hotels, guesthouses and restaurants etc. The results reflect quantity of solid waste, how it was generated, how it is often collected, method of collection and disposal.

Table 2.1 presents percentage distribution of establishment by waste collection. It was observed that waste was mostly collected from Bar/Tavern with 64.7 percent followed by Restaurants with 19.3 percent. The table further shows that waste was less collected in Chalets (0.1 percent).

Table 2.1: Percentage Distribution of Establishments by Waste Collection

Type of Establishment	Waste Collection Yes	Waste Collection No	Total
Hotels	1.0	3.4	13
Guest House	4.8	14.0	59
Bed and Breakfast	2.3	6.8	28
Chalets	0.1	0.0	1
Lodges	2.0	0.0	23
Other	0.2	0.0	2
Restaurant	19.3	42.7	235
Bar/Tavern	64.7	33.1	755
Catering	5.7	0.0	66
Total (%)	**100.0**	**100.0**	
Total (N)	**1152**	**29**	**1181**

2.2.3 Method of Waste Collection

There are different methods that can be used for waste collection. These include Maseru City Council (MCC), Sub-contracted by MCC and Own collection.

Table 2.2 presents percentage distribution of establishment by method of waste collection. It is generally noted that Bar/Tavern used Own Collection (68.1 percent) as a greatest method of waste collection, followed by Individual/Company Contracted with 17.0 percent. Sub-Contracted by MCC was the least (3.8 percent) of method of waste collection used by Bed and Breakfast.

Table 2.2: Percentage Distribution of Establishments by Method of Collection

Type of Establishment	Method of Collection: MCC	Sub-Contracted by MCC	Individual/Company Contracted	Own Collection	Total (%)
Hotels	8.3	0.0	33.3	58.3	100.0
Guest House	37.4	7.3	22.1	33.2	100.0
Bed and Breakfast	34.6	3.8	23.1	38.5	100.0
Chalets	0.0	0.0	0.0	100.0	100.0
Lodges	0.0	0.0	0.0	100.0	100.0
Other	0.0	0.0	50.0	50.0	100.0
Restaurant	16.6	0.0	20.1	63.3	100.0
Bar/Tavern	10.9	4.0	17.0	68.1	100.0
Catering	7.6	16.7	26.5	49.2	100.0

Total (N)	**154**	**46**	**212**	**741**	**1152**

2.2.4 Waste Disposal

Waste disposal is the collection, processing and recycling or deposition of the waste material of human activities. Waste can be disposed- off in different ways, however, the following categories were used; burnt, dumping site, reuse and recycling. https://www.britannica.com/technology/waste-disposal.

Percentage distribution of establishments by method of disposal is presented by table 2.3. Reuse was the most widespread method of waste disposal with 75.0 percent used by Hotel followed by Burnt, Dumping Site and "Other" Method of Disposal with 8.3 percent each. Chalets reported Reuse (100.0 percent) as the only method of waste disposal in the reference year.

Table 2.3: Percentage Distribution of Establishments by Method of Disposal

	Method of Disposal					
Type of Establishment	**Burnt**	**Dumping Site**	**Recycling**	**Reuse**	**Other**	**Total (%)**
Hotels	8.3	8.3	0.0	75.0	8.3	100.0
Guest House	7.3	37.4	7.3	31.6	16.4	100.0
Bed and Breakfast	3.8	46.2	0.0	46.2	3.8	100.0
Chalets	0.0	0.0	0.0	100.0	0.0	100.0
Lodges	0.0	73.9	0.0	26.1	0.0	100.0
Other	0.0	50.0	0.0	50.0	0.0	100.0
Restaurant	7.4	33.3	5.5	38.8	15.1	100.0
Bar/Tavern	30.9	51.6	10.1	7.3	0.0	100.0
Catering	6.1	30.3	6.1	40.2	17.4	100.0
Total (N)	**257**	**530**	**96**	**213**	**56**	**1152**

2.2.5 E-Waste Collection

E-waste is any electrical or electronic equipment that's been discarded. E-waste is particularly dangerous due to toxic chemicals that naturally leach from the metals inside when buried. Computers, televisions, VCRs, stereos, copiers, and fax machines are common electronic products

https://www.ewaste1.com/what-is-e-waste/

This section illustrates method of e-waste collection and how e-wastes were disposed.

Table 2.4 explains percentage distribution of establishments by method of collection. The table indicates that Catering collected more e-waste using Own Collection (82.2

percent) followed by Individual/Company Contracted with 17.8 percent. Generally, Bed and Breakfast was the only establishment that reported to have used Department of Environment in the collection of e-waste.

Table 2.4: Percentage Distribution of Establishment by Method of Collection

	Method of Collection				
Type of Establishment	**Department of Environment**	**Sub-Contracted by MCC**	**Individual/Company Contracted**	**Own Collection**	**Total (%)**
Hotels	0,0	33,3	0,0	66,7	100,0
Guest House	0,0	68,9	0,0	31,1	100,0
Bed and Breakfast	12,5	12,5	25,0	50,0	100,0
Lodges	0,0	0,0	0,0	100,0	100,0
Other	0,0	0,0	50,0	50,0	100,0
Restaurant	0,0	14,4	15,2	70,4	100,0
Bar/Tavern	0,0	0,0	33,6	66,4	100,0
Catering	0,0	0,0	17,8	82,2	100,0
Total (N)	**1**	**17**	**42**	**122**	**182**

2.2.6 E-Waste Disposal

E-waste can be disposed of safely by recycling or dumping into Dumping site to reduce its adverse impacts on the environment.

Table 2.5 describes percentage distribution of establishments by method of disposal. The table shows that Guesthouse, Lodges and Catering reported Dumping Site as the only method for disposing e-waste.

Table 2.5: Percentage Distribution of Establishment by Method of Disposal

	Method of Disposal		
Type of Establishment	**Dumping Site**	**Recycling**	**Total**
Hotels	66.7	33.3	100.0
Guest House	100.0	0.0	100.0
Bed and Breakfast	37.5	62.5	100.0
Lodges	100.0	0.0	100.0
Other	50.0	50.0	100.0
Restaurant	59.6	40.4	100.0
Bar/Tavern	82.1	17.9	100.0
Catering	100.0	0.0	100.0
Total	**144**	**39**	**182**

Table 2.6 reveals percentage distribution by type of e-waste and method of disposal. From the table, it is observed that Kettle (98.1 percent) was mostly disposed off at the Dumping Site compared to being recycled (1.9 percent). Heaters (97.3 percent) were also reported to have been mostly disposed off at the dumping site than been recycled (2.7 percent). The category of 'Other' includes DVD players, microwaves, globes and Econet lamps.

Table 2.6: Percentage Distribution by Type of E-Waste and Method of Disposal

	Method of Disposal		
Type of E -Waste	**Dumping Site**	**Recycling**	**Total (%)**
Television	56,8	43,2	100,0
Computer/Laptop	60,5	39,5	100,0
Tablet	100,0	0,0	100,0
Heater	97,3	2,7	100,0
Kettle	98,1	1,9	100,0
Other	58,4	41,6	100,0
Total (N)	**144**	**38**	**182**

2.2.7 Medical Waste

Medical waste is any kind of waste that contains infectious material (or material that's potentially infectious). This definition includes waste generated by healthcare facilities like physician's offices, hospitals, dental practices, laboratories, medical research facilities, and veterinary clinics. https://www.medprodisposal.com/what-is-medical-waste-medical-waste-definition-types-examples-and-more/

Medical waste collected is from 2017 to 2020 and covers three districts in the southern region. This section will focus on quantities of waste such as infectious waste, sharps, general waste and pathological waste.

Medical Waste by year and type of waste in kilogram (kg) is presented in table 2.7. The table shows that collection of Infectious Waste (5,306.78kg) in 2020 was highest medical waste recorded. The year 2018 followed with 4,170.02kg.

Collection of Sharps declined from 44,196.85kg in 2019 to 594.81kg in 2020. The table further reveals that Pathological Waste was mostly collected in 2020 with 1,329.07kg. There were no records of Pathological waste for the years 2018 and 2019.

Table 2.7: Medical Waste Collection by Year and Waste Type in Kilogram (kg)

	Type of Waste			
Year	**Infectious**	**Sharps**	**General**	**Pathological**
2017	868.23	626.52	73.65	19.00

2018	4,170.02	1,042.69	5,020.50	
2019	3,063.14	44,196.85	46,141.70	
2020	5,306.78	594.81	462.42	1,329.07
Total (N)	**13408.17**	**451460.87**	**51698.27**	**1348.07**

2.3 Summary

The highest metal waste collection was in October with 428.5 tonnes for the year 2020 and there were no records of scrap metal waste collection in April. In 2021, the greatest waste collection was in June accounted for 499.8 tonnes. The least waste collection was 96.0 tonnes which was observed in January

Regarding accommodation and food service establishments, waste was mostly collected from Bar/Tavern with 64.7 percent whereas less was collected in Chalets (0.1 percent). Bar/Tavern used Own Collection (68.1 percent) as a greatest method of waste collection. Sub-Contracted by MCC was the least (3.8 percent) of method of waste collection used by Bed and Breakfast.

Reuse was the most widespread method of waste disposal with 75.0 percent used by Hotels, followed by Burnt, Dumping Site and "Other" Method of Disposal with 8.3 percent each. Catering collected more E-Waste using Own Collection (82.2 percent). Bed and Breakfast is the only establishment that reported to have used Department of Environment in the collection of e-waste. Guesthouse, Lodges and Catering reported the Dumping Site as the only method for disposing e-waste.

Collection of Infectious Waste (5,306.78kg) in 2020 was highest medical waste recorded and 2018 followed with 4,170.02kg. Collection of Sharps declined from 44,196.85kg in 2019 to 594.81kg in 2020. Pathological Waste was mostly collected in 2020 with 1,329.07kg. There were no records of Pathological waste for the years 2018 and 2019.

CHAPTER 3: LAND USE AND COVER

3.0 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 (Framework for the Development of Environment Statistics, 2014). The two primary aspects of land are land use and land cover. 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 is a vital natural resource for human survival and the base for all terrestrial ecosystem services. Land being "used" means the deployment of land for diverse purposes and land utilization by human and their habitat (Abebe, Getachew and Ewunetu, 2022). However, challenges such as climate change, rapid population growth land tenure, biodiversity loss and land degradation have a huge impact on land use (Winkler, Fuchs and Rounseveli, 2021). Consequently, there are areas of land that are "not in use" by human activities. Land use statistics cover both land in use and land not in use.

3.1 Scope and Coverage

This chapter consists of secondary data collected from Roads Directorate and Department of Forestry. The results covered are for the entire country and range from 2015/2016 to 2020/2021.

3.2 Results

The results show the land used for agriculture (area planted and fallow), land under forests and other wooded land. Land under build-up and related land (road lengths).

3.3 Agricultural Land

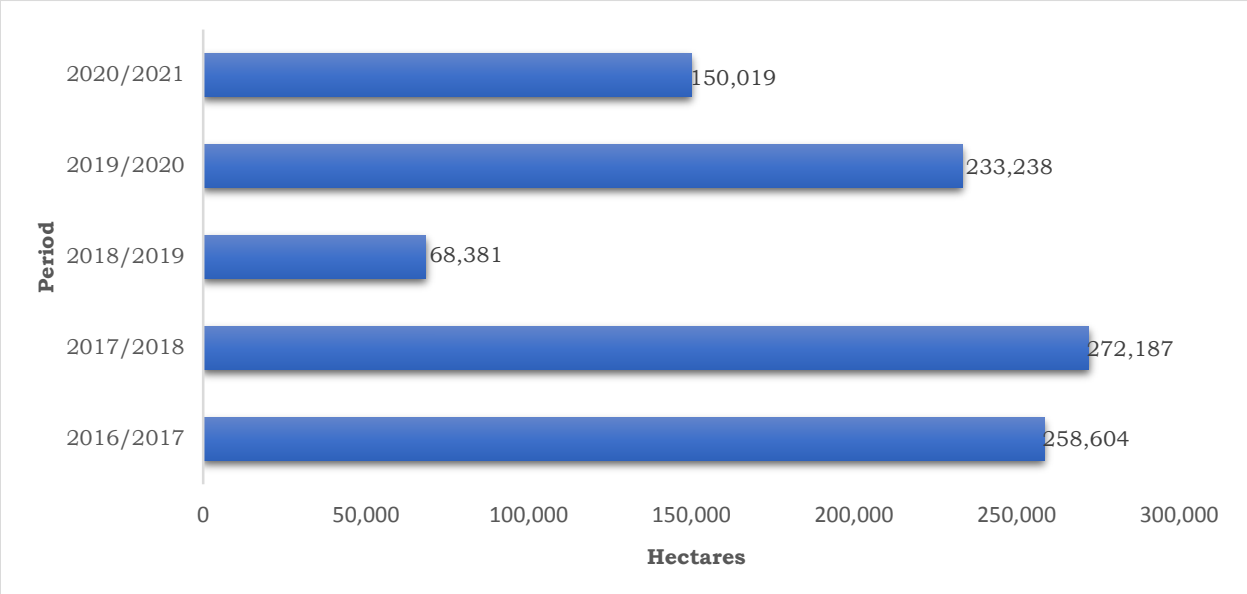
This refers to the major classes of land use on agricultural holdings. It includes land under scattered farm buildings, yards and their annexes, permanently uncultivated land, such as uncultivated patches, banks, footpaths, ditches, headlands and shoulders.

3.3.1 Area Planted

The area planted refers to all fields that were cultivated in a specified agricultural year which commence from the 01st August of the current year to the 31st July of the following year.

Presented in figure 3.1 is area planted in hectares (ha) for the period 2016/2017 to 2020/2021. Area planted crops decreased from 2019/2020 (233,238ha) to 150,019ha in 2020/2021.

Figure 3.1: Area Planted in Hectares (ha) - 2016/2017 to 2020/2021



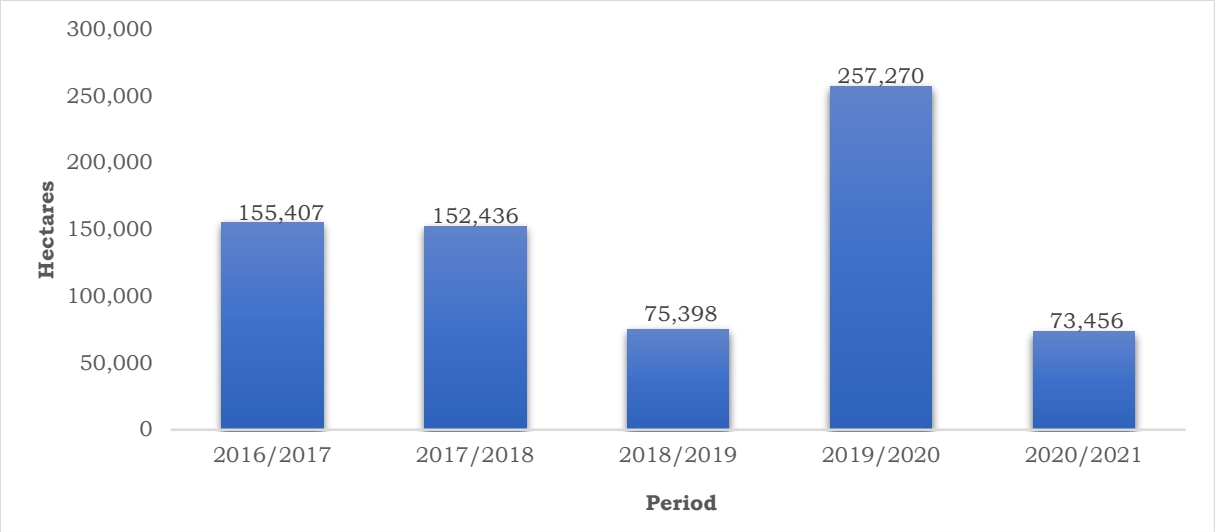
Source: Agricultural Production Survey

3.3.2 Area Fallow

Area fallow refers to the land that remained uncultivated for a period of no more than three years.

Figure 3.2 portrays area fallow in hectares (ha) for the period 2016/2017 to 2020/2021. The figure reveals that the highest area fallow was in 2019/2020 (257,270ha) while the least was in 2020/2021 with 73,456ha.

Figure 3.2: Area Fallow in Hectares (ha) - 2016/2017 to 2020/2021



Source: Agricultural Production Survey

3.3.3 Fertilizer Application

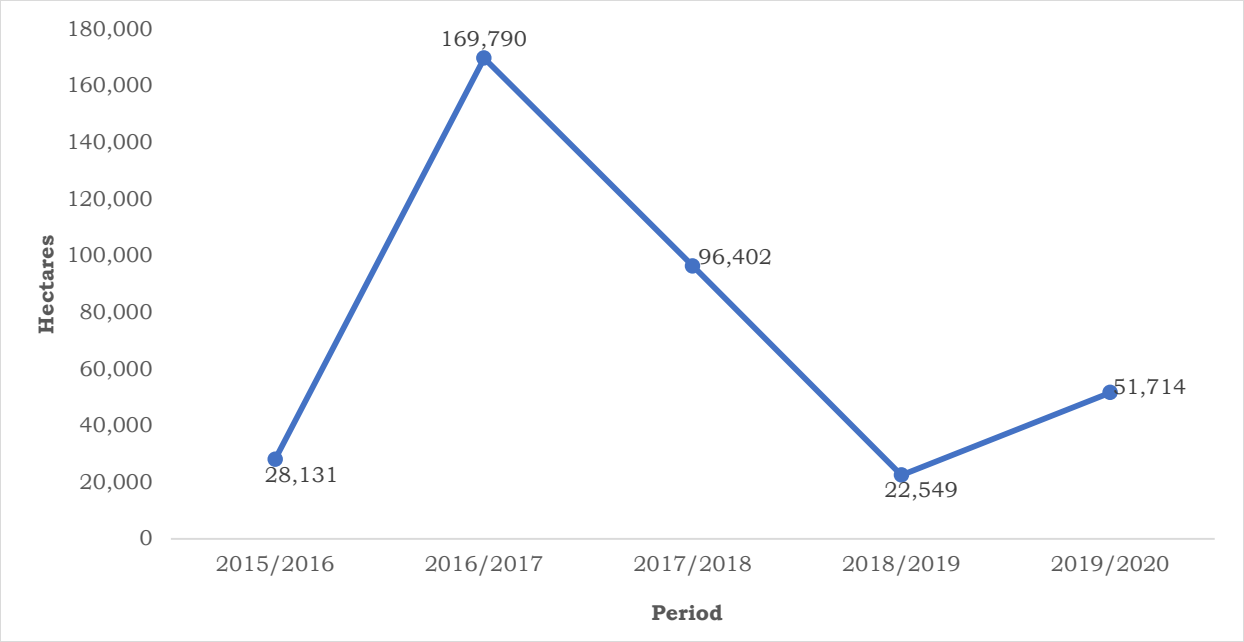
Fertilizer is either a chemical or organic compound that is applied to plants for the purpose of providing supplemental nutrition to enhance all or a number of the plant's growth characteristics (Stewart, 2023).

3.3.3.1 Inorganic Fertilizer Application

Inorganic fertilizers are materials that are mined or synthesized from non-living materials. Many inorganic fertilizers contain nutrients that are immediately available to plants.
https://gardeningsolutions.ifas.ufl.edu/care/fertilizer/types-of-fertilizer.html

Area applied inorganic fertilizers in hectares (ha) for the period 2015/2016 to 2019/2020 is illustrated in figure 3.3. Area applied inorganic fertilizers increased from 2018/2019 (22,549ha) to 51,714ha in 2019/2020.

Figure 3.3: Area Applied Inorganic Fertilizers in Hectares ('000) - 2015/2016 to 2019/2020



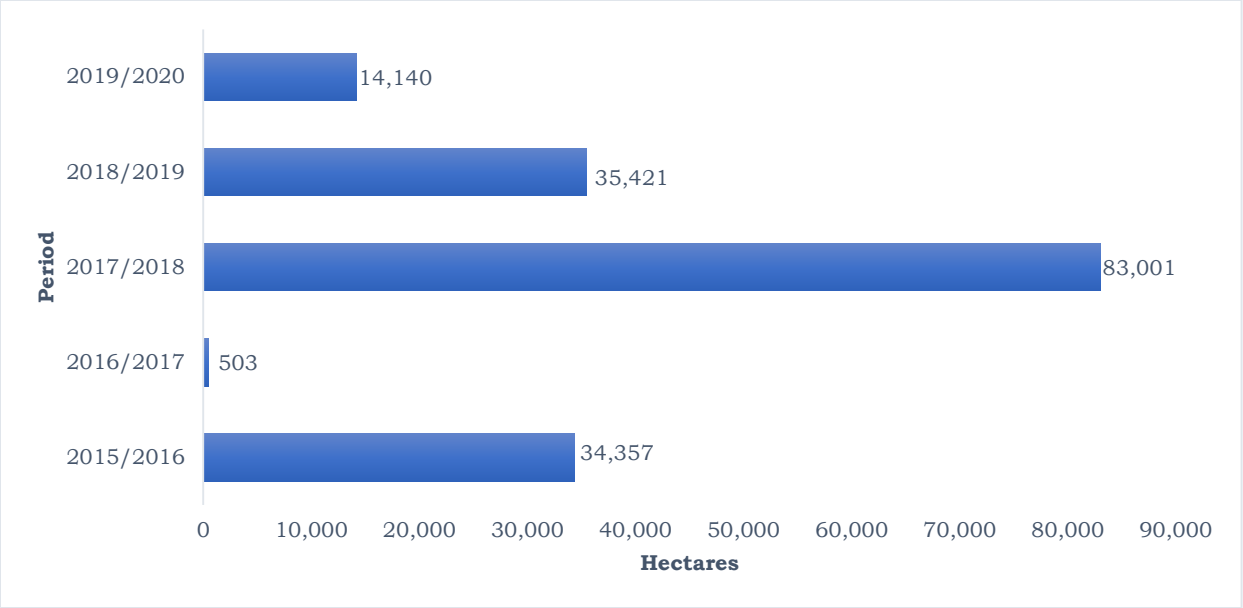
Source: Agricultural Production Survey

3.3.3.2 Organic Fertilizer Application

Organic fertilizers are made from natural and organic materials-mainly manure, compost, or other animal and plant products. One of the best benefits of organic fertilizers is that it can be made at home.
https://www.myallgreen.com/the-different-types-fertilizer/

Figure 3.4 depicts area applied organic fertilizers in hectares (ha) for the period 2015/2016 to 2019/2020. The figure portrays that the highest area applied organic fertilizers was in 2017/2018 accounting to 83,001ha. Area applied organic fertilizers decreased from the same year to 2019/2020 (14,140ha).

Figure 3.4: Area Applied Organic Fertilizers in Hectares ('000) - 2015/2016 to 2019/2020



Source: Agricultural Production Survey

3.3.4 Irrigation System

Irrigation is the artificial application of water to land to help improve crop production and pastures. It also includes the process of moving water from the sources (such as dams, rivers, wells and others) using pumps, tubes, sprays and other man-made means to apply to agricultural crops. (Jones,2023).

Table 3.1 presents area in hectares (ha) irrigated by sources of irrigation water in 2019/2020. About 3,214ha of the area planted was irrigated. The highest area (1,411ha) was irrigated from Dam/Reservoir/Earth Dam (Manual Watering).

Table 3.1: Area in Hectares (ha) Irrigated by Source of Irrigation Water - 2019/2020

Source of Irrigation Water	Area
Surface Water River/Lake/Pond/Mountain (Gravity))	465
Surface Water (River/Lake/Pond (Pump)	218
Dam /Reservoir/Earth Dam (Manual Watering)	1,411
Dam /Reservoir/Earth Dam (Pump)	244
Ground Water (Deep Well/Tube Well) (Pump)	90
Ground Water (Shallow Well) Dam/Reservoir/Earth Dam (Manual Watering)	261
Piped Water	408
Harvested	40
Borehole (Manual)	24

Borehole (Mechanized)	50
Total	**3,214**

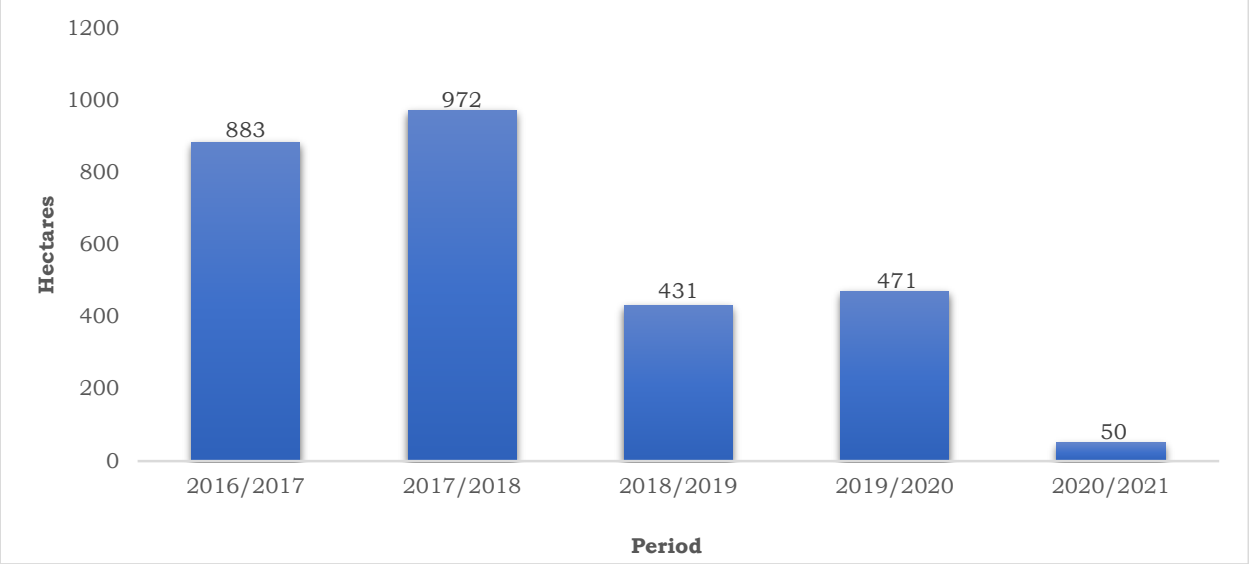
Source: Lesotho Agricultural Census

3.4 Land Covered by Trees

A forest is a complex ecosystem and supports 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. Lesotho forest cover is 34,404 ha. http://edugreen,teri.res.in

Presented in figure 3.5 is area planted forest trees in hectares (ha) for the period 2016/2017 to 2020/2021. The figure demonstrates that area planted forest trees decreased from 2019/2020 (471ha) to 2020/2021 with 50ha.

Figure 3.5: Area Planted Forest Trees in Hectares ('000) - 2016/2017 to 2020/2021



Source: Department of Forestry

3.4.1 Fruit Trees

A fruit tree is a tree, which bears fruit that is consumed or used by animals and humans. https://www.definitions.net/definition/fruit+tree

Table 3.2 shows number and area planted fruit trees in hectares (ha) for the period 2016/2017 to 2020/2021. The table reveals that the number of fruit trees planted increased from 188,425 trees in 2019/2020 to 215,513 trees in 2020/2021. However, the area planted fruit trees decreased from 301ha to 72ha of the same period.

Table 3.2: Number of Fruit Trees Planted and Area in Hectares ('000) – 2016/2017 to 2020/2021

Year	Number	Area
2016/2017	446,414	714
2017/2018	487,471	780
2018/2019	465,230	744
2019/2020	188,425	301
2020/2021	215,513	72
Total	**1,803,053**	**2,611**

Source: Department of Forestry

3.4.2 Grape Trees

A grape is a fruit, botanically a berry, of the deciduous woody vines of the flowering plant genus Vitis. https://en.wikipedia.org/wiki/Grape.

Area planted grape trees in hectares (ha) for the period 2016/2017 to 2020/2021 is represented by table 3.3. The table indicates that there has been an increase in the number of grape trees planted from 2019/2020 (2,876) to 2020/2021 with 21,920. The table further reveals a similar pattern whereby area planted increased from 2019/2020 (2,2ha) to 47ha in 2020/2021.

Table 3.3: Number of Grape Trees Planted and Area in Hectares ('000) - 2016/2017 to 2020/2021

Year	Number	Area
2016/2017	21,821	16.5
2017/2018	1,976	1.5
2018/2019	25,535	19.3
2019/2020	2,876	2.2
2020/2021	21,920	47.0
Total	**74,128**	**86.5**

Source: Department of Forestry

3.5 Built-up and related land

This refers to land under houses, roads, mines and quarries as well as any other facilities, including their auxiliary spaces, deliberately installed for the pursuit of human activities. Included are also certain types of open land (non-built-up), which are closely related to these activities, such as waste tips, derelict land in built-up areas, junk yards, city parks and gardens. Land occupied by scattered farm buildings, yards and their annexes is excluded. Land under closed villages or similar rural localities are included.

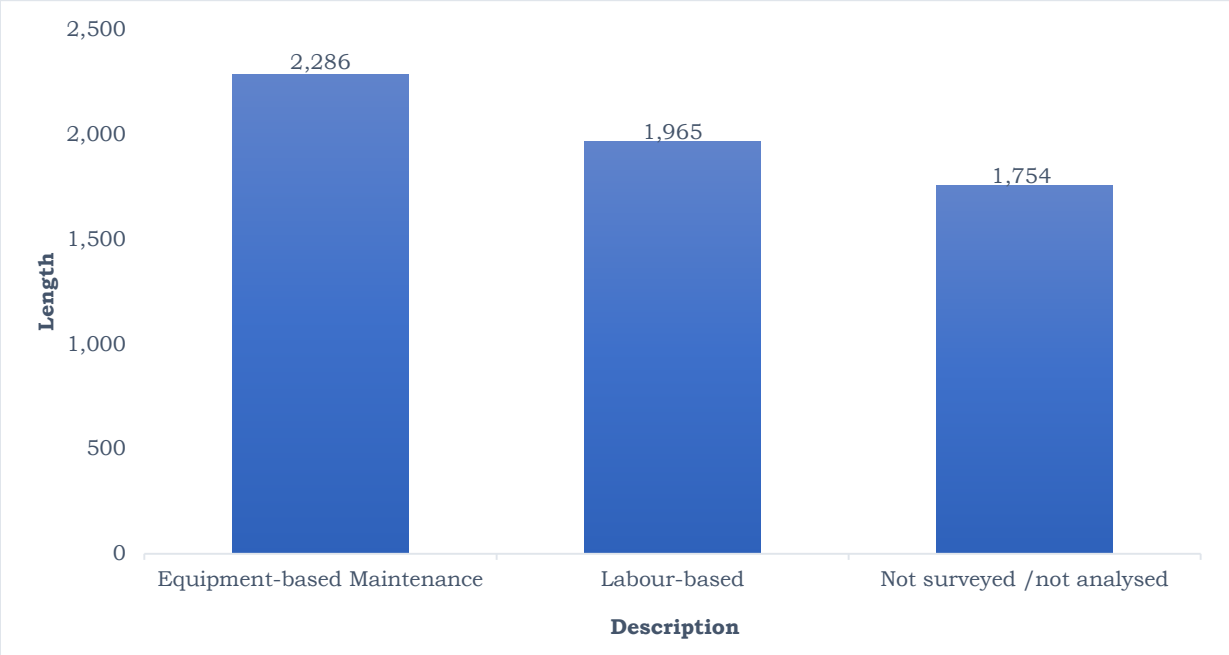
https://www.eeaeuropa.eu/help/glossary/eea-glossary/built-up-land

3.5.1 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).

Figure 3.6 demonstrates road lengths in kilometers (km) by description in 2019. It is observed that the longest road length (2,286km) was for that surveyed undergoing Equipment-based Maintenance and the shortest was that Not surveyed or analyzed with 1,724km.

Figure 3.6: Road Lengths in Kilometers (km) by Description - 2019



Source: Roads Directorate

3.6 Land Cover

Land cover refers to the biophysical properties of a land earth, whether vegetation, urban infrastructure, water, bare soil or other. For instance, a land cover type of forest may be used for timber production, wildlife management or recreation; it might be private land, a protected watershed or popular state park. (Winkler, Fuchs, Rainseveli, et all, 2021)

Table 3.4 shows aggregate land cover change in hectares (ha) by catchments for the period 2017/2018 to 2020/2021. The table indicates an increasing pattern of land cover change from 2017/2018 (548.65ha) to 2020/2021 (1,318.36ha) for Built-up and 597.16ha to 6,776.63ha for Trees. The opposite is observed for Cropland whereby it decreased from 28,670.66ha in 2017/2018 to 2020/2021 (-6,515.13ha).

Table 3.4: Land Cover Change Area in Hectares (ha) by Catchments - 2017/2018 to 2020/2021

Catchments	2017/2018	2018/2019	2019/2020	2020/2021
Built-Up	548.65	686.25	822.74	1,318.36
Cropland	28,670.66	-4,432.26	-512.84	-6,515.13
Trees	597.16	2,024.21	2,924.27	6,776.63
Water Body	1,429.16	-1,009.06	658.42	1,148.83
Wetland	4,206.94	-431.69	806.26	1,595.80
Shrubland	37,360.12	-3,458.04	12,244.97	-16,913.09
Grassland	-84,748.57	3,089.12	-19,423.99	8,488.84
Bare Surfaces	2,150.60	-113.89	-418.73	4,055.38
Irrigated Cropland	6,085.42	-217.60	578.72	-1,982.82
Gullies	3,699.85	3,863.05	2,320.19	2,027.20

Source: Lesotho Atlas Dashboard

3.7 Summary

Area planted crops decreased from 2019/2020 (233,238ha) to 150,019ha in 2020/2021. The highest area fallow was in 2019/2020 (257,270ha) while the least was in 2020/2021 with 73,456ha. Area applied inorganic fertilizers increased from 2018/2019 (22,549ha) to 51,714ha in 2019/2020 while area applied organic fertilizers decreased from 2017/2018 accounting to 83,001ha to 2019/2021 (14,140ha). About

3,214ha of the area planted was irrigated. The highest area (1,411ha) was irrigated from Dam/Reservoir/Earth Dam (Manual Watering).

Area planted forest trees decreased from 2019/2020 (471ha) to 2020/2021 with 50ha. The number of fruit trees planted increased from 188,425 trees in 2019/2020 to 215,513 trees in 2020/2021. However, the area planted fruit trees decreased from 301ha to 72ha of the same period. There has been an increase in the number of grape trees planted from 2019/2020 (2,876) to 2020/2021 with 21,920. Area planted also increased from 2019/2020 (2,2ha) to 47ha in 2020/2021.

The longest road length (2,286km) was for that surveyed undergoing Equipment-based Maintenance and the shortest was that Not surveyed or analyzed with 1,724km. There has been an increasing pattern of land cover change from 2017/2018 (548.65ha) to 2020/2021 (1,318.36ha) for Built-up and 597.16ha to 6,776.63ha for Trees. The opposite is observed for Cropland whereby it decreased from 28,670.66ha in 2017/2018 to 2020/2021 (-6,515.13ha).

CHAPTER 4: AIR AND CLIMATE CHANGE

4.0 Introduction

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 2020 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 incomes 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.

4.1 Scope and Coverage

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

4.2 Results

The results of monthly and annual mean (maximum and minimum) temperatures and rainfalls are discussed, as well as ozone depleting substances and airborne diseases for the year 2021.

4.3 Climate Change

The Kingdom of Lesotho (2017) defines climate change as a change in the state of the climate that can be identified (e.g. by using statistical tests) by a change in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. 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”.

4.3.1 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. Maximum and minimum temperatures are air temperatures observed at the site.

4.3.1.1 Monthly Temperatures

In Lesotho the climate is temperate: it's warm in summer (November to March), sometimes hot during the day, but with cool nights, while it's mild in winter (May to August) during the day but with cold nights. The temperature range between night and day is generally wide.

Table 4.1 shows monthly mean maximum temperature by sub-stations. In summer, Botha-Bothe and Leribe mean maximum temperature ranges around 13.3°C to 25.2

°C. Mejametalana had mean maximum temperature around 14.8°C to 17.8 °C and Mohale's Hoek and Quthing mean maximum temperature ranges around 16.4°C to 23.1 °C. In winter, Botha-Bothe and Leribe had mean maximum temperatures around 13.7°C to 25.3 °C, Mejametalana around 13.9°C to 16.7°C and Mohale's Hoek and Quthing around 16.9°C to 22.3 °C.

Table 4.1: Monthly Mean Maximum Temperature (°C) by Sub-stations- 2021

Month	Botha-Bothe	Leribe	Mafeteng	Mejametalana	Mohale's Hoek	Mokhotlong	Oxbow	Phuthiatsana	Qacha's Nek	Quthing	Semonkong	Thaba-Tseka
January	24.7	13.3	18.3	16.2	17.3	13.3	17.7	20.0	17.8	20.6	24.0	21.0
February	21.9	16.8	19.1	17.8	17.1	13.9	19.6	20.4	20.8	19.5	23.3	23.1
March	25.2	16.2	19.1	17.7	19.6	15.0	17.6	22.8	21.9	23.1	24.0	21.9
April	24.4	16.1	19.1	17.1	19.3	14.7	15.2	20.1	20.8	23.6	24.8	21.8
May	25.3	15.3	20.7	16.7	18.6	15.9	18.0	18.0	20.5	22.3	22.5	24.3
June	24.7	14.3	18.4	15.9	18.5	15.0	19.0	20.4	19.6	22.0	25.6	23.4
July	24.1	13.7	19.1	15.2	16.9	14.7	16.4	21.2	17.0	20.9	23.7	23.6
August	24.9	16.1	19.0	13.9	17.3	15.4	17.3	20.5	20.5	17.8	22.6	23.2
September	25.4	15.4	20.7	16.2	16.1	17.0	15.1	18.4	19.5	20.2	21.7	21.9
October	25.0	15.4	18.3	16.3	18.2	14.4	16.6	16.3	21.2	20.6	24.7	23.6
November	24.3	14.7	17.9	14.8	18.0	18.3	15.7	19.1	18.9	22.1	25.5	24.7
December	23.9	17.7	17.4	17.5	16.4	16.8	18.2	18.9	21.5	20.5	21.3	21.4

Source: Lesotho Meteorological Services

Table 4.2 illustrates monthly mean minimum temperature by sub-stations. In summer, from November to March, Botha-Bothe and Leribe mean minimum temperature ranges around 5.4°C to 16.2 °C, Mejametalana around 0.1°C to 4.4 °C and Mohale's Hoek and Quthing around -0.8°C to 13.1°C. In winter, from May to August, Botha-Bothe and Leribe had a mean minimum temperature around 7.9°C to 15.5 °C, Mejametalana slightly below and above freezing point (0 °C or 32°F) and it was around -4.2°C to 5.5°C and Mohale's Hoek and Quthing around 1.2°C to 9.2°C.

Table 4.2: Monthly Mean Minimum Temperature (°C) by Sub-stations- 2021

Month	Botha-Bothe	Leribe	Mafeteng	Mejametalana	Mohale' Hoek	Mokhotlong	Oxbow	Phuthiatsana	Qacha's Nek	Quthing	Semonkong	Thaba-Tseka
January	12.1	16.2	5.8	2.1	4.3	2.2	3.1	3.1	7.4	13.1	12.6	12.5

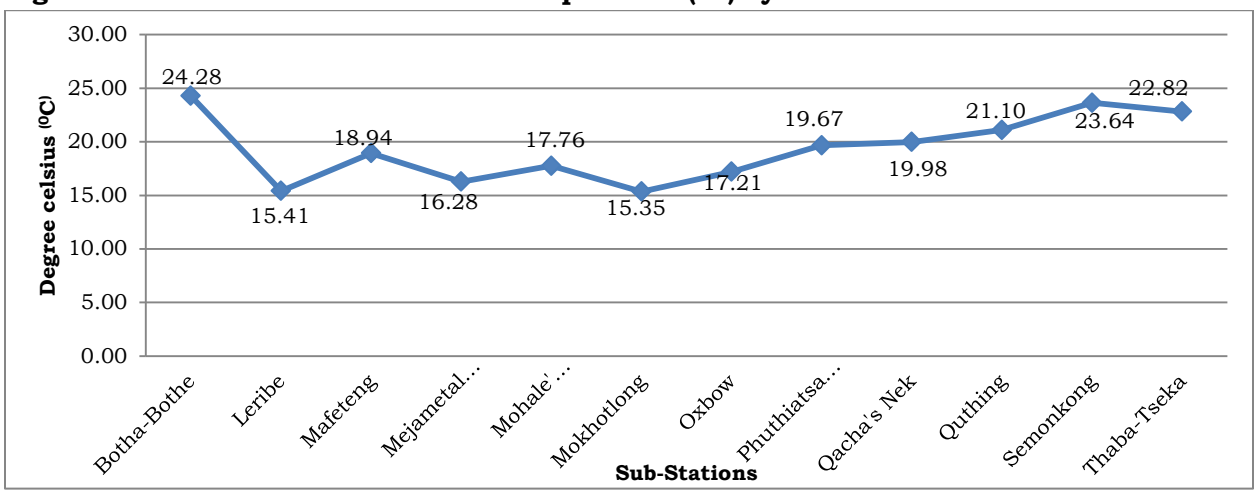
February	15.7	11.8	7.2	4.4	-0.8	-2.2	3.4	2.6	5.8	2.3	12.1	
March	5.4	14.3	11.8	0.1	10.4	1.8	3.6	0.6	6.3	9.2	7.2	
April	7.6	15.3	11.4	2.6	4.1	2.5	0.1	1.3	7.5	8.4	12.2	
May	12.3	15.3	7.2	5.5	4.4	2.7	3.3	2.1	7.7	6.9	9.9	
June	13.2	11.5	14.9	5.4	2.8	-4.6	3.0	3.3	5.7	9.2	13.4	
July	7.9	14.6	9.8	-4.2	2.7	0.5	2.4	-0.4	9.1	1.2	13.1	12.2
August	15.5	13.9	10.3	3.4	4.7	1.5	4.0	2.8	7.7	3.9	12.8	9.9
September	11.3	16.0	5.3	2.3	3.1	3.1	0.3	1.4	11.3	6.5	9.9	
October	13.4	7.3	6.6	4.9	1.4	4.9	0.5	6.0	8.9	9.2	13.3	
November	9.5	15.2	9.7	6.0	3.4	-2.6	2.4	3.7	10.3	4.1	11.4	
December	11.4	12.8	10.1	1.6	1.5	-2.7	2.6	3.2	6.0	11.6	12.4	6.5

Source: Lesotho Meteorological Services

4.3.1.2 Annual Temperatures

Annual mean maximum temperature by sub-station is depicted by figure 4.1. It is observed that Botha Bothe had the highest annual mean maximum temperature (24.28 °C) followed by Semonkong with 23.64 °C. Sub-station with the least annual mean maximum temperature was Mokhotlong with 15.35 °C.

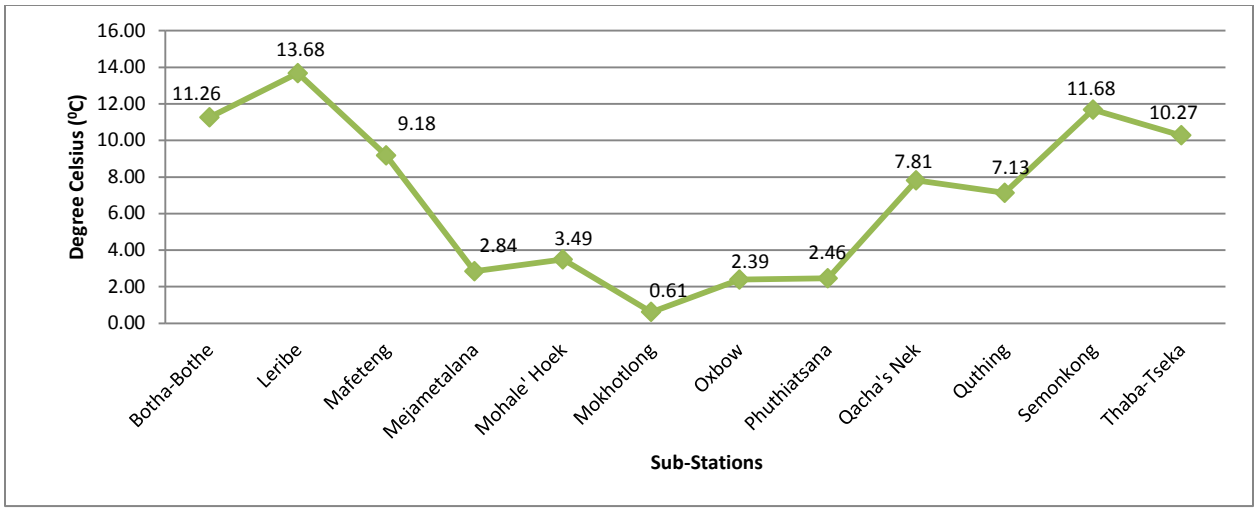
Figure 4.1: Annual Mean Maximum Temperature (°C) by Sub-Stations- 2021



Source: Lesotho Meteorological Services

Figure 4.2 represents annual mean minimum temperature by sub-station. Annual mean minimum temperature for Mokhotlong lows to 0.61°C, which is slightly above freezing point (0 °C) followed by Oxbow with 2.39 °C. The annual mean minimum temperature for leribe is high with 13.68 °C.

Figure 4.2: Annual Mean Minimum Temperature (°C) by Sub-Stations-2021



Source: Lesotho Meteorological Services

4.3.2 Monthly 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. https://education.nationalgeographic.org/resource/precipitation/.

Although precipitation is scarce in winter since it is a dry season, sometimes snow can fall more particularly in the mountains.

Monthly average precipitation (millimeters) by sub-station is shown on Table 4.3. In general precipitations in December were lower for all substations. In summer, Oxbow precipitation ranged between 96.9 mm and 222.7 mm and in winter it was between 101.0 mm and 346.2 mm as compared to other sub-stations.

Table 4.3: Monthly Average Precipitation (millimeters) by Sub-Stations in- 2021

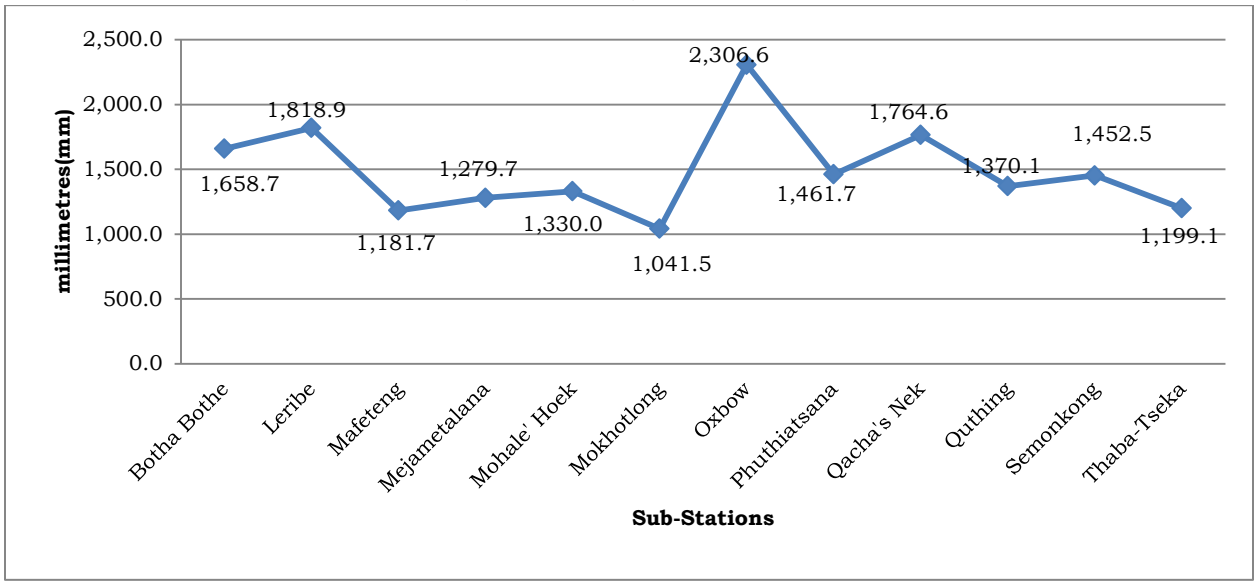
Month	Botha Bothe	Leribe	Mafeteng	Mejametalana	Mohale' Hoek	Mokhotlong	Moshoeshoe I	Oxbow	Phuthiatsana	Qacha's Nek	Quthing	Semonkong	Thaba-Tseka
January	105.2	133.2	85.2	70.3	105.7	115.2	86.1	172.6	88.7	120.4	92.0	95.9	93.7
February	60.1	74.2	18.7	25.7	24.5	58.5	37.2	96.9	48.2	70.2	27.4	36.2	80.3
March	131.7	130.9	60.1	100.5	66.1	74.5	90.6	222.7	110.2	154.1	93.7	103.2	100.2
April	156.6	166.6	103.6	124.9	129.2	83.9	127.8	162.8	134.5	142.0	107.2	117.9	105.2
May	158.2	156.8	83.5	70.7	149.9	137.6	93.6	229.2	120.5	200.0	180.6	201.1	150.4
June	52.7	82.9	34.0	62.5	44.3	40.0	66.2	101.0	64.1	67.4	51.8	58.3	27.4
July	308.6	334.1	188.6	230.9	198.6	61.5	234.3	346.2	270.8	203.8	200.0	231.6	180.4
August	134.4	151.7	152.9	149.4	169.4	128.2	144.5	183.5	129.8	192.9	146.7	175.1	100.7
September	209.2	236.2	203.0	221.6	174.9	97.3	221.3	268.3	215.6	199.1	176.9	169.8	83.0
October	160.9	168.9	128.7	111.0	123.1	109.4	136.8	222.9	149.7	167.7	106.3	100.4	132.7
November	168.1	172.8	111.1	106.1	130.0	85.0	113.1	248.3	121.2	180.3	169.2	138.4	110.4
December	13.0	10.6	12.2	6.0	14.3	50.4	7.0	52.0	8.3	66.9	18.2	24.7	34.5

Source: Lesotho Meteorological Services

4.3.3 Annual Precipitation

Figure 4.3 represents annual precipitation (millimeters) by sub-stations. The highest value (2,306.6 mm per year) of precipitation was recorded in Oxbow followed by Leribe with 1,818.9 mm. The least precipitation was observed in Mokhotlong with 1,041.5 mm per year.

Figure 4.3: Annual Precipitation (millimeters) by Sub-Stations - 2021



Source: Lesotho Meteorological Services

4.4 Ozone Depleting Substances (Gas)/Alternatives

Ozone depleting substances are chemicals that destroy the earth's protective ozone layer. The main uses of ozone depleting substances include:

- CFCs and HCFCs in refrigerators and air conditioners,
- HCFCs and halons in fire extinguishers,
- CFCs and HCFCs in foam,
- CFCs and HCFCs as aerosol propellants, and
- Methyl bromide for fumigation of soil, structures and goods to be imported or exported.https://www.dcceew.gov.au/environment/protection/ozone/publications/ozone-depleting-substances-factshee.

Table 4.4 shows quantity of gas (kg and Mt) by regions and type of gas. It is observed that Central region used all types of gases and mostly utilized R22 with 6,845.20 kg followed by R134a (4,755.14kg). The table further shows that R134a and R600a were used by all three regions with the total of 9,688.50kg (9.69 Mt) and 1,127.46kg (1.13Mt) respectively.

Table 4.4: Quantity of Gas (kg & Mt) by Region and Type of Gas - 2021

	Refrigerant								
Region	**R22**	**R134a**	**R404a**	**R406**	**R407a**	**R410A**	**R290**	**R507**	**R600a**
North	1,210.8	2,931.16	296.1	0,00	0,00	2,70	0,00	0,00	42,04
Central	6,845.2	4,755.14	1,335.1	13,60	33,90	1,918.6	339.79	272.6	1,052.06
South		2,002.2	54.8			2.80	1.26		33.36
Total (kg)	**8,056**	**9,688.5**	**1,686**	**13.6**	**33.9**	**1,924.1**	**341.05**	**272,6**	**1,127.46**
Total Mt)	**8.06**	**9.69**	**1.69**	**0.01**	**0.03**	**1.92**	**0.34**	**0.27**	**1.13**

4.5 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. https://www.maine.gov/dhhs/mecdc/infectious-disease/epi/airborne/index.shtml.

Outpatient is a patient who comes to the hospital, clinic, or dispensary for diagnosis or treatment but is not admitted for an overnight stay.https://medical-dictionary.thefreedictionary.com/outpatient.

Five age groups, including babies, young adults, middle-aged adults, and old adults, are used in the classification system.

Table 4.5 presents number of out-patient cases by types of airborne diseases and sex. The table shows that the most dominating disease for all age groups and sex was Coughs and Colds followed by Chicken Pox. It is observed that 31,454 cases of female Young Adults between 5 and 19 years had Coughs and Colds and only 22,238 cases of male Young Adults of the same age were infected. Age group that had Diphtheria Meningococcal meningitis only was Middle-aged Adults between 40 and 59 years with 1 case each for both sexes.

Table 4.5: Number of Outpatient Cases by Types of Airborne Diseases, Sex and Age Group- 2021

Types of Disease	Males					Females				
	Babies	Young Adults		Middle-aged Adults	Old Adults	Babies	Young Adults		Middle-aged Adults	Old Adults
	0-4	5-19	20-39	40-59	60+	0-4	5-19	20-39	40-59	60+
Coughs and Colds	26,732	22,238	11,128	8,872	6,560	28,311	31,454	22,891	13,779	10,201
Chicken Pox	97	170	108	52	28	96	238	137	75	76
Mumps	40	120	85	42	15	30	114	143	64	53
Measles	21	21	3	2	5	18	27	12	5	14
Whooping Cough	17	4	6	3	6	12	4	10	6	9
Tuberculosis	5	9	87	113	74	1	9	85	50	35
Anthrax	0	0	1	0	0	0	1	2	2	0
Diphtheria	0	0	0	1	0	0	0	0	1	0
Meningococcal meningitis	3	1	3	1	1	1	0	1	2	4
Other forms of meningitis	4	12	21	29	12	1	13	43	58	19

Source: Ministry of Health

4.6 Summary

The highest annual mean maximum temperature was observed in Botha-Bothe (24.28 °C) and the highest annual mean minimum temperature in Leribe with 13.68 °C. The least annual mean temperatures (maximum and minimum) were observed in Mokhotlong (15.35 °C and 0.16 °C). Oxbow recorded the highest annual precipitation (2,306.6 mm per year). R134a was mostly used (9688.50 kg) followed by R22 with 8056.00 kg. The disease with high prevalence rate for all age groups and sex was Coughs and Colds.

CHAPTER 5: BIODIVERSITY

5.0 Introduction

Biodiversity is all the different kinds of life found in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world. Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balance and support life.
https://www.worldwildlife.org/pages/what-is-biodiversity.

5.1 Scope and coverage

The results for this chapter are for the entire country and the data used is secondary collected from different ministries and nurseries from 2017 to 2021.

5.2 Results

The analysis on Biodiversity statistics by charts and tables is presented. The results indicate the number of different animal species, plant species, ecosystems and protected areas.

5.3 Flora

Flora is plant life. Lesotho has high level of plant endemism which is more confined to the Drakensberg Alpine Centre biodiversity hotspot area. Even though Lesotho's flora has been profoundly modified by human activities, it still contains a diverse range of plants, of which vascular plants are the most dominant, ranging from primitive Psilotum nudum to a wide range of flowering plants (National Environment Secretariat 2000). A number of plant species comprising Angiosperms (monocotyledons and dicotyledons), Gymnosperms, Bryothytes (Mosses, Liverworts and Hornworts) pteridophytes (Ferns and Fern Allies), Thallophytes (Algae and Fungi) have been recorded.

Table 5.1 presents the number and type of plant species. It is noted that the Angiosperms constitute the largest number (2,535) of the recorded species and Bryophytes followed with 279 species. Gymnosperms make up the smallest number (62) of the recorded species.

Table 5.1: Type and Number of Plant Species - 2000

Type of Plant Species	Number of Species	Number of Subspecies
Thallophytes	132	-
Bryothytes	279	3
Pteridophytes	85	1
Gymnosperms	62	1
Angiosperms	2,535	172
Total	**3,093**	**177**

Source: National Environment Secretariat

5.4 Fauna

Fauna is animal life. Lesotho's fauna, particularly birds, has been documented than flora. This explains why major conservation efforts have focused specifically on birds such as Geronticus calvus (Southern bald Ibis, mokhotlo) and Gypaetus barbatus (Bearded vulture, ntsu kobokobo). In addition to birds, other forms of fauna in the country consist of mammals, herpetofauna (reptiles and amphibians), fish and invertebrates (National Environment Secretariat 2000).

Table 5.2 shows the type and number of animal species. The Invertebrates had the highest number (1,279) of recorded animal species and Birds were the second with 340 species. Fish had the lowest number (14).

Table 5.2: Type and Number of Animal Species- 2000

Type of Species	Number of Current Species	Number of Historical Species	Total
Mammals	63	19	82
Birds	318	22	340
Reptiles	40	3	43
Amphibians	19	-	19
Fish	14	-	14
Invertebrates	1,279	-	1,279
Total	**1,733**	**44**	**1,777**

Source: National Environment Secretariat

5.4.1 Fish

Fish fall under vertebrates and are sources of protein. The Maloti Minnow is the only endemic fish in Lesotho. Introduction of rainbow trout in the Katse dam has proven harmful to the survival of Lesotho's endemic fish. It has been found that the exotic Rainbow trout preys on Maloti Minnow (Lesotho Environment Report 2014).

Table 5.3 shows quantity of fish harvested in tonnes for the period 2019/2020 to 2020/2021. Production of Rainbow Trout decreased by 97.8 percent between 2019/2020 and 2020/2021.

Table 5.3: Quantity of Fish Harvested in Tonnes - 2019/2020 to 2020/2021

Name	2019/2020	2020/2021	Total
Rainbow Trout	1906.16	42.35	1948.51
Common carp	0.02	0.00	0.02

Source: Department of Livestock Services

5.5 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.).

5.5.1 Rangelands

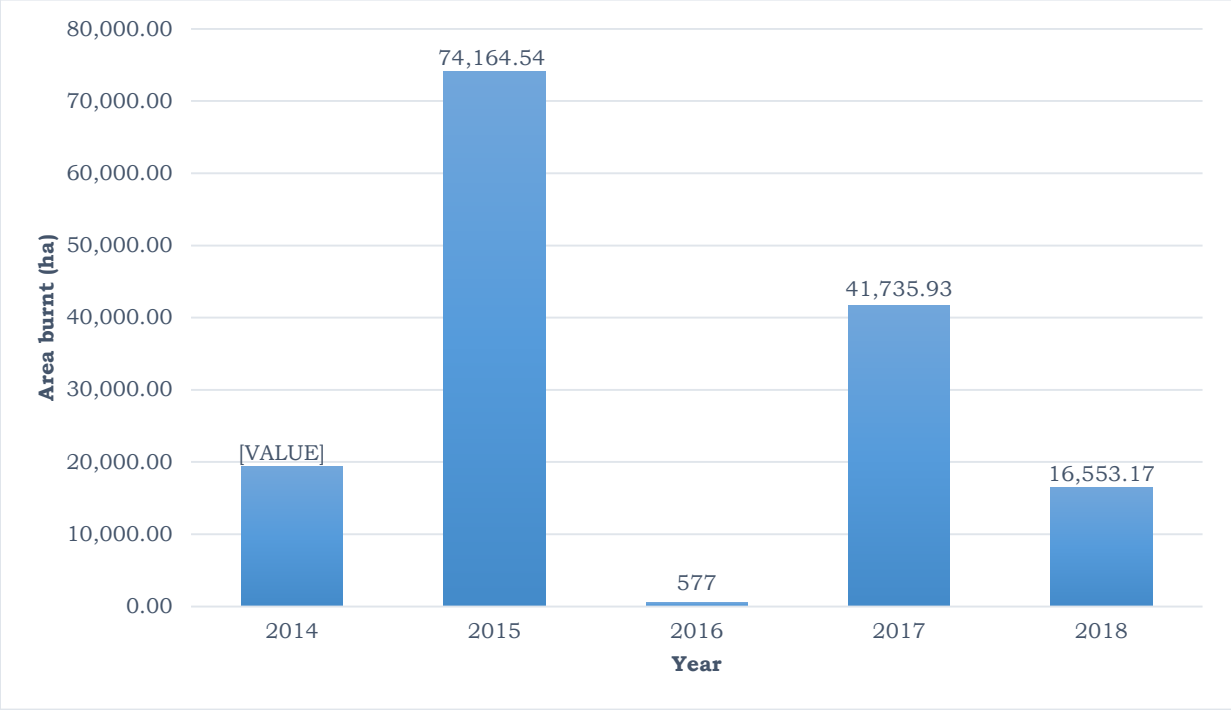
Rangelands account for about 60% of the country's area (Range Resources Management Policy, 2014) and are amongst the most notable and economically important ecosystems as they provide resources such as herbaceous species for livestock forage.

5.5.1.1 Rangeland Fires

Fires in the grasslands occur as a natural phenomenon, which is useful for biodiversity and ecosystem management in the biome. However, radical deviation from the natural fire regime, including total exclusion for long periods of time, increase in the frequency of fires or wrong-season fires will have an impact on biodiversity (Lesotho Environment Outlook Report, 2014).

Figure 5.1 displays area burnt in hectares from 2014 to 2018. The largest area burnt was 74,164.54 hectares in 2015 followed by 41,735.93 hectares in 2017. The smallest area burnt was 577 hectares in 2016.

Figure 5.1: Area Burnt in Hectares 2014 - 2018



Source: Department of Environment

5.5.2 Wetlands

Wetlands (locally called mekhoabo) occur as extensive bogs and sponge-lands especially in the mountains agro-ecological zone, though may be small in extent, collectively, they could cover thousands of hectares. Wetlands are critical to maintaining and improving the quality of lives in Sub-Saharan Africa (SSA) by improving livelihoods of rural populations and reducing poverty especially in the summer seasons and in times of droughts. In Lesotho, wetlands are also known to support grazing, forestry and cropping activities, hence can be said to be ecologically, economically and socially important (Olaleye, Mating, Nkhoeloane et al:2021).

Table 5.4 shows the area of the monitored wetlands in Mafeteng for the year 2021. Mosoang 2 is reported to have had the largest area of 0.87 km^2 elevated at 2,013m and Hermon follows with 0.19km^2 with an elevation of 1,470m. Luma wetland and Skanka lake had the same area of 0.07 km^2.

Table 5.4: Area of Monitored Wetlands in Mafeteng - 2021

Wetland	Area (km^2)	Elevation (m)
Tsakholo lake	0.17	1,548
Hermon	0.19	1,470
Luma lake	0.11	1,635
Luma wetland	0.07	1,647
Skanka lake	0.07	1,699
Mosoang 2	0.87	2,013

Source: Department of Water Affairs

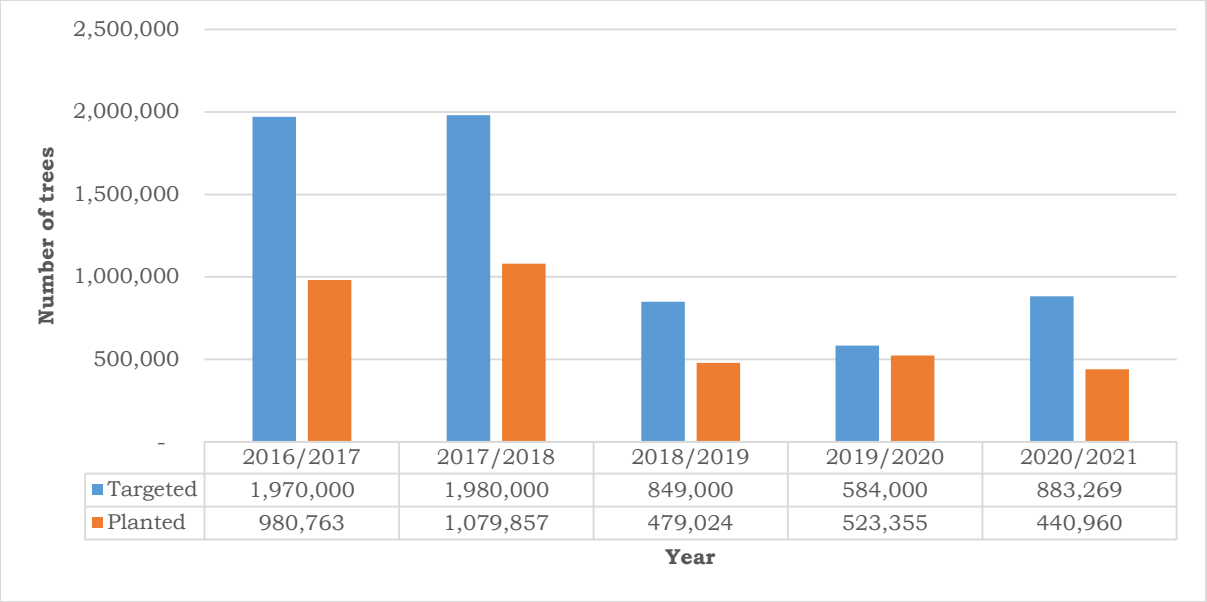
5.5.3 Forests

Forests provide habitats for plants and animals. **Habitat loss is one of the main causes of biodiversity loss**, as land that once was forest is cleared for other use https://wwf.panda.org/discover/our_focus/forests_practice/importance_forests

The functioning of forest ecosystems is characterized by energy and nutrient flow and cycling, biomass production and the decomposition of dead organic matter. www.gavinpublishers.com

Figure 5.2 displays the number of forest trees targeted and planted annually for the period 2016/2017 to 2020/2021. It is observed that more (1,079,857) forest trees were planted in 2017/2018 and the target was 1,980,000 followed by 2016/2017 with 980,763 trees and the target was 1,970,000. It is further observed that between 2019/2020 and 2020/2021, the number of trees planted decreased by 82,395.

Figure 5.2: Number of Forest Trees Targeted and Planted - 2016/2017 to 2020/2021



Source: Department of Forestry

5.6 Protected Areas

Lesotho has little area under protection with only 14,299 hectares of it being formally protected. Areas under protection are mostly in the main Drakensberg Escarpment. 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 Report 2014).

International Union Conservation of Nature (IUCN) protected area management categories, are categories used to classify protected areas in a system developed by IUCN. https://en.wikipedia.org/wiki/IUCN_protected_area_categories

The protected areas in Lesotho fall under the following categories:

Category II - Economic and biodiversity functioning of the region, ecosystem protection and recreation

Category III - Managed mainly for conservation of specific natural or cultural features

Category IV - Managed mainly for the sustainable use of natural ecosystems.

Table 5.5 presents the protected areas profile of Lesotho. It is noticed that majority of protected areas which were operational were under Category II, followed by two (Khomophatsoa MRA and Sanqebethu MRA) under Category IV.

Table 5.5: Protected Areas Profile of Lesotho - 2021

Category IUCN	Name	Area(ha)	Status
II	Senqu sources	~3,340	Proposed-under investigation

	Liqobong	2,200	Proposed-under investigation
	Sehlabathebe National Park	6,475	Operational
	Tšehlanyane National Park	5,333	Operational
	Bokong Nature Reserve	1,972	Operational
	Letša-la-Letsie	434	Operational
III	Liphofung Cave Rock Art Site	4	Operational
	Thaba-ea-Botha-Bothe		Planned
IV	Khomophatšoa MRA	33,000	Operational
	Mokhotlong/Sanqebethu MRA	52,000	Operational
	Moteng MRA		Proposed
	Liseleng ERMA	8,385	Dormant
	Mofolaneng ERMA	14,988	Dormant
	Khubelu ERMA	140,488	Planned
	Ramatšeliso ERMA	10,082	Dormant
	Corridor between Bokong and Tšehlanyane	6,836	Proposed

Source: Department of Environment

5.6.1 Snake Parks

Snake parks are a home to a wide range of snakes such as adders, pythons, vipers and cobras.

Table 5.6 shows the number of snakes at Qacha's Nek Snake Park. The table reveals that the number of Puff Adder snakes was the same from 2017 to 2020 and doubled in 2021. There was a decrease on the number of Cobras by 6 between 2020 and 2021. Snakes such as African Boa, Anaconda, Python and Rattler were last reported in 2018.

Table 5.6: Number of Snakes at Qacha's Nek Snake Park – 2017 to 2021

Snakes	2017	2018	2019	2020	2021
Cobra	15	15	14	14	8
Puff Adder	13	13	13	13	26
Spotted Skaapsteker	4	0	0	0	3
African boa	1	1	0	0	0
Python	1	1	0	0	0
Rattler	1	1	0	0	0
Anaconda	0	1	0	0	0
Herald Snake	1	0	0	0	0
Total	**36**	**32**	**27**	**27**	**37**

Source: Snake Park

5.6.2 Botanical Gardens

A botanical garden is a controlled and staffed institution for the maintenance of a living collection of plants under scientific management for purposes of education and research, together with such libraries, herbaria, laboratories, and museums as are essential to its particular undertakings

https://en.wikipedia.org/wiki/Botanical_garden.

Figure 5.3 illustrates the total number of seedlings propagated at Katse Botanical Garden. The highest number (27,594) of seedlings propagated was recorded in 2020/2021 and 2018/2019 follows with 20,519 seedlings. The lowest number (14,805) of seedlings propagated was recorded in 2016/2017. ***For full list of propagated species refer to Annex.***

Figure 5.3: Total Number of Seedlings Propagated at Katse Botanical Garden- 2016/2017 to 2020/2021

Source: Katse Botanical Garden

Table 5.7 shows the number and type of the propagated seedlings at Katse Botanical Garden. The highest number of propagated Leucosidea Sericea was obtained in 2018/2019 and 2020/2021 with 13,698 and 13,891seedlings independently. The least number (1,202) was propagated in 2017/2018.

Table 5.7: Number and Type of the Propagated Seedlings at Katse Botanical Garden- 2016/2017 to 2020/2021

Scientific Name	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021
Aloe polyphylla	693	4,046	863	733	571
Leucosidea sericea	2,637	1,202	13,698	8,809	13,891
Cotyledon orbiculata	1025	289	140	90	494
Heteromorpha trifoliata	358	38	164	639	0
Hesperantha coccinea	953	0	419	53	0
Galtonia viridiflora	1,309	1,631	0	0	123
Eucomis autumnalis	516	767	342	120	0
Olea africana	0	13	205	363	0
Kniphofia ensfolia	756	18	101	0	0
Sutherlandia montana	898	146	0	17	55
Aloe broomi	619	322	197	0	2,923
Elephantina elephantoriza	0	68	98	40	557
Diospyros austro-africana	0	177	1,349	488	908
Aloe ferox	0	56	615	55	0
Total	**13,566**	**10,286**	**18,204**	**11,407**	**19,522**

Source: Katse Botanical Garden

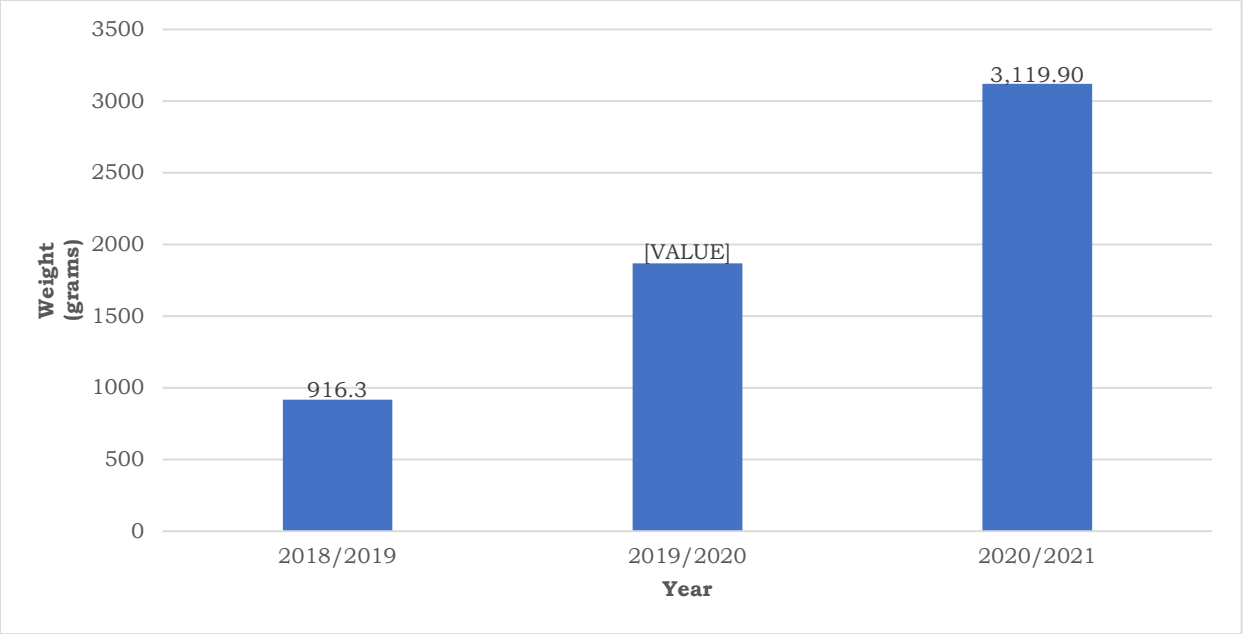
5.6.2.1 Seeds Collection

Seeds collection is performed using mechanical seed stripers, vacuums or by hand. Collectors travel to locations near the target reclamation site. Large known populations of targeted species are monitored for seed ripeness.
https://www.twinsistersnursery.com/about/our-seed-collection-and-germination-process

Refer to Annex for species names of seeds collected.

Figure 5.4 depicts the weight of seeds collected at Katse Botanical Garden for the period 2018/2019 to 2020/2021. It is shown that the highest (3,119.9g) collection of seeds was made in 2020/2021 and the least collection (916.3 g) was in 2018/2019.

Figure 5.4: Weight (grams) of Seeds Collected at Katse Botanical Garden- 2018/2019 to 2020/2021



Sourcce: Katse Botanical Garden

5.7 Flowers

Flowers are very important in nature. Flowers play a crucial role in our lives; they have been used for generations to express the thoughts and feelings words cannot explain. Besides adding color, texture and biodiversity to gardens and ecosystems, flowers are botanically important structures and essential sources of food for many organisms (Williams, 2019).

Table 5.8 presents the quantity of flowers imported at a Nursery in Maseru. It is noticed that Petunia flowers constituted the largest number (1,830) of flowers imported followed by Dianthus with 935 in 2021. Dahlia flowers were the least (12) imported in the same year.

Table 5.8: Quantity of Flowers imported at a Nursery- 2020 and 2021

Flowers	2020	2021
Alyssum	378	192
Begonia	0	332
Celosia	0	105
Coleus	0	24
Dahlia	0	12
Dianthus	150	935
Hypoestes	0	222
Impatient	0	254

Petunia	216	1,830
salvia	0	108
Verbena	18	91
Vinca	0	270
Marigold	36	168
Calendula	0	106
Pansy	216	848
Viola	30	156
Lobelia	12	0
Gazania	54	442
Primula	24	32
Total	**1,134**	**6,127**

Source: Maseru Nursery

5.8 Summary

Angiosperms constituted the largest number (2,535) of the recorded plant species and invertebrates had the highest number (1,279) of the recorded animal species. The largest area burnt was 74,164.54 hectares in 2017. The highest number (1,079,857) of forest trees planted was obtained in 2017/2018. The highest number (27,594) of the propagated rare and threatened plant species was recorded in 2020/2021 and the highest (3,119.90g) seed collection was made same year.

ANNEX

Water and Sanitation

Table 1: Dam Elevation and Density at Mohale and Katse -2017 to 2021

Year	Mohale	Katse	Mohale	Katse
	Elevation (MASL)	Volume (MCM)	Elevation (MASL)	Volume (MCM)
2017	2,041.49	2,023.80	387.98	1,076.84
2018	2,028.02	2,022.74	240.43	1,049.06
2019	2,025.90	2,015.56	222.51	891.95
2020	2,025.50	2,019.68	219.07	982.11
2021	2,035.17	2,032.33	371.85	1,370.21

Source: Lesotho Highlands Development Authority

Solid Waste

Table 2: Medical Waste Collection by District and Type - 2017

	Type of Waste			
District	**Infectious**	**Sharps**	**General**	**Pathological**
Mohale'shoek	392.73	473.32	73.65	0
Mafeteng	202.5	109.2	0	19
Quthing	273	44	0	0
Total (N)	**868.23**	**626.52**	**73.65**	**19**

Table 3: Monthly Medical Waste by Container Type - 2018

	Container Type			
Months	**Red Plastic (Large)**	**Sharps (5L)**	**Red Bucket (10L)**	**Pharmaceutical Bin**
March	6.85	1.7		
April	321.48	52.95		
May	959.84	189.45	16.02	114.45
June	889.68	170.54	130.45	183.38
July	339.23	64.60		42.38
Total (N)	**2517.08**	**479.24**	**146.47**	**340.21**

Table 4: Waste Collection by Months and Container Type - 2020

	Container Type			
Months	**Red Plastic (Large)**	**Sharps (5L)**	**Red Bucket (10L)**	**Pharmaceutical Bin**
August	896.06	129.53	65.53	210.70
September	1,064.89	123.89	118.89	388.45
October	1,456.73	118.30	128.85	179.90
November	1,088.46	124.89	48.65	374.88
December	800.64	98.20	100.50	175.14
Total (N)	**5,306.78**	**594.81**	**462.42**	**1,329.07**

Land Use and Cover

Table 5: Road lengths in Kilometers (km) by Description and Year – 2015 to 2019

Year	Undergoing Equipment-based Maintenance	Undergoing labor-based Maintenance	Roads not Surveyed /not analyzed	Total kilometers
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

Air and Climate Change

Table 6: Average Monthly Mean Temperature by Sub-stations- 2021

Month	Both a-Both e	Leribe	Mafeteng	Mejametalana	Mohale' Hoek	Mokhotlong	Oxbow	Phuthiatsana	Qacha's Nek	Quthing	Semonkong	Thaba-Tseka
January	18.4	14.7	12.1	9.1	10.8	7.7	10.4	11.5	12.6	16.9	18.3	16.7
February	18.8	14.3	13.2	11.1	8.1	5.9	11.5	11.5	13.3	10.9	17.7	23.1
March	15.3	15.3	15.4	8.9	15.0	8.4	10.6	11.7	14.1	16.1	15.6	21.9
April	16.0	15.7	15.2	9.8	11.7	8.6	7.7	10.7	14.2	16.0	18.5	21.8
May	18.8	15.3	14.0	11.1	11.5	9.3	10.6	10.0	14.1	14.6	16.2	24.3
June	19.0	12.9	16.7	10.6	10.7	5.2	11.0	11.9	12.6	15.6	19.5	23.4

July	16.0	14.2	14.5	5.5	9.8	7.6	9.4	10.4	13.0	11.1	18.4	17.9
August	20.2	15.0	14.7	8.6	11.0	8.5	10.7	11.6	14.1	10.8	17.7	16.5
September	18.4	15.7	13.0	9.3	9.6	10.0	7.7	9.9	15.4	13.4	15.8	21.9
October	19.2	11.4	12.5	10.6	9.8	9.6	8.5	11.2	15.0	14.9	19.0	23.6
November	16.9	15.0	13.8	10.4	10.7	7.9	9.1	11.4	14.6	13.1	18.5	24.7
December	17.6	15.3	13.7	9.6	8.9	7.1	10.4	11.0	13.8	16.0	16.9	13.9
Year	**17.9**	**14.5**	**14.1**	**9.6**	**10.6**	**8.0**	**9.8**	**11.1**	**13.9**	**14.1**	**17.7**	**16.5**

Table 7: Average Precipitation

Month	Millimeters	Inches
January	105.19	4.10
February	60.11	2.34
March	131.75	5.14
April	156.62	6.11
May	158.23	6.17
June	52.66	2.05
July	308.62	12.04
August	134.37	5.24
September	209.17	8.16
October	160.86	6.27
November	168.11	6.56
December	13.02	0.51
Year	**1658.71**	**64.69**

Source: Lesotho Meteorological Services

Average Temperature- 2021: Botha-Bothe

Month	Max (°C)	Min (°C)	Mean (°C)	Max (°F)	Min (°F)	Mean (°F)
January	24.70	12.06	18.38	76.47	53.71	65.09
February	21.90	15.66	18.78	71.42	60.19	65.81
March	25.23	5.41	15.32	77.41	41.74	59.58
April	24.38	7.59	15.98	75.89	45.65	60.77
May	25.33	12.25	18.79	77.59	54.05	65.82
June	24.69	13.23	18.96	76.44	55.82	66.13
July	24.09	7.86	15.97	75.36	46.14	60.75
August	24.87	15.46	20.17	76.77	59.83	68.30
September	25.37	11.34	18.35	77.66	52.40	65.03
October	24.97	13.40	19.19	76.95	56.12	66.54
November	24.34	9.50	16.92	75.80	49.09	62.45
December	23.92	11.35	17.64	75.06	52.43	63.75
Year	**24.48**	**11.26**	**17.87**	**76.06**	**52.27**	**64.17**

Table 8: Average Precipitation

Month	Millimeters	Inches
January	133.19	5.19
February	74.20	2.89
March	130.91	5.11
April	166.58	6.50
May	156.84	6.12
June	82.86	3.23
July	334.15	13.03
August	151.75	5.92

Average Temperature- 2021: Leribe

Month	Max (°C)	Min (°C)	Mean (°C)	Max (°F)	Min (°F)	Mean (°F)
January	13.31	16.19	14.75	55.96	61.14	58.55
February	16.76	11.75	14.26	62.18	53.16	57.67
March	16.21	14.31	15.26	61.18	57.77	59.47
April	16.08	15.33	15.71	60.95	59.59	60.27
May	15.26	15.30	15.28	59.47	59.53	59.50
June	14.26	11.48	12.87	57.68	52.67	55.17
July	13.72	14.62	14.17	56.70	58.31	57.51
August	16.05	13.85	14.95	60.90	56.94	58.92

September	236.18	9.21
October	168.87	6.59
November	172.78	6.74
December	10.59	0.41
Year	**1818.88**	**70.94**

Source: Lesotho Meteorological Services

September	15.41	15.95	15.68	59.75	60.71	60.23
October	15.41	7.30	11.35	59.73	45.14	52.44
November	14.71	15.24	14.97	58.47	59.44	58.95
December	17.74	12.79	15.27	63.94	55.03	59.48
Year	**15.41**	**13.68**	**14.55**	**59.74**	**56.62**	**58.18**

Table 9: Average Precipitation

Month	Millimeters	Inches
January	133.19	5.19
February	74.20	2.89
March	130.91	5.11
April	166.58	6.50
May	156.84	6.12
June	82.86	3.23
July	334.15	13.03
August	151.75	5.92
September	236.18	9.21
October	168.87	6.59
November	172.78	6.74
December	10.59	0.41
Year	**1818.88**	**70.94**

Source: Lesotho Meteorological Services

Average Temperature- 2021: Leribe

Month	Max (°C)	Min (°C)	Mean (°C)	Max (°F)	Min (°F)	Mean (°F)
January	13.31	16.19	14.75	55.96	61.14	58.55
February	16.76	11.75	14.26	62.18	53.16	57.67
March	16.21	14.31	15.26	61.18	57.77	59.47
April	16.08	15.33	15.71	60.95	59.59	60.27
May	15.26	15.30	15.28	59.47	59.53	59.50
June	14.26	11.48	12.87	57.68	52.67	55.17
July	13.72	14.62	14.17	56.70	58.31	57.51
August	16.05	13.85	14.95	60.90	56.94	58.92
September	15.41	15.95	15.68	59.75	60.71	60.23
October	15.41	7.30	11.35	59.73	45.14	52.44
November	14.71	15.24	14.97	58.47	59.44	58.95
December	17.74	12.79	15.27	63.94	55.03	59.48
Year	**15.41**	**13.68**	**14.55**	**59.74**	**56.62**	**58.18**

Table 10: Average Precipitation

Month	Millimeters	Inches
January	85.24	3.32
February	18.72	0.73
March	60.13	2.35
April	103.59	4.04
May	83.54	3.26
June	34.02	1.33
July	188.58	7.35
August	152.90	5.96

Average Temperature- 2021: Mafeteng

Month	Max (°C)	Min (°C)	Mean (°C)	Max (°F)	Min (°F)	Mean (°F)
January	18.35	5.76	12.05	65.03	42.37	53.70
February	19.15	7.22	13.18	66.47	45.00	55.73
March	19.10	11.77	15.43	66.38	53.18	59.78
April	19.08	11.38	15.23	66.34	52.49	59.42
May	20.72	7.23	13.97	69.29	45.01	57.15
June	18.44	14.88	16.66	65.19	58.79	61.99
July	19.09	9.82	14.46	66.36	49.68	58.02
August	19.02	10.31	14.67	66.23	50.56	58.40

September	203.03	7.92
October	128.70	5.02
November	111.07	4.33
December	12.20	0.48
Year	**1181.72**	**46.09**

Source: Lesotho Meteorological Services

September	20.71	5.29	13.00	69.27	41.52	55.40
October	18.32	6.64	12.48	64.97	43.95	54.46
November	17.92	9.73	13.83	64.25	49.52	56.89
December	17.38	10.12	13.75	63.28	50.21	56.74
Year	**18.94**	**9.18**	**14.06**	**66.09**	**48.52**	**57.31**

Table 11: Average Precipitation

Month	Millimeters	Inches
January	70.33	2.74
February	25.74	1.00
March	100.49	3.92
April	124.88	4.87
May	70.70	2.76
June	62.55	2.44
July	230.87	9.00
August	149.40	5.83
September	221.61	8.64
October	111.02	4.33
November	106.06	4.14
December	6.03	0.24
Year	**1279.68**	**49.91**

Source: Lesotho Meteorological Services

Average Temperature- 2021: Mejametalana

Month	Max (°C)	Min (°C)	Mean (°C)	Max (°F)	Min (°F)	Mean (°F)
January	16.19	2.10	9.15	61.15	35.79	48.47
February	17.81	4.44	11.12	64.06	39.99	52.02
March	17.73	0.10	8.91	63.92	32.17	48.05
April	17.11	2.56	9.83	62.79	36.60	49.70
May	16.69	5.51	11.10	62.04	41.92	51.98
June	15.92	5.36	10.64	60.65	41.64	51.15
July	15.17	-4.19	5.49	59.31	24.46	41.89
August	13.88	3.37	8.62	56.98	38.07	47.52
September	16.23	2.31	9.27	61.21	36.16	48.69
October	16.29	4.89	10.59	61.32	40.80	51.06
November	14.78	6.04	10.41	58.61	42.87	50.74
December	17.53	1.60	9.56	63.55	34.87	49.21
Year	**16.28**	**2.84**	**9.56**	**61.30**	**37.11**	**49.21**

Table 12: Average Precipitation

Month	Millimeters	Inches
January	105.74	4.12
February	24.53	0.96
March	66.06	2.58
April	129.19	5.04
May	149.90	5.85
June	44.25	1.73
July	198.60	7.75
August	169.43	6.61
September	174.93	6.82

Average Temperature- 2021: Mohale's Hoek

Month	Max (°C)	Min (°C)	Mean (°C)	Max (°F)	Min (°F)	Mean (°F)
January	17.28	4.29	10.78	63.10	39.72	51.41
February	17.07	-0.83	8.12	62.73	30.51	46.62
March	19.55	10.35	14.95	67.20	50.64	58.92
April	19.26	4.14	11.70	66.67	39.45	53.06
May	18.61	4.42	11.52	65.50	39.95	52.73
June	18.52	2.84	10.68	65.34	37.12	51.23
July	16.87	2.69	9.78	62.37	36.84	49.61
August	17.31	4.71	11.01	63.16	40.47	51.81
September	16.07	3.07	9.57	60.93	37.52	49.23

October	123.10	4.80
November	129.99	5.07
December	14.31	0.56
Year	**1330.03**	**51.87**

Source: Lesotho Meteorological Services

October	18.24	1.39	9.81	64.82	34.51	49.66
November	17.95	3.37	10.66	64.31	38.07	51.19
December	16.38	1.49	8.94	61.49	34.68	48.08
Year	**17.76**	**3.49**	**10.63**	**63.97**	**38.28**	**51.13**

Table 13: Average Precipitation

Month	Millimeters	Inches
January	115.22	4.49
February	58.47	2.28
March	74.47	2.90
April	83.90	3.27
May	137.58	5.37
June	39.99	1.56
July	61.52	2.40
August	128.24	5.00
September	97.34	3.80
October	109.41	4.27
November	84.97	3.31
December	50.42	1.97
Year	**1041.52**	**40.62**

Source: Lesotho Meteorological Services

Average Temperature- 2021: Mokhotlong

Month	Max (°C)	Min (°C)	Mean (°C)	Max (°F)	Min (°F)	Mean (°F)
January	13.25	2.19	7.72	55.85	35.94	45.90
February	13.92	-2.20	5.86	57.06	28.04	42.55
March	14.96	1.84	8.40	58.92	35.31	47.11
April	14.73	2.53	8.63	58.51	36.56	47.54
May	15.92	2.72	9.32	60.65	36.90	48.77
June	14.97	-4.57	5.20	58.95	23.77	41.36
July	14.67	0.53	7.60	58.41	32.95	45.68
August	15.38	1.54	8.46	59.68	34.78	47.23
September	16.97	3.05	10.01	62.55	37.49	50.02
October	14.38	4.88	9.63	57.89	40.79	49.34
November	18.28	-2.56	7.86	64.90	27.40	46.15
December	16.78	-2.67	7.05	62.20	27.19	44.70
Year	**15.35**	**0.61**	**7.98**	**59.63**	**33.10**	**46.36**

Table 14: Average Precipitation

Month	Millimeters	Inches
January	172.61	6.73
February	96.91	3.78
March	222.75	8.69
April	162.78	6.35
May	229.24	8.94
June	101.01	3.94
July	346.24	13.50
August	183.49	7.16
September	268.34	10.47

Average Temperature- 2021: Oxbow

Month	Max (°C)	Min (°C)	Mean (°C)	Max (°F)	Min (°F)	Mean (°F)
January	17.74	3.11	10.43	63.94	37.59	50.77
February	19.65	3.41	11.53	67.36	38.14	52.75
March	17.63	3.61	10.62	63.74	38.50	51.12
April	15.17	0.13	7.65	59.31	32.24	45.78
May	17.98	3.29	10.63	64.36	37.92	51.14
June	18.99	2.97	10.98	66.18	37.34	51.76
July	16.35	2.37	9.36	61.44	36.26	48.85
August	17.34	4.02	10.68	63.22	39.24	51.23
September	15.10	0.32	7.71	59.19	32.58	45.89

October	222.91	8.69
November	248.34	9.69
December	52.00	2.03
Year	**2306.61**	**89.96**

Source: Lesotho Meteorological Services

October	16.61	0.47	8.54	61.90	32.84	47.37
November	15.68	2.43	9.05	60.22	36.37	48.30
December	18.21	2.59	10.40	64.77	36.66	50.71
Year	**17.21**	**2.39**	**9.80**	**62.98**	**36.30**	**49.64**

Table 15: Average Precipitation

Month	Millimeters	Inches
January	88.75	3.46
February	48.22	1.88
March	110.17	4.30
April	134.49	5.25
May	120.47	4.70
June	64.11	2.50
July	270.82	10.56
August	129.82	5.06
September	215.63	8.41
October	149.70	5.84
November	121.23	4.73
December	8.32	0.32
Year	**1461.73**	**57.01**

Source: Lesotho Meteorological Services

Average Temperature- 2021: Phuthiatsana

Month	Max (°C)	Min (°C)	Mean (°C)	Max (°F)	Min (°F)	Mean (°F)
January	20.03	3.07	11.55	68.05	37.52	52.79
February	20.39	2.57	11.48	68.70	36.63	52.67
March	22.76	0.58	11.67	72.96	33.04	53.00
April	20.09	1.27	10.68	68.15	34.29	51.22
May	17.97	2.08	10.02	64.34	35.75	50.04
June	20.42	3.33	11.88	68.76	38.00	53.38
July	21.20	-0.41	10.39	70.16	31.25	50.70
August	20.46	2.76	11.61	68.83	36.98	52.90
September	18.44	1.41	9.92	65.20	34.53	49.86
October	16.34	5.97	11.16	61.41	42.75	52.08
November	19.06	3.67	11.36	66.30	38.60	52.45
December	18.89	3.19	11.04	66.01	37.75	51.88
Year	**19.67**	**2.46**	**11.07**	**67.41**	**36.43**	**51.92**

Table 16: Average Precipitation

Month	Millimeters	Inches
January	120.37	4.69
February	70.20	2.74
March	154.06	6.01
April	141.96	5.54
May	199.96	7.80
June	67.36	2.63
July	203.78	7.95
August	192.85	7.52

Average Temperature- 2021: Qacha's Nek

Month	Max (°C)	Min (°C)	Mean (°C)	Max (°F)	Min (°F)	Mean (°F)
January	17.75	7.45	12.60	63.95	45.40	54.68
February	20.75	5.85	13.30	69.35	42.53	55.94
March	21.86	6.28	14.07	71.36	43.31	57.33
April	20.80	7.53	14.17	69.44	45.56	57.50
May	20.54	7.71	14.13	68.97	45.88	57.43
June	19.62	5.67	12.64	67.32	42.21	54.76
July	16.98	9.07	13.03	62.56	48.33	55.45
August	20.46	7.67	14.06	68.82	45.81	57.31

September	199.15	7.77
October	167.70	6.54
November	180.28	7.03
December	66.89	2.61
Year	**1764.56**	**68.82**

Source: Lesotho Meteorological Services

September	19.52	11.27	15.39	67.13	52.28	59.71
October	21.15	8.94	15.05	70.08	48.09	59.08
November	18.85	10.29	14.57	65.94	50.52	58.23
December	21.52	5.99	13.76	70.74	42.79	56.76
Year	**19.98**	**7.81**	**13.90**	**67.96**	**46.06**	**57.01**

Table 17: Average Precipitation

Month	Millimeters	Inches
January	91.97	3.59
February	27.45	1.07
March	93.72	3.66
April	107.22	4.18
May	180.63	7.04
June	51.82	2.02
July	199.99	7.80
August	146.74	5.72
September	176.93	6.90
October	106.30	4.15
November	169.21	6.60
December	18.17	0.71
Year	**1370.13**	**53.44**

Source: Lesotho Meteorological Services

Average Temperature- 2021: Quthing

Month	Max (°C)	Min (°C)	Mean (°C)	Max (°F)	Min (°F)	Mean (°F)
January	20.62	13.15	16.88	69.11	55.66	62.39
February	19.52	2.30	10.91	67.14	36.13	51.64
March	23.07	9.16	16.12	73.53	48.49	61.01
April	23.55	8.43	15.99	74.40	47.17	60.78
May	22.29	6.88	14.58	72.11	44.38	58.25
June	21.95	9.24	15.60	71.52	48.64	60.08
July	20.91	1.23	11.07	69.64	34.21	51.92
August	17.82	3.87	10.84	64.08	38.96	51.52
September	20.22	6.54	13.38	68.39	43.77	56.08
October	20.58	9.16	14.87	69.05	48.49	58.77
November	22.12	4.11	13.11	71.81	39.39	55.60
December	20.49	11.55	16.02	68.89	52.79	60.84
Year	**21.10**	**7.13**	**14.12**	**69.98**	**44.83**	**57.41**

Table 18: Average Precipitation

Month	Millimeters	Inches
January	95.89	3.74
February	36.19	1.41
March	103.21	4.03
April	117.91	4.60
May	201.07	7.84
June	58.26	2.27
July	231.60	9.03
August	175.06	6.83

Average Temperature- 2021: Semonkong

Month	Max (°C)	Min (°C)	Mean (°C)	Max (°F)	Min (°F)	Mean (°F)
January	24.00	12.63	18.32	75.20	54.73	64.97
February	23.35	12.05	17.70	74.03	53.69	63.86
March	24.02	7.18	15.60	75.23	44.92	60.08
April	24.77	12.16	18.46	76.58	53.88	65.23
May	22.45	9.88	16.17	72.42	49.79	61.10
June	25.63	13.36	19.50	78.13	56.06	67.09
July	23.68	13.06	18.37	74.63	55.51	65.07
August	22.61	12.84	17.73	72.70	55.12	63.91

September	169.76	6.62
October	100.39	3.92
November	138.43	5.40
December	24.69	0.96
Year	**1452.46**	**56.65**

Source: Lesotho Meteorological Services

September	21.66	9.92	15.79	70.98	49.85	60.42
October	24.67	13.26	18.97	76.41	55.87	66.14
November	25.55	11.40	18.47	77.98	52.51	65.25
December	21.28	12.42	16.85	70.31	54.36	62.33
Year	**23.64**	**11.68**	**17.66**	**74.55**	**53.02**	**63.79**

Table 19: Average Precipitation

Month	Millimeters	Inches
January	93.73	3.66
February	80.31	3.13
March	100.23	3.91
April	105.25	4.10
May	150.44	5.87
June	27.43	1.07
July	180.43	7.04
August	100.71	3.93
September	83.03	3.24
October	132.68	5.17
November	110.42	4.31
December	34.49	1.34
Year	**1199.14**	**46.77**

Source: Lesotho Meteorological Services

Average Temperature- 2021: Thaba Tseka

Month	Max °C	Min (°C)	Mean (°C)	Max (°F)	Min (°F)	Mean (°F)
January	20.97	12.51	16.74	69.75	54.52	62.13
February	23.07		23.07	73.52	32.00	73.52
March	21.90		21.90	71.41	32.00	71.41
April	21.78		21.78	71.20	32.00	71.20
May	24.26		24.26	75.67	32.00	75.67
June	23.45		23.45	74.21	32.00	74.21
July	23.61	12.22	17.92	74.50	54.00	64.25
August	23.21	9.88	16.54	73.77	49.79	61.78
September	21.90		21.90	71.43	32.00	71.43
October	23.64		23.64	74.55	32.00	74.55
November	24.66		24.66	76.39	32.00	76.39
December	21.36	6.48	13.92	70.45	43.67	57.06
Year	**22.82**	**10.27**	**16.55**	**73.08**	**50.49**	**61.78**

Biodiversity

Table 20: Number of the Propagated Seedlings at Katse Botanical Garden- 2016/2017

Name of Species	Total
Aloe polyphylla	693
Sutherlandia montana	898
Galtonia viriodiflora	1,309
Kniphofia caulescence	15

Cotyledon orbiculata	1,025
Kniphofia ensfolia	756
Leucosedia sericea	2,637
Agapanthus campanalatus	1,295
Delosperma obtusume	934
Hesperantha coccinea	953
Heteromorpha trifoliate	358
Scilla natalensis	1,239
Tulbaghia allicea	1,558
Eucomis autumnalis	516
Aloe broomii	619
Total	**14,805**

Table 21: Number of the Propagated Seedlings at Katse Botanical Garden- 2017/2018

Name of Species	Total
Eucomis automnalis	767
Delosperma obtusome	9
Aloe broomii	322
Aloe polyphylla	4,046
Tulbaghia alliancea	1347
Kniphofia caulescence	128

Kniphofia ensfolia	18
Agapanthus campanalatus	19
Heteromorpha tripholiata/aboresence	38
Galtonia veridiflora	1631
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	1202
Hesperantha coccinea	1,014
Aloe ferox	56
Boophane disticha	10
Brunsvigia grandiflora	23
Olea Africana	13
Euphobia clavaroides	12
Total	**18, 416**

Table 22: Number of the Propagated Seedlings at Katse Botanical Garden- 2018/2019

Name of Species	Number of Seedlings
1.Cotydon orbiculata	140
2.Eucomis automnalis	342
3.Olea africana	205
4.Hesperantha coccinea	419
5.Dianthus basuticus	60

6.Diospyros austro africana	1349
7.Hypoxis costata	27
8.Withania somnifera	379
9.Hetermopha tripholiata	164
10.Leucosedia sericea	13,968
11.Haemanthus humilis	19
12.Ghomphostigma vergatum	56
13.Xysmalobium	78
14.Aloe aristata	1090
15.Aloe polyphylla	863
16.Aloe ferox	615
17.Aloe broomii	197
18.Elephantorhizha elephantina	98
19.Zantedeschia albomaculata	150
20.Plectrenthus grallatus	31
21.Kniphofia ritualis	12
22. Eucomis bicolor	2
23.Albuca shawii	77
24.Bulbine narcissifolia	62
25.Kniphofia ensifolia	101
26.xerovita viscosa	2
27.Boophone disticha	13
Total	**20,519**

Table 23: Weight (grams) of Seeds Collected at Katse Botanical Garden- 2020/2021

Name of Species	**Weight (g)**
1.Kniphofia sp	0.1
2.Aristea sp	0.8
3.Kniphofia sp	4.3
4.Gladiolous sp	0.8
5.Cynotis sp	0.1
6.Gladiolous sp	0.1

7.Silene sp	0.4
8.Kniphofia thodei	0.5
9.Peucelanum thodei	11.3
10.Grassula sp	0.1
11.Zaluzianskia sp	0.3
12.Senecio microspermum	7.7
13.Gladiolous oppositiflorous	0.4
14.Grassulla alba	0.4
15.Androcimbium melanthoides	6.3
16.Watsonia gladioloides	6.2
17.Gladiolous sp	4.6
18. Brunsvigia grandiflora	30.0
19.Scadoxos	25.0
20.Alpedia	5.1
21.Androcymbium	7.8
22.Eucomis schiffi	8.2
23.Sirene	3.4
24.Kniphofia sp	35.8
25.kniphofia northiae	58.0
27. Bulbine narcissifolia	48.8
28.Glumicalix	3.2
29.Stapelia	0.5
30.Elephantorhiza elephantina	152.0
31.Cussonia paniculata	1.8
32. Arestea sp	6.8
33. Arestea cognata	1.1
34. Snecio sp	0.4
35.Diaospyros austro africana	1490.0
36.Crinum bulbispermum	256.0
37.Dicoma anomala	85.6
38.Hermania sp	3.5
39.Lessertia perenanns	86.1
40.Bulbine capitata	3.0
41.Delosperma obtusome	0.5
42.Scilla natalensis	762.0
Total	**3,119.9**

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