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2016 Environment Report

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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.

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CHAPTER 1: WATER AND SANITATION

1.0 Introduction

Water is vital for life, as well as indispensable resources for the economy, while playing a fundamental role in the climate regulation cycle ("https://water.org/our-impact/water-crisis/"). Today's water crisis is not an issue of scarcity, but of access and the same case is with Lesotho. Cities and slums grow at an increasing rates and the situation worsens daily. Every day, lack of access to clean water and sanitation kills thousands, leaving others with reduced quality of life. Better water management is needed to meet human needs, sustain economic activities and achieve environmental goals.
("https://data.unicef.org/topic/water-and-sanitation/drinking-water/").

The sources of drinking water include rivers, lakes, streams, ponds, reservoirs and springs ("https://www.epa.gov/sourcewaterprotection"). As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals, and can pick up substances resulting from the presence of animals or from human activities.

Water is Lesotho's most valuable natural resource. It is a key determinant of economic growth and resource that must be carefully managed as part of sustainable programme. This makes Lesotho a relatively water-abundant country in the middle of the water-stressed area of South Africa

1.1 Scope and Coverage

Data collected is secondary and it is collected from Lesotho Highland Water Authority (LHDA) and government departments.

1.2 Results

1.2.1 Main Source of Drinking Water

Water is an essential substance on earth for life depends entirely on it. Human being and animals need clean and safe water from all dangerous substances so it could provide good health.

Table 1.1 indicates the percentage distribution of households by Main Source of drinking Water and Settlement. In Urban residence, 58.0 percent of households had Piped water into yard/plot as the source of drinking water. In Peri-Urban and Rural settlements, most households used Public tap/standpipe as the main source of drinking water with 34.6 percent and 55.5 percent respectively. In total, most

households in Lesotho used Public tap/standpipe (35.3 percent) as their main source of drinking water followed by those who used Piped water into yard/plot (27.5 percent). The least were those households who used Cart with small tank/drum (0.1 percent) as the main source of drinking water.

Table 1.1: Percentage Distribution of the Households by Main Sources of Drinking Water and Settlement, Census 2016

	Settlement			
Main Source of drinking Water	**Urban**	**Peri-Urban**	**Rural**	**Total**
Piped water into dwelling	11.5	6.1	1.1	5.7
Piped water into yard/plot	58.0	28.9	3.3	27.5
Piped into someone else's yard/plot	12.8	9.0	2.0	6.9
Borehole into yard/plot	1.1	2.6	0.8	1.1
Rainwater harvesting at home	0.1	0.1	0.2	0.1
Rainwater harvesting, neighbor	0.4	0.1	0.2	0.2
Public tap/standpipe	9.7	34.6	55.5	35.3
Public borehole	1.8	8.3	9.1	6.1
Protected spring	1.8	4.0	8.0	5.2
Unprotected spring	2.5	5.6	17.9	10.7
Surface water (river, dam, lake, pond, stream, canal, irrigation channels)	0.2	0.3	1.4	0.8
Cart with small tank/drum	0.1	0.1	0.2	0.1
Tanker-truck	0.1	0.2	0.3	0.2
Other	0.0	0.1	0.0	0.0
Total	**100.0**	**100.0**	**100.0**	**100**

1.2.2 Improved Main Source of Drinking Water

People do not just need water to drink but it has to be clean and be of good quality for it to be safe for their lives.

Figure 1.1 depicts percentage distribution of improved and unimproved main source of drinking water by settlement. Most households (87.7 percent) country wide used Improved source of drinking water and 12.3 percent fetched drinking water from Unimproved sources. Through the three settlements, households that fetched water from Improved sources ranged from 79.8 percent in Rural settlement to 96.6 percent in Urban settlement. Households that used Unimproved water sources ranged from 3.4 percent in Urban settlement to 20.2 percent in Rural settlement.

Figure 1.1: Percentage Distribution of Improved and Unimproved Main Source of Drinking Water by Settlement, Census 2016

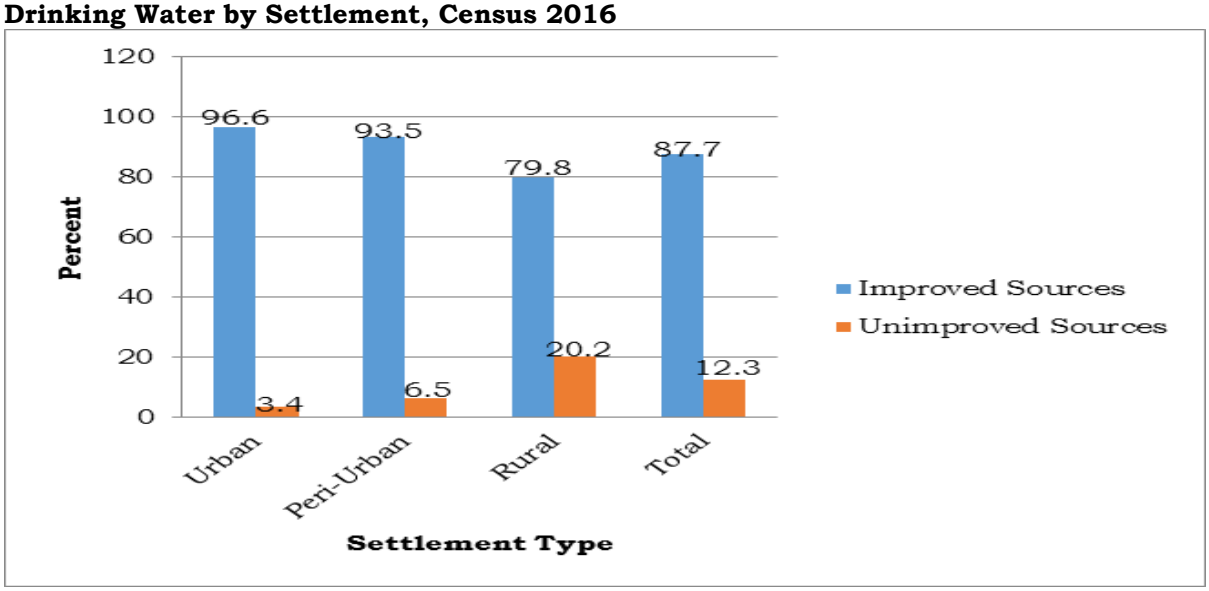


Table 1.2 presents the percentage distribution of household by agency and residence. The Table shows that Water and Sewage Company (WASCO) supplied 90.0 percent of the households in Lesotho with water followed by Department of Rural Water Supply (DRWS) with 3.9 percent. Households (5.2 percent) did not know the agency that supplied them with water.

Table 1.2: Percentage Distribution of Household by Agency and Residence 4th Quarter CMS 2014/2015

	Residence		
Agency	**Urban**	**Rural**	**Total**
WASCO	94.3	52.9	90.0
DRWS	0.7	31.7	3.9
Other	0.0	8.3	0.9
Do not know	5.0	7.1	5.2
Total (%)	**100.0**	**100.0**	**100.0**
Total (N)	**159,552**	**18,607**	**178,159**

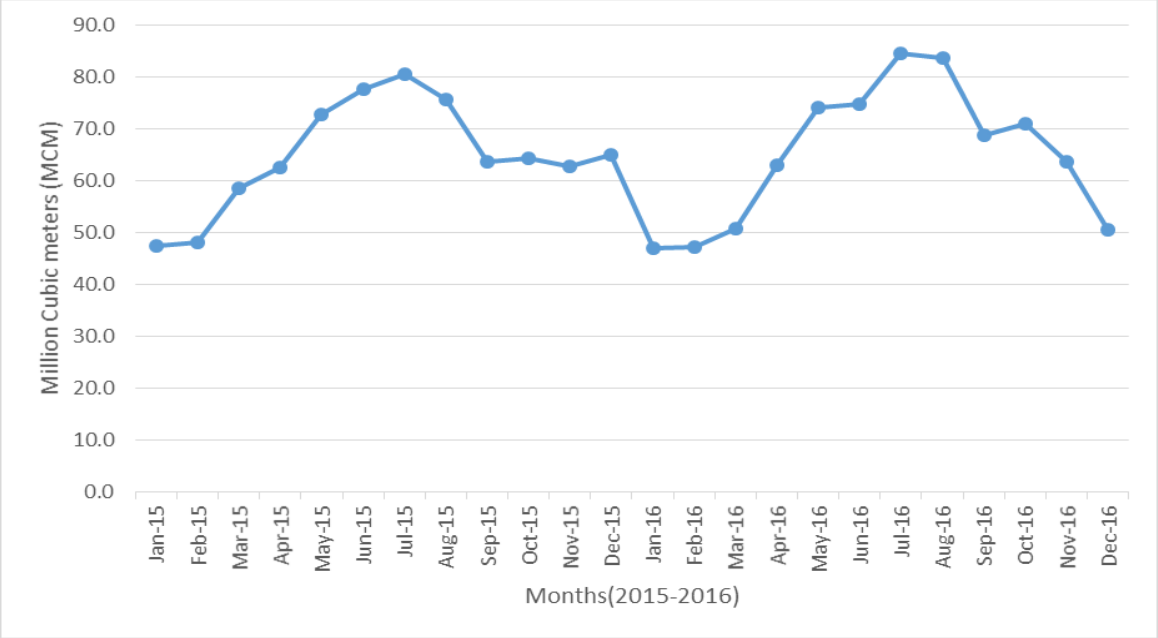
1.3 Water Exports

Water export is water that is transferred from one country to the other as a commodity through pipelines. Lesotho exports water to the Republic of South Africa (RSA).

Figure 1.2 displays water exports to Republic of South Africa in the years 2015 and 2016. It can be observed from the figure that the highest quantities of water were sold in July 2016 (84.6 MCM) and August 2016 (83.8 MCM). Throughout all the two years, it was noticed that the lowest quantities of water are sold to RSA in

January and February, whereas the highest quantities are sold to RSA in June, July and August.

Figure1.2: Water Exports in Million cubic meters (MCM) for the Period (2015-2016)



Source: Lesotho Highlands Development Authority

1.4 Sanitation

Sanitation is the system for taking dirty water and other waste products away in order to protect people's health. Inadequate sanitation results in many illnesses in people's lives.

Table 1.3 shows percentage distribution of households by main type of sanitation. In Lesotho, most households used Ventilated Improved Pit latrine (39.6 percent) followed by Unimproved Pit latrine with 31.1 percent. The least were those households that used Bucket toilets with 0.2 percent. The table further indicates that in urban settlement, 47.7 percent of households used Ventilated Improved Pit latrine followed by those that used Unimproved Pit latrine with 35.9 percent. There was 3.5 percent of households who reported to have used Open Defecation (Bush/field) in urban settlements.

Table 1.3: Percentage Distribution of Households by Main type of Sanitation, Census 2016

Main Type of Sanitation	Settlements			Total
	Urban	Peri-Urban	Rural	
Flush to piped sewer system	5.4	3.0	0.2	2.5
Flush to septic tank/Biogas digester	2.4	0.7	0.1	1.1
Flush to pit latrine	0.8	0.5	0.1	0.4
Ventilated Improved Pit latrine (VIP)	47.7	39.2	33.4	39.6
Unimproved Pit latrine	35.9	39.4	26.1	31.1
Bucket toilet	0.1	0.1	0.2	0.2
Public/Neighbour toilet	4.1	5.8	6.4	5.4
Open Defecation (Bush/field)	3.5	11.2	33.5	19.6
Total	**100.0**	**100.0**	**100.0**	**100.0**

Table 1.4 presents the percentage distribution of household by "How was the toilet build and paid for" and residence. Most households in the Urban settlement (88.1 percent) and rural settlement (61.3 percent) aquired their toilets by 'Owner build family savings and support'. From the total number of households in Lesotho, only 0.5 percent did not know how their toilets were built and paid for.

Table 1.4: Percentage Distribution of Household by How was the toilet build and paid for and Residence 4th Quarter CMS 2014/2015

How was the Toilet build and paid for	Urban	Rural	Total
Owner built, family savings and support	88.1	61.3	**74.3**
Owner built, subsidy from goverment	1.6	19.4	**10.8**
Goverment/NGO responsible for building	0.6	18.0	**9.6**
Other	0.3	0.7	**0.5**
Don't know	9.3	0.7	**4.8**
Total (%)	**100.0**	**100.0**	**100.0**
Total (N)	**213,317**	**226,601**	**439,918**

Table 1.5 presents the percentage distribution of household by How often is the toilet cleaned and residence. The table displays that 59.4 percent of households in urban settlement cleaned the toilets weekly followed by those that cleaned the toilets daily (21.7 percent). Households that cleaned their toilet once a month had the lowest percentage of 2.1. In rural settlement, 47.0 percent of households cleaned their toilets weekly followed by 19.6 percent of households who cleaned their toilets 'less frequently'.

Table 1.5: Percentage Distribution of Household by how often is the toilet cleaned and Residence 4th Quarter CMS 2014/2015

How often toilet cleaned	Urban	Rural	Total
Daily	21.7	16.8	**19.2**
Weekly	59.4	47.0	**53.1**
Twice a month	4.4	9.3	**6.9**
Once a month	2.1	2.6	**2.4**
less frequently	6.0	19.6	**13.0**
Never	6.3	4.6	**5.4**
Total (%)	**100.0**	**100.0**	**100.0**
Total (N)	**213,317**	**226,601**	**439,918**

1.5 Summary

The highest number of households in Lesotho used water from Public taps/standpipes (35.0 percent) followed by those households who had water piped into their yards (27.5 percent). Most households in Lesotho used water from improved sources. These ranges from 79.8 percent in rural settlement to 96.6 percent in urban settlement. There were still people with no proper sanitation and used Open Defecation (Bush/field) comprising 19.6 percent. It can also be noticed that water exports to South Africa were higher in winter and lower in summer.

CHAPTER 2: SOLID WASTE

2.0 Introduction

Solid Waste is defined as the useless and unwanted products in the solid state derived from the activities of the society. In Lesotho's law, waste is defined as "any substance that may be prescribed as waste or any matter, whether liquid, solid, gaseous, or radio-active, which is discharged, emitted or disposed in the environment in such a volume, composition or manner as to cause an alteration of the environment." (Seholoholo, 1998:3).

Industrialization, urbanization and technological advancement have made cities to face miserable solid waste management as they are spreading many diseases in the developing countries. Vectors such as insects and rodents spread diseases like cholera and dengue fever while contaminated water also exposes people to disease organisms. Most of these diseases are not easily discovered during childhood as they are infectious and toxic. They are revealed later in adulthood stage especially to those living nearby the dumping sites due to the potential of the waste to pollute air, food sources, land, and vegetation. The poor disposal and handling of waste thus leads to environmental degradation, destruction of ecosystem and poses great risks to public health.
www.unep.org/urban_environment/pdfs/dandorawastedump-reportsummary.pdf

There are several forms to manage solid waste such as elimination of undesirable waste products through recycling and composting which transform waste into useful products to protect human health. The environment in many cities is poor as the public sector is unable to deliver services effectively hence result in illegal dumping sites often common.

2.1 Scope and Coverage

The type of the data collected is secondary and it is collected from the specified data sources. Most of the data covers Maseru district only.

2.2 Results

The results shows scrap metal waste collected.

2.2.1 Scrap Metal Waste Collected

The data collected is for Scrap Metal waste. Scraps are recyclable and are materials left over from product consumption, such as parts of vehicles, building supplies, and surplus materials.

Figure 2.1 portrays scrap metal waste collected (in tons) in Maseru for the year 2016 by month. It is observed that the highest scrap metal waste was recorded in May with 253.2 tons and followed by April at 244.0 tons. The least amount of scrap metal waste was recorded in December with 7.7 tons.

Figure 2.1: Scrap Metal Waste (in tons) Collected in Maseru by month for the year 2016

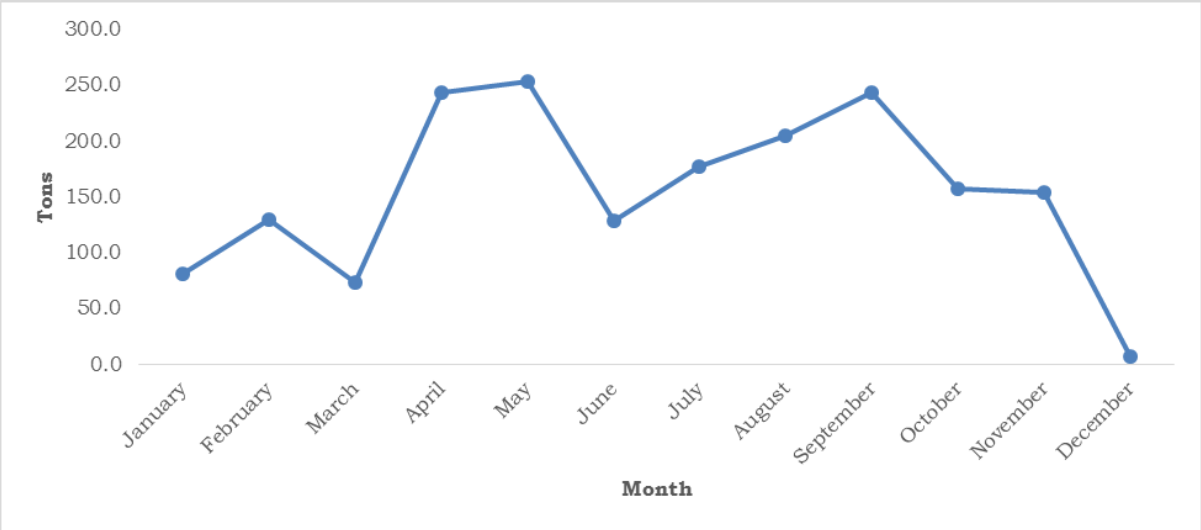


Table 2.1 presents scrap metal waste collected (in tons) in Maseru for the period (2012-2016). The Table reveals that 2013 dominated all other years with a total of 6,754.8 tons of scrap metal waste collected and 2012 is second with a total of 6,481.2 tons. Comparing the yearly collection by months, the observation is that in 2012 most scrap metal was collected in the month of February with 524.0 tons while in 2013 the highest collection was in July with 559.4 tons. For the year 2014, the uppermost collection was in January at 390.0 tons and July was the month with the maximum scrap metal waste collection in 2015 with 337.7 tons while for 2016 was in May at 253.2 tons.

Table 2.1: Scrap Metal Waste (in tons) Collected in Maseru for the period (2012-2016)

	Year				
Month	**2012**	**2013**	**2014**	**2015**	**2016**
January	339.5	424.4	390.0	151.3	81.4
February	524.0	535.4	283.0	261.3	129.8
March	433.7	382.8	376.0	252.7	73.5
April	219.8	409.7	312.0	258.2	244.0
May	402.9	317.6	315.0	247.1	253.2
June	354.4	307.3	323.0	335.6	128.8
July	357.4	559.4	233.0	337.7	177.3
August	459.7	417.5	295.0	287.8	204.6
September	387.8	484.3	272.0	231.9	243.8
October	413.2	386.2	150.0	190.7	157.6
November	420.1	351.5	169.0	200.9	154.4
December	156.7	165.7	118.0	56.0	7.7
Total	**6,481.2**	**6,754.8**	**5,250.0**	**4,826.3**	**3,872.0**

2.3 Municipal Waste Generated

Municipal waste generated is waste generated by different establishments. The following categories are used: Industrials, Commercial, Small-scale enterprises, Institutions and Households. The sampled residential areas for low-income areas were Thibella, Motimposo, Seoli and Khubetsoana. Medium income level areas were Matala Phase I and II, Arrival centre, Ha-Thetsane and Lecop. High income level areas were Katlehong, Lower Thetsane, Hills View and New Europa.
Refer to Annex 2

2.4 Solid Waste/Garbage Disposal

Waste disposal refers to collection, processing, managing and monitoring of waste material produced by human activities. Solid waste dumps are extremely spoiling the environmental conditions in developing countries. Wet waste decomposes and release bad odor which affects the people settled next to the dumping site and leads to chemical poisoning.

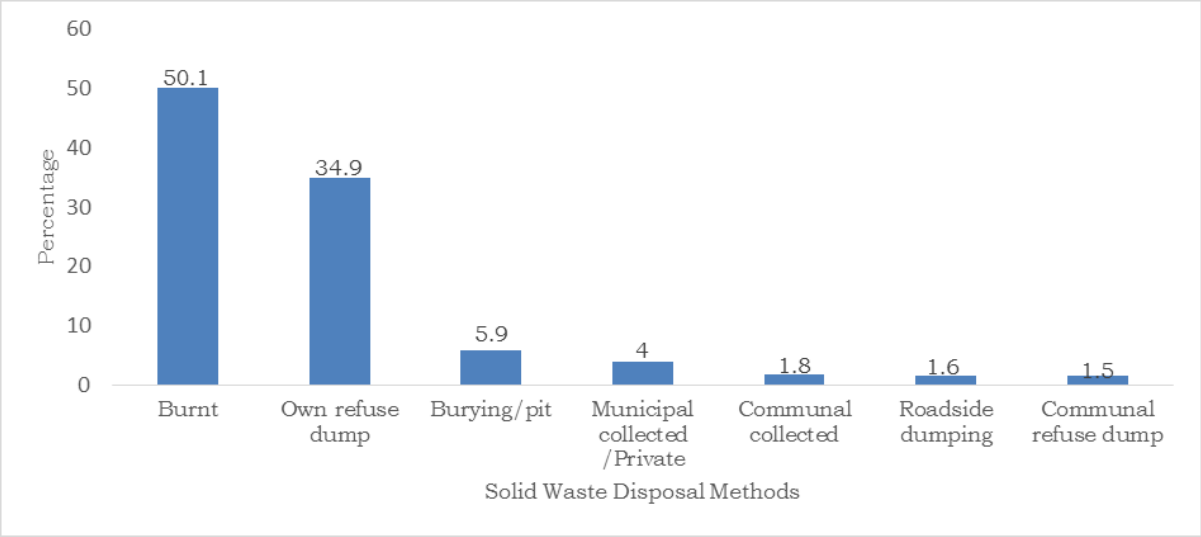
Table 2.2 indicates the number of households by method of solid waste disposal and settlement for year 2016. The results shows that Burning garbage (296,427 households) was the most commonly used method of garbage disposal in the country. Own refuse dump followed with 187,387 households stating that they used it as method of garbage disposal. Differentiating by the settlement, it is observed that burning of garbage was also the predominantly used method by households in both Urban (147, 088) and Peri-urban (25,849) areas to dispose off the garbage. On the contrary, households in the Rural areas (154,131) recorded Own refuse dump as the method they normally use for garbage disposal.

Table 2.2: Number of Households by Method of Solid Waste Disposal and Settlement, Census 2016

	Settlement			
Method of Disposal	**Urban**	**Peri-Urban**	**Rural**	**Total**
Municipality collected	20,920	353	223	21,496
Communal collected	9,100	410	303	9,813
Communal refuse dump	4,747	759	2,666	8,172
Roadside dumping	5,096	669	2,977	8,742
Burnt	147,088	25,849	96,490	296,427
Burying/pit	8,710	3,447	19,513	31,670
Own refuse dump	21,138	12,118	154,131	187,387
Other	235	105	410	750
Total	**217,034**	**43,710**	**276,713**	**537,457**

Figure 2.2 depicts the percentage distribution of households by method of solid waste disposal for the year 2016. It illustrates that, about half (50.1 percent) of the households were burning waste as a method of garbage disposal. The second most commonly practiced method of garbage disposal used by the households in 2016 was Own refuse dump with 34.9 percent. Households who used Municipal collection to dispose off their garbage accounted 4.0 percent. Communal refuse dump was the least method of garbage disposal used by the households at 1.5 percent.

Figure 2.2: Percentage Distribution of Households by Method of Solid Waste Disposal, Census 2016



2.5 Summary

Most of the scrap metal waste collected in 2016 was in May accounting for 253.2 tons and the least was in December with 7.7 tons. Comparing with other years, 2013 dominated having a total of 6,754.8 tons scrap metal waste collected. There has been a decreasing pattern in the scrap metal waste collection from 2013 to 2016 (6,754.8 to 3,872.0 tons). Burning garbage/waste was the mostly used (50.1 percent) method of disposing off garbage in Lesotho while Own refuse dump recorded the second method used (34.9 percent) by the households. The situation was similar regarding Urban and Peri-urban areas. Conversely, households in the Rural areas (154,131) stated Own refuse dump as the first method of garbage disposal. The least method used was Communal refuse dump with 1.5 percent.

CHAPTER 3: LAND USE AND COVER

3.0 Introduction

Land use is the human use of land. Land use involves the management and modification of natural environment or wilderness into built environment such as fields, pastures and settlements. It also has been defined as the arrangements, activities and inputs people undertake in a certain land cover type to produce, change or maintain it (FAO/UNEP, 1999). Land plays a significant part in the total wealth of the nation as most (if not all) of the economic activity of a nation is produced on some piece of land.

Land use information is needed for various reasons including the following;

- Different land uses affect the natural equilibrium of ecosystems differently
- Dissimilar impacts on the sustainable flow of goods and services
- Land resources are finite and usually scarce
- Competition among various land uses (e.g. urban expansion into agricultural areas)
- Knowledge of current land use (and land resources) is needed for formulating changes leading to sustainable use of the resources.
- Land cover information is undoubtedly an important input into predictivemodels related to environmental protection, such as models for climate change,biodiversity, land degradation, and regional and national food security early warning systems (Land Cover Atlas of Lesotho 2016).

Shares of total land area for three different types of land use are: arable land – land cultivated for crops like wheat, maize, and beans that are replanted after each harvest; permanent crops - land cultivated for crops like citrus, coffee, and rubber that are not replanted after each harvest; includes land under flowering shrubs, fruit trees, nut trees, and vines, but excludes land under trees grown for wood or timber; other – any land not arable or under permanent crops; includes permanent meadows and pastures, forests and woodlands, built-on areas, roads, barren land, etc (CIA World Factbook, 2013).

Lesotho is divided into four geographical regions/ ecological zones:

- The mountain region covers 18,037 km2 (59% of the total area of the country) and is characterized by the bare rock outcrops of the Maluti range and deep river valleys, with elevations of 2,000 m and above;
- The foothills region covers 4,529 km2 (15%) and lies at elevations from 1,800 m to 2,000 m between the lowlands and the Maluti mountains;
- The lowland region covers 5,094 km2 (17%) and is situated along the western border and consists of a narrow belt of land with elevation of 1,800 m or less and width between 10 and 65 km;

- The Senqu Valley covers 2,690 km2 (9%) and forms a narrow strip of land that flanks the banks of the Senqu (Orange) River and penetrates deep into the Maluti Mountains; elevations vary from mountains to lowlands.

http://www.fao.org/nr/water/aquastat/countries_regions/lesotho/index.stm

3.1 Scope and Coverage

Data used is secondary and was collected from different Government Ministries. The results covered are for the entire country and ranges from 2011 to 2016.

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) is also covered.

3.3 Agricultural Land

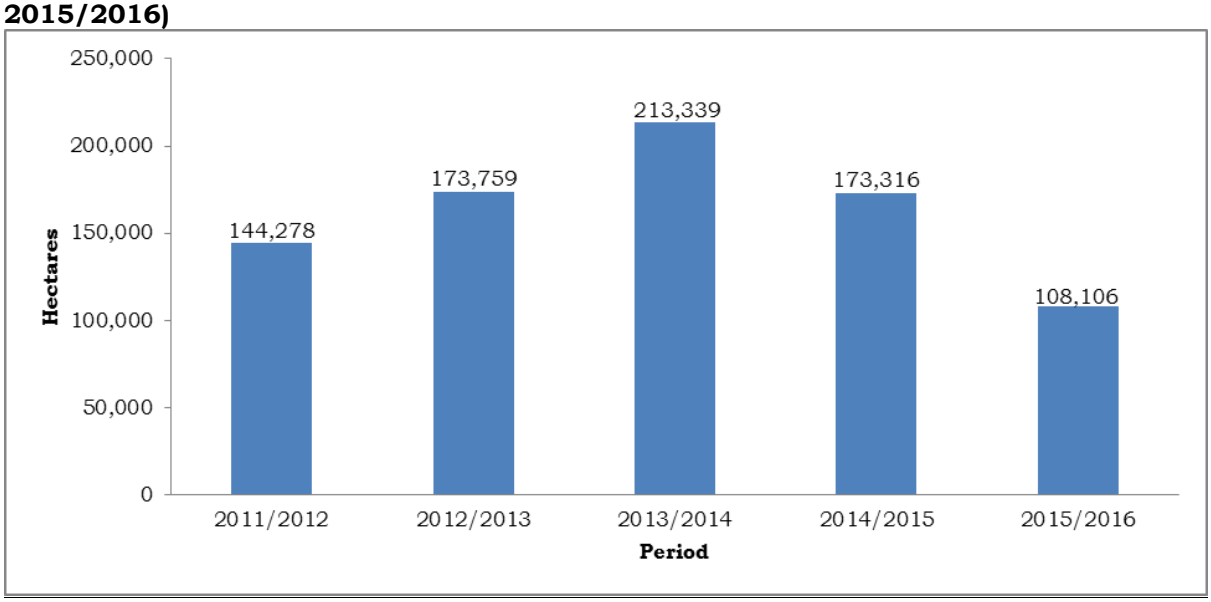
This refers to the major classes of land use on agricultural holdings. For classification the gross area is surveyed for each class. 'Agricultural land' includes land under scattered farm buildings, yards and their annexes, permanently uncultivated land, such as uncultivated patches, banks, footpaths, 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.

Figure 3.1 depicts area planted for all crops in hectares for the period 2011/2012 to 2015/2016. It is observed that there was an increase of 32.4 percent in area planted from the period of 2011/2012 to 2013/2014. There was a decrease of area planted from the period of 2013/2014 to 2015/2016 with 49.3 percent. The lowest area planted was in 2015/2016 with 108,106 hectares.

Figure 3.1: Area Planted for all Crops in Hectares (ha) for the Period (2011/2012-2015/2016)



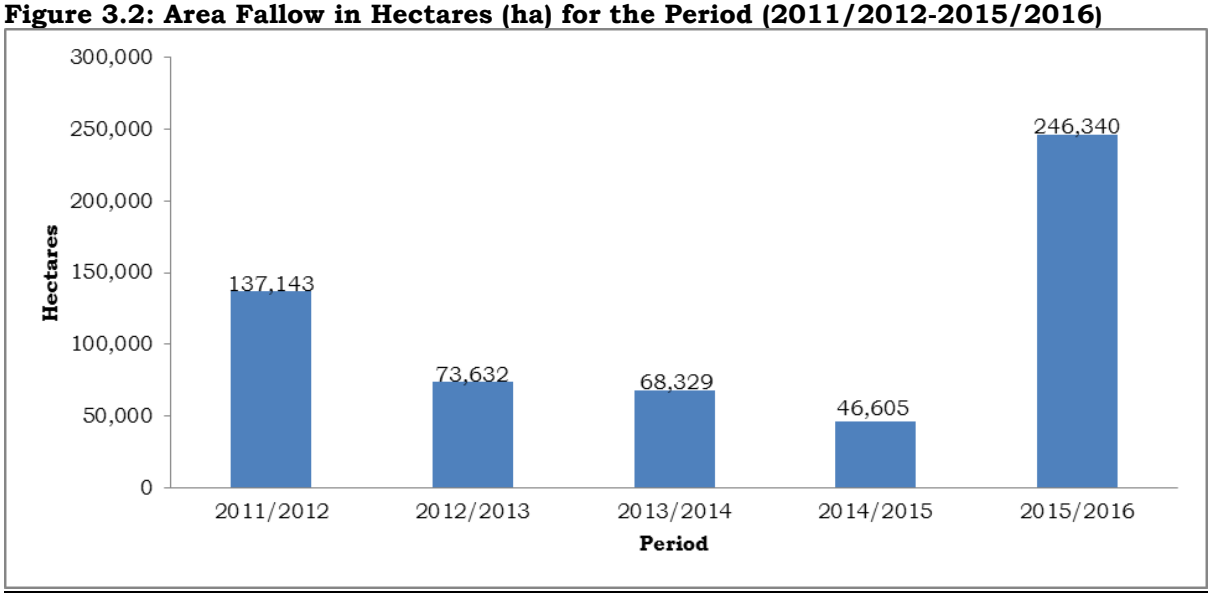
Source: Agricultural Production Surveys

3.4 Area Fallow

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

Figure 3.2 illustrates area fallow in hectares for the period 2011/2012 to 2015/2016. The area fallow has been decreasing from 2011/2012 (137,143 ha) to 2014/2015 (46,605 ha). An increase of 428.6 percent from 2014/2015 (246,340 ha) to 2015/2016 (46,605 ha) was also observed.

Figure 3.2: Area Fallow in Hectares (ha) for the Period (2011/2012-2015/2016)



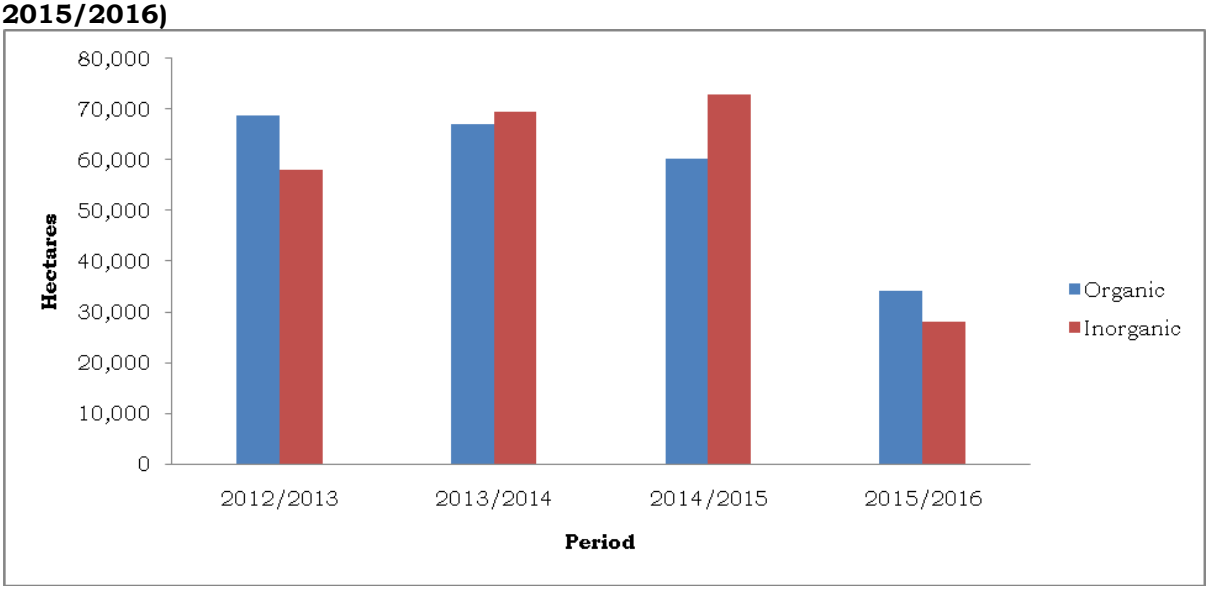
Source: Agricultural Production Surveys

3.4.1 Inorganic and Organic Fertilizer Application

Fertilizer is either a chemical or organic compound that is applied to plant for the purpose of providing supplemental nutrition to enhance all or a number of the plants growth characteristics. Inorganic fertilizer is a chemical (synthetic) fertilizer used to improve plant growth by supplying nutrients. Organic fertilizer refers to natural material added to the soil to supply nutrients essential to the growth of plants.

Figure 3.3 portrays area applied fertilizers in hectares by type and period (2012/2013 to 2015/2016). The observation is that more area was applied with Inorganic fertilizers in 2014/2015 (72,889ha) and 2013/2014 (69,526ha) than Organic fertilizers with 67,070 ha and 60,314 ha respectively. The least area applied with fertilizers was in 2015/2016 with 28,131 hectares of Inorganic and 34,357 hectares of Organic fertilizers.

Figure 3.3: Area Applied Fertilizers in Hectares (ha) by Type and Period (2012/2013-2015/2016)



Source: Agricultural Production Surveys

3.4.2 Pesticide Application

In the process of plant growth, a pesticide is any substance or mixture of substances used to prevent, destroy, repel, or mitigate any pest. Pests are living organisms that occur where they are not wanted or that cause damage to crops or humans or other animals.

Table 3.1 presents area applied pesticides in hectares by period 2012/2013 to 2015/2016. The area applied pesticides was higher in 2014/2015 with 77,264ha and least in 2015/2016 with 3,133ha. More area was applied with 'Other' types of pesticides throughout the periods except in 2014/2015 where

'Avalanche' dominated with 18,128 ha. In 2015/2016 only 20ha was applied with 'Fastac'. Gaps on the table show that there was no information for those persticides in those periods.

Table 3.1: Area Applied Pesticide in Hectares (ha) by Period (2012/2013 - 2015/2016)

Pesticides	2012/2013	2013/2014	2014/2015	2015/2016
Malathion	2,331	641	6,465	133
Dithane	332	801	8,321	250
Karate	4,072	1,476	11,371	529
Avalanche	46	187	18,128	856
Ripcort	705	935	59	271
Cutworm bait	1,451	254	3,175	-
Not used	44	2,214	-	-
Camprin	2,318	1,679	107	-
Fastac	-	-	9,511	20
Other	4,447	3,946	13,250	1,074
unknown	2,484	2,463	6,877	-
Total	**18,230**	**14,596**	**77,264**	**3,133**

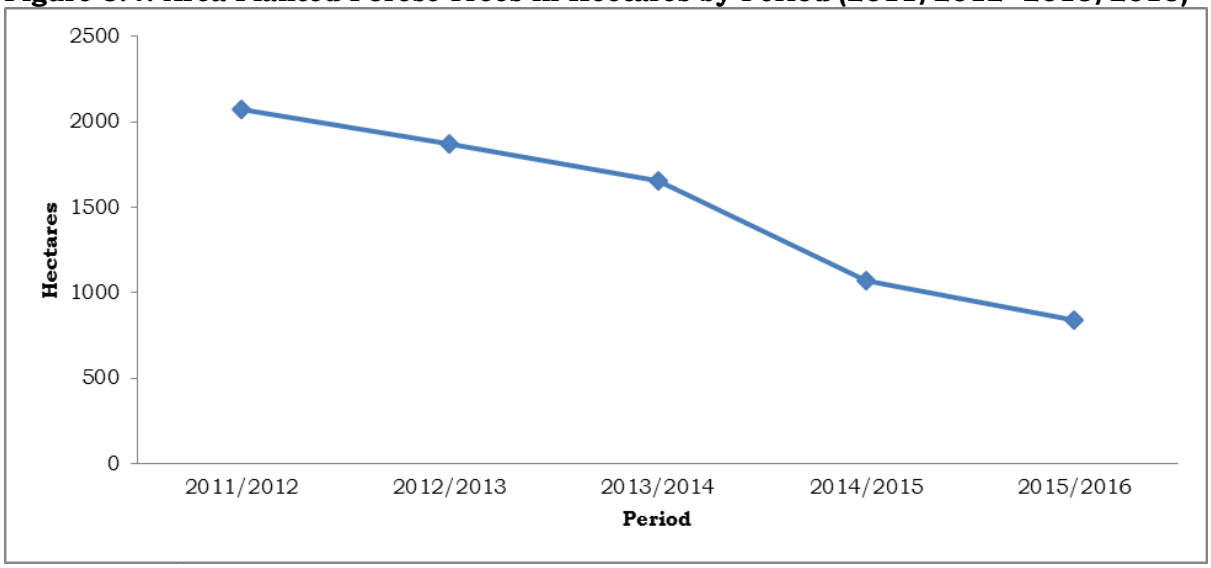
Source: Agricultural Production Surveys

3.5 Forests and other Wooded Land 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. 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 3.4 portrays area planted forest trees in hectares by period 2011/2012 to 2015/2016. The highest number of trees planted was observed in 2011/2012 covering an area of 2,075ha. The figure shows the decreasing pattern in the area planted forest trees from 2011/2012 (2,075 ha) to 2015/2016 (841ha). The highest decrease of 35.2 percent from 2013/2014 to 2014/2015 was observed.

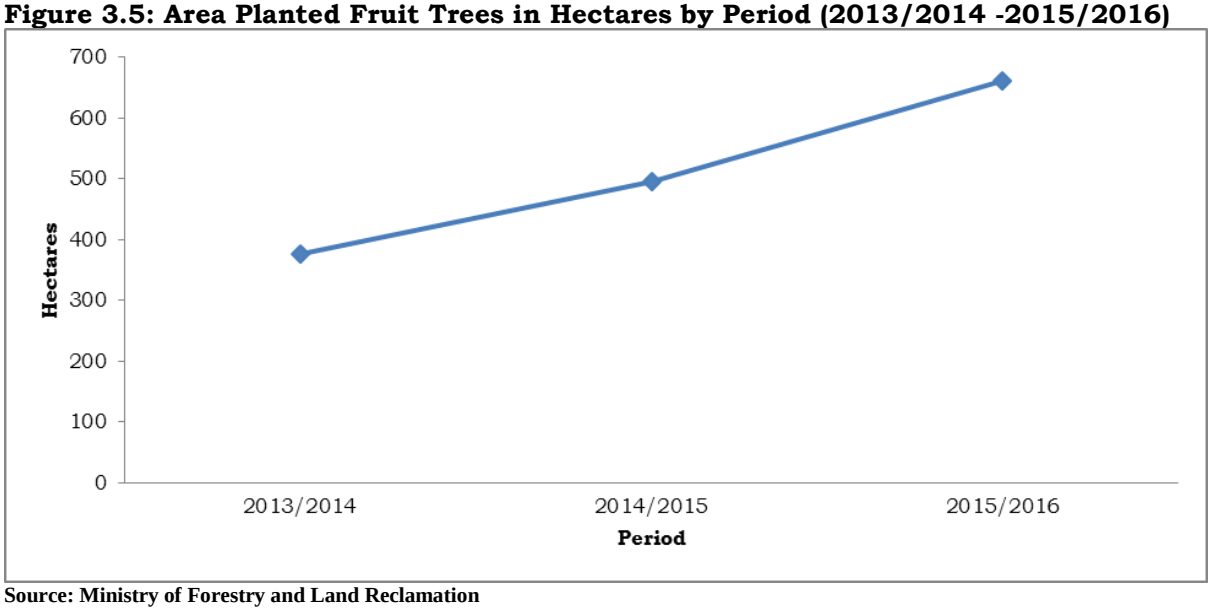
Figure 3.4: Area Planted Forest Trees in Hectares by Period (2011/2012 -2015/2016)



Source: Ministry of Forestry and Land Reclamation

Figure 3.5 depicts area planted forest trees in hectares by period 2013/2014 to 2015/2016. The minimum area planted was 376 ha in 2013/2014, it increased by 31.6 percent in 2014/2015 and further increased by 33.7 percent in 2015/2016.

Figure 3.5: Area Planted Fruit Trees in Hectares by Period (2013/2014 -2015/2016)



Source: Ministry of Forestry and Land Reclamation

3.6 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.

3.6.1 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).

Table 2 shows road lengths in square kilometers (km^2) by description for the period 2012 to 2016. It is observed from the table that Roads surveyed undergoing equipment-based maintenance had the largest lengths of 2,444.39 km^2 in 2012 followed by 2,256.01 km^2 in 2016. The largest lengths of roads not surveyed/not analyzed were in 2013 (2,966.31 km^2), while the least were in 2015 covering 362.92 km^2.

Table 3.2: Road lengths in Square kilometers (km^2) by description and Period (2012-2016)

Year	Roads surveyed undergoing equipment-based maintenance	Roads surveyed undergoing labour-based maintenance	Roads not surveyed/not analysed	Total kilometres
2012	2,444.39	2,073.79	1,346.86	5,864.95
2013	2,001.79	896.44	2,966.31	5,864.54
2014	2,041.60	2,018.89	1,804.05	5,864.50
2015	2,155.28	2,106.55	362.92	4,624.75
2016	2,256.01	1,835.47	533.27	4,091.48

Source: Roads Directorate

3.7 Summary

The minimum area planted crops was 108,106 hectares in 2015/2016 and the maximum area fallow was 246,340 hectares in the same year. Area applied with fertilizers and pesticides was lowest in 2015/2016 with 62,488 hectares and 3,133 hectares respectively. The number of forest trees planted shows a decreasing trend from 2011/2012 covering 2,075 hectares to 2015/2016 covering 841 hectares. The number of fruit trees planted shows an increasing pattern from 2013/2014 covering 376 hectares to 2015/2016 with 662 hectares.

CHAPTER 4: AIR AND CLIMATE CHANGE

3.0 Introduction

Lesotho is considered to be one of the countries vulnerable to the adverse effects of climate change according to Department of Meteorology report on "Adaptation to climate change technology needs in Lesotho" June 2004. Also, Under the United Nations Framework Convention on Climate Change (UNFCCC), Lesotho is categorized as one of the countries highly vulnerable to the impact of climate change, deserving special attention. The energy, land use change and forestry sectors were found to be emitting the highest amount of greenhouse gases in Lesotho's First National Communication to the Conference of the Parties in April 2000.

Lesotho experienced catastrophic heavy rains that affected its entire territory from the end of December 2010 to February 2011. These heavy rainfalls were up to 245 percentages above annual average and affected most of Basotho and the landscape. In 2015, Lesotho was severely affected by the El-Nino together with most of the Southern African Countries which was estimated to end in March 2016 according to the Department of Meteorology.

All these adverse climatic changes have a lot of effect on socio economic life of the people. It is therefore imperative that data should be available to inform policy makers to address these issues; hence air and climate change statistics.

4.1 Scope and Coverage

The chapter will consist of the following sections; temperature changes, rainfall changes and Ozone Depleting Substances (ODS) and or Alternatives by sectors.
The chapter comprises secondary data on temperatures, precipitates and ODS from Lesotho Meteorological Service and primary data collected on refrigerants from the 2016 Lesotho Population and Housing Census.

4.2 Climate Change

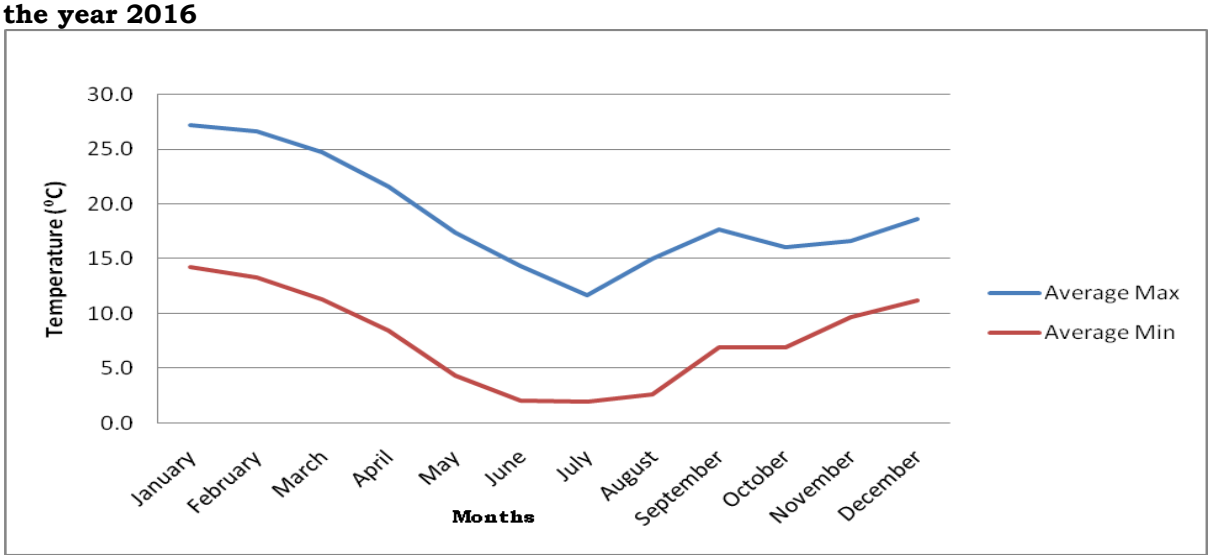
A region's climate means the usual weather patterns and conditions. A change in weather patterns and conditions is a change in climate. The results of maximum and minimum temperatures are discussed below as well as rainfall.

4.3 Maximum and Minimum Temperatures

Temperature is the state of a body with regard to heat or cold, as indicated by the thermometer; or the degree of free caloric which a body possesses, when compared with other bodies. Maximum and minimum temperatures are air temperatures observed at the site.

Figure 4.1 depicts Annual Average Maximum and Minimum Temperatures in degrees Celsius (^{0}C) for the year 2016. The highest annual average maximum temperature was observed in January with 27.2^{0}C. From this point the annual average maximum temperature decreased for all the months until July (11.7^{0}C). From July it has been fluctuating for all the months until it reached 18.7^{0}C in December. The highest annual average minimum temperature was observed in January with 14.3^{0}C whilst the lowest annual average minimum temperature was 2.0^{0}C in July.

Figure 4.1: Annual Average Maximum and Minimum Average Temperatures (^{0}C) for the year 2016



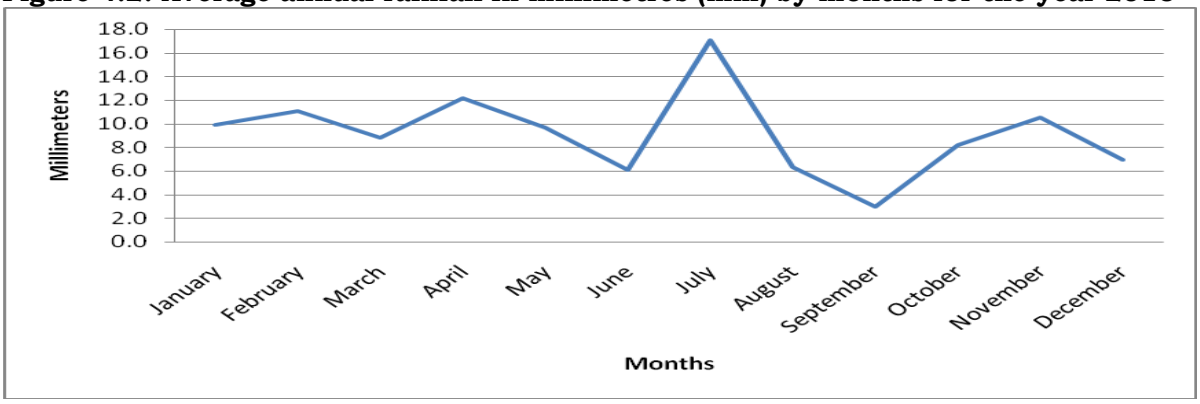
Source: Lesotho Meteorological Services

4.4 Average Annual Rainfall

Rainfall is the type of precipitation that occurs when water vapour in the atmosphere condenses into droplets that can no longer be suspended in the air.

Figure 4.2 displays average annual rainfall in millimetres (mm) by months for the year 2016. The highest average annual rainfall for the year 2016 was observed in July (17.1 mm), followed by April (12.2 mm). The lowest average annual rainfall was observed in September with 3.0 mm.

Figure 4.2: Average annual rainfall in millimetres (mm) by months for the year 2016



Source: Lesotho Meteorological Service

4.5 Domestic Refrigerators

Domestic Refrigerators refers to refrigerators found at household level.

Table 4.1 shows Total Number of Domestic Refrigerators by District and Type of Refrigerant, 2016 PHC. The Table indicates that out of the total of 119,778 refrigerators, 42,359 were not shown the type of gas used, thus making it difficult to tell which type of gas is commonly used in the country. It was observed that refrigerators operating with R134a (33,098) were mostly used followed by R600a (29,659) and the least HCL (3,984). It was also observed that there are more refrigerators (51,027) in Maseru followed by Berea and Leribe with a total of 20,974 and 20,253 respectively.

Table 4.1: Total Number of Domestic Refrigerators by District and Type of Refrigerant, Census 2016

	Refrigerant					
Districts	**NH3**	**R134a**	**R600a**	**HCL**	**Not Shown**	**Total**
Botha-Bothe	755	1,232	1,321	277	1,190	**4,775**
Leribe	1,782	5,931	5,603	678	6,259	**20,253**
Berea	1,923	6,105	4,426	729	7,791	**20,974**
Maseru	3,625	14,975	13,198	1,565	17,664	**51,027**
Mafeteng	1,121	1,714	1,821	364	4,071	**9,091**
Mohale'sHoek	593	1,472	1,512	155	2,022	**5,754**
Quthing	426	522	470	75	1,458	**2,951**
Qacha's Nek	222	511	599	62	767	**2,161**
Mokhotlong	95	288	347	37	551	**1,318**
Thaba-Tseka	136	348	362	42	586	**1,474**
Total	**10,678**	**33,098**	**29,659**	**3,984**	**42,359**	**119,778**

4.6 Ozone Depleting Substances and Alternatives by Sectors

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.

Sectors that will be covered in this section are Butcheries, Mortuaries, Hospitals, Offices, Supermarkets, Textiles, Garages, Off Sales, Furniture Shops and Hotels.

4.6.1 Butcheries

Butchery refers to a slaughterhouse or a place where meat is prepared for sale.

Table 4.2 presents the quantity (in kilograms) of gas purchased in Butcheries by type of ODS for the period 2012 to 2015. ODS Alternatives were more purchased in Butcheries for the year 2012 with 32.6 kg as compared to ODS (1.3 kg). It is also observed that in the year 2015 the purchase of ODS (7.8 kg) in the Butcheries outweigh the purchase of ODS Alternatives (4.9 kg).

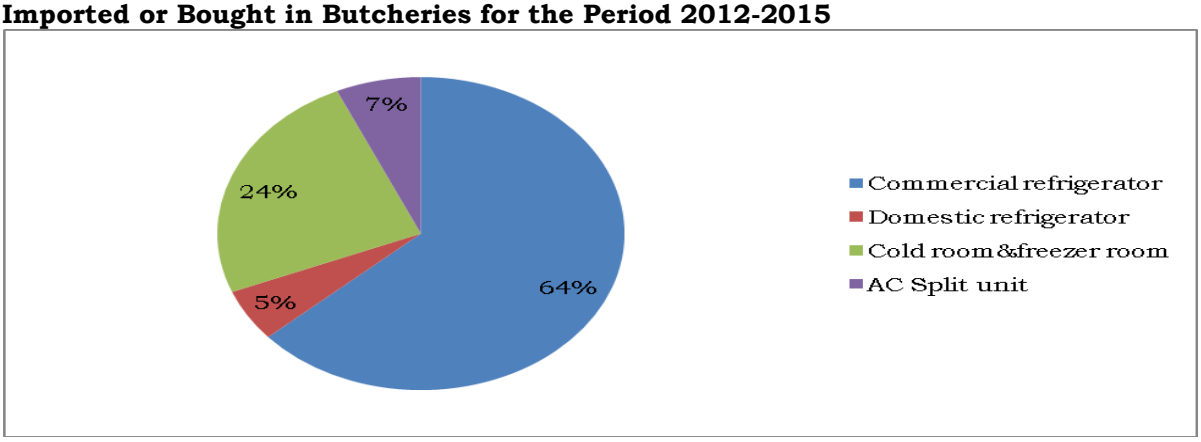
Table 4.2: Quantity (in kilograms) of Gas Purchased in Butcheries by type of ODS for the period 2012-2015

		Year			
ODS Alternative	**Pre 2012**	**2012**	**2013**	**2014**	**2015**
R134a	26.56	1.38	2.57	2.52	1.2
R600a	0.46	0	0	0.69	0.73
R410a	0.38	5.23	0	0	3
R404a	7.2	26.03	3.6	0	0
Total		**32.64**	**6.17**	**3.21**	**4.93**
ODS					
R22	11.85	1.32	0	3.6	7.61
HC	0	0	0	0	0.15
Total		**1.32**	**0**	**3.6**	**7.76**

Source: Lesotho Meteorological Services

Figure 4.3 depicts Total Percentage of Equipment Containing ODS and or Alternative Imported or Bought in Butcheries for the period 2012 to 2015. It is observed from the figure that Commercial refrigerator and Cold room & freezer room were more purchased in Butcheries in the country with 64.0 percent and 24.0 percent respectively. AC split unit and Domestic refrigerators accounted for 7.0 percent and 5.0 percent respectively.

Figure 4.3: Total Percentage of Equipment Containing ODS and or Alternative Imported or Bought in Butcheries for the Period 2012-2015



Source: Lesotho Meteorological Services

4.6.2 Mortuaries

Mortuary refers to a place where dead bodies are kept temporarily before their proper burial or cremation.

Table 4.3 shows the quantity (in kilograms) of gas purchased in Mortuaries by type of ODS for the period 2012 to 2015. It is observed that ODS has been the only type of substance used in Mortuaries throughout the period 2012 to 2015 and a small amount of ODS Alternative was bought in 2013 (0.023 kg) and in 2015 (0.1 kg). The maximum amount of ODS purchased in Mortuaries is observed in 2013 (21 kg), followed by 2012 (20.7 kg), 2015 (20.2 kg) and least purchased was in 2014 (16.6 kg).

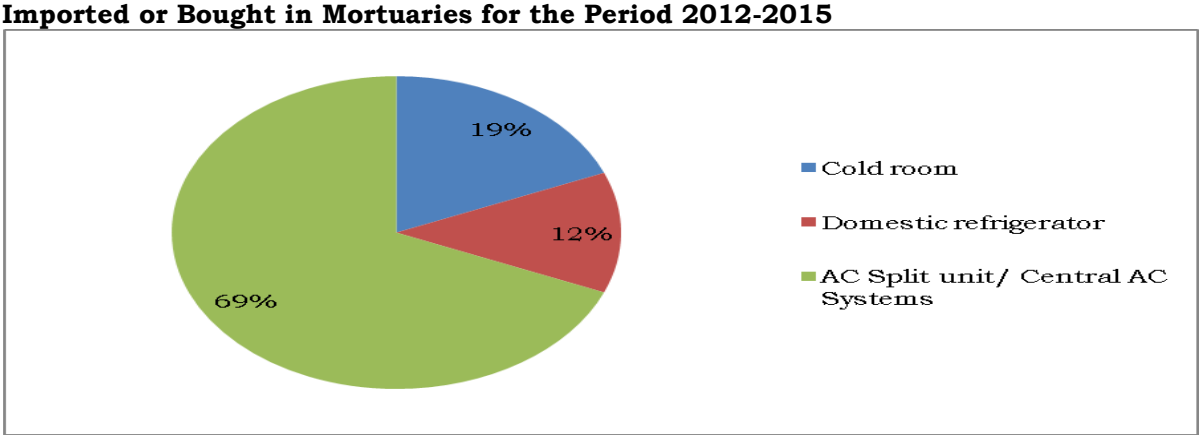
Table 4.3: Quantity (in kilograms) of Gas Purchased in Mortuaries by type of ODS for the period 2012-2015

		Year			
ODS Alternative	**Pre 2012**	**2012**	**2013**	**2014**	**2015**
R600a	0.13	0	0.02	0	0.1
ODS					
R22	53.34	8.67	21	16.6	16.6
R12	-	12	-	-	-
R500	-	-	-	-	3.6
Total		**20.67**	**21**	**16.6**	**20.2**

Source: Lesotho Meteorological Services

Figure 4.4 depicts Total Percentage of Equipment Containing ODS and or Alternative Imported or Bought in Mortuaries for the period 2012 to 2015. AC Split unit/Central AC Systems (69.0 percent) were mostly purchased Equipment in Mortuaries between the years 2012 and 2015, followed by Cold room (19.0 percent) and least Domestic refrigerators (12.0 percent).

Figure 4.4: Total Percentage of Equipment Containing ODS and or Alternative Imported or Bought in Mortuaries for the Period 2012-2015



Source: Lesotho Meteorological Services

4.6.3 Hospitals

Hospital refers to an institution that is built, staffed, and equipped for the diagnosis of disease.

Table 4.4 indicates the quantity (in kilograms) of gas purchased in Hospitals by type of ODS for the period 2012 to 2015. It is observed that ODS Alternative has been mostly purchased in Hospitals in the years 2014 and 2015. Comparatively ODS purchased reached a maximum of 18.6 kg and ODS Alternative purchased was only 3.3 kg in 2013. In 2014 ODS Alternative purchased in Hospitals in the country reached a maximum of 11.5 kg while ODS was only 0.3 kg.

Table 4.4: Quantity (in kilograms) of Gas Purchased in Hospitals by type of ODS for the period 2012-2015

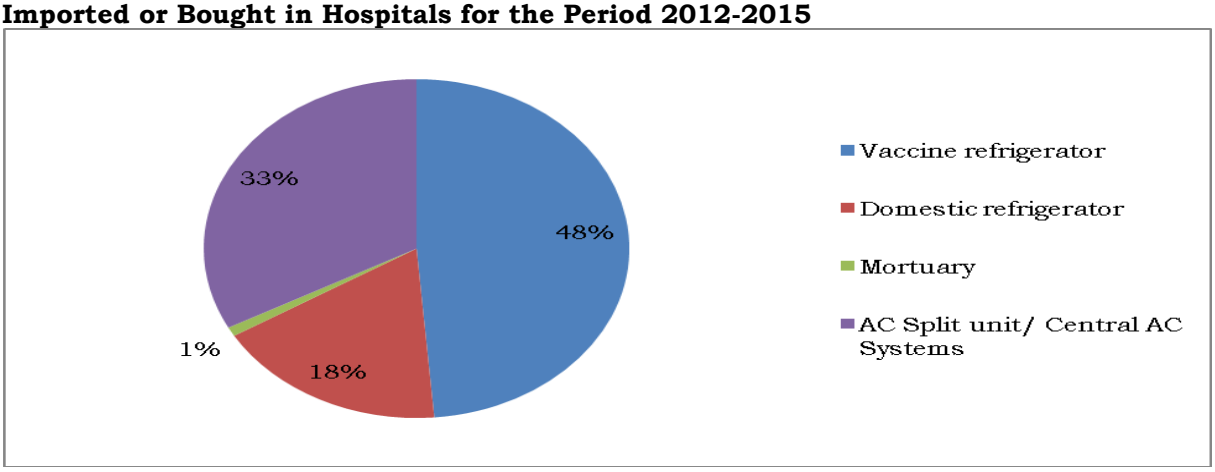
		Year			
ODS Alternative	**Pre 2012**	**2012**	**2013**	**2014**	**2015**
R134a	25.51	0.25	1.48	2.24	0.47
R600a	3.61	0.48	1.08	2.24	0.3
R410a	101.16	0	0	6.97	6.3
R404a	90.93	0	0	0	0.22
R407a	11.8	0	0	0	0.22
R717	2.37	0.55	0.77	0	0.22
Total		**1.28**	**3.33**	**11.45**	**7.73**
ODS					
R22	624.72	0	18.47	0	3.2
R12	60.95	0	0.1	0	0
HC	0	0	0.06	0.33	0.07
Total		**0**	**18.63**	**0.33**	**3.27**

Source: Lesotho Meteorological Services

Figure 4.5 illustrates Total Percentage of Equipment Containing ODS and or Alternative Imported or Bought in Hospitals for the period 2012 to 2015. It is observed that Vaccine refrigerator (48.0 percent) followed by AC Split unit/Central

AC System (33.0 percent) was mostly imported or bought Equipment containing ODS and or Alternative in Hospitals. It is also observed Mortuary was least imported or bought Equipment containing ODS and or Alternative in Hospitals with 1.0 percent.

Figure 4.5: Total Percentage of Equipment Containing ODS and or Alternative Imported or Bought in Hospitals for the Period 2012-2015



Source: Lesotho Meteorological Services

4.6.4 Offices

An office refers to a building or room in which people work at desks doing business or professional activities.

Table 4.5 represents the quantity (in kilograms) of gas purchased in Offices by type of ODS for the period 2012 to 2015. In 2012 ODS and ODS Alternatives purchased in Offices were 4.13 kg and 1.88kg respectively. In 2013 ODS Alternatives purchased increased with 1.23 kg from 2012. It also decreased by 2.99 kg from 2013 to 2014. The highest quantities of ODS and ODS Alternatives in 2015 were 358.49 kg and 136.35 kg respectively.

Table 4.5: Quantity (in kilograms) of Gas Purchased in Offices by type of ODS for the period 2012-2015

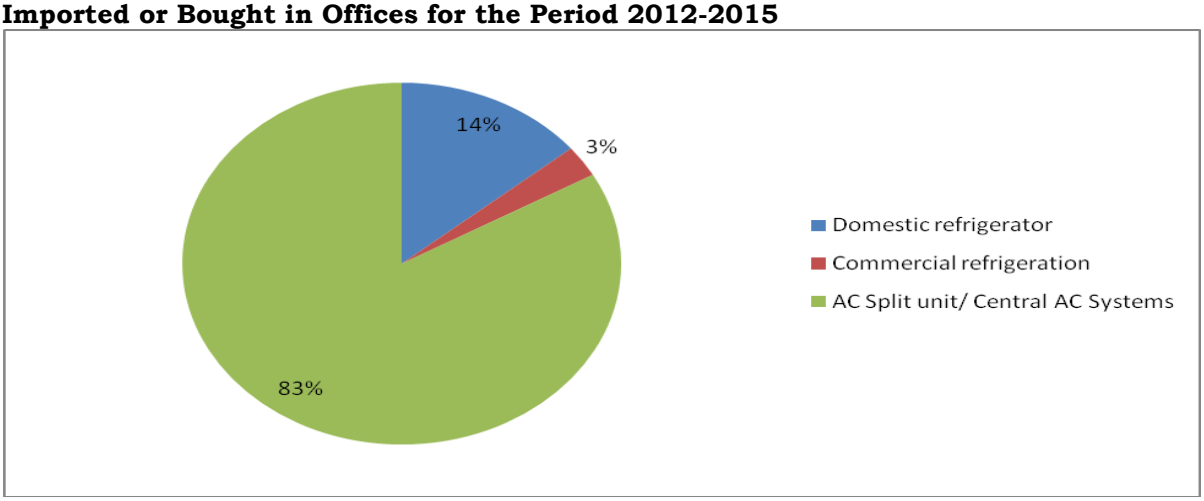
		Year			
ODS Alternative	**Pre 2012**	**2012**	**2013**	**2014**	**2015**
R134a	2.64	1.05	0	0.12	0.59
R600a	0.4	0.03	0	0	5.09
R410a	13.72	0.8	3.11	0	130.67
Total		**1.88**	**3.11**	**0.12**	**136.35**
ODS					
R22	1403.24	2.79	0	0	217.19
R401a	33.26	1.34			141.3
Total		**4.13**	**0**	**0**	**358.49**

Source: Lesotho Meteorological Services

Figure 4.6 depicts Total Percentage of Equipment Containing ODS and or Alternatives Imported or Bought in Offices for the period 2012 to 2015. AC Split

unit/Central AC Systems (83 percent) were mostly imported or bought Equipment containing ODS/Alternatives in Offices in the country, followed by Domestic refrigerators (14 percent) and least was Commercial refrigeration with (3 percent).

Figure 4.6: Total Percentage of Equipment Containing ODS and or Alternative Imported or Bought in Offices for the Period 2012-2015



Source: Lesotho Meteorological Services

4.6.5 Supermarkets

Supermarket refers to a self-service shop offering a wide variety of food and household products, organized into aisles.

Table 4.6 shows the quantity (in kilograms) of gas purchased in Supermarkets by type of ODS for the period 2012 to 2015. In 2012, ODS and ODS alternatives were 1.96 kg and 23.92 kg respectively. ODS alternatives decreased to 5.52 kg from 2012 to 2013. It increased to 17.02 kg from 2013 to 2014. In 2015 ODS alternatives purchased in supermarkets reached a minimum of 4.35 kg.

Table 4.6: Quantity (in kilograms) of Gas Purchased in Supermarkets by type of ODS for the period 2012-2015

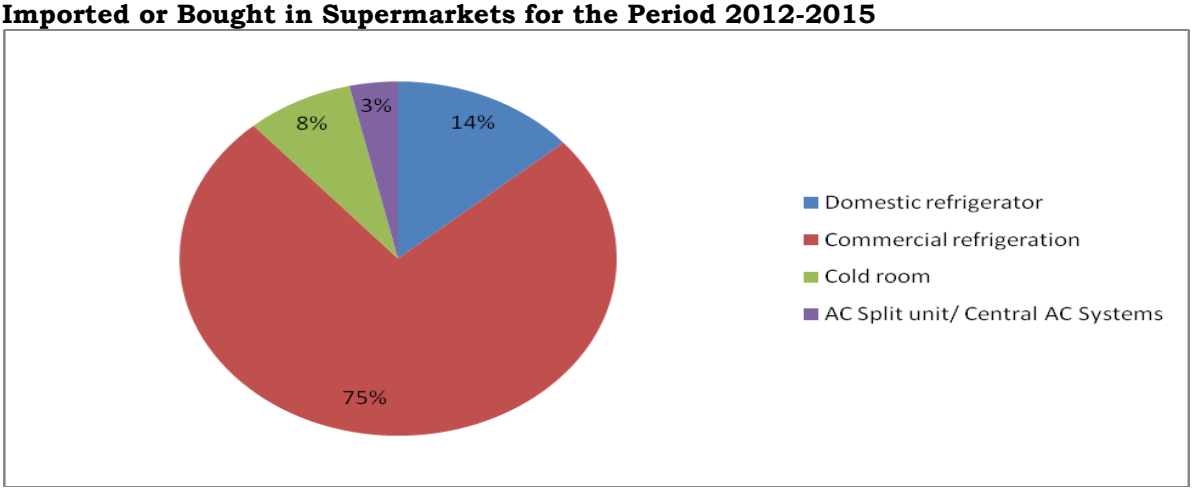
		Year			
ODS Alternative	**Pre 2012**	**2012**	**2013**	**2014**	**2015**
R134a	241.74	13.31	5.49	16.78	3.3
R600a	0.52	0.08	0	0.24	0.6
R410a	26.82	5.23	0	0	0
R404a	56.7	5.3	0.03	0	
R290	0.78	0	0	0	0.45
Total		**23.92**	**5.52**	**17.02**	**4.35**
ODS					
R22	38.7	1.96	0	0	0

Source: Lesotho Meteorological Services

Figure 4.7 depicts Total Percentage of Equipment Containing ODS and or Alternatives Imported or Bought in Supermarkets for the period 2012 to 2015. Commercial refrigeration (75.0 percent) were mostly imported or bought equipment

containing ODS/ODS Alternatives in supermarkets in the country, followed by domestic refrigerator (14.0 percent) and cold room operations (8.0 percent) and the least was AC Split unit/Central AC Systems with 3.0 percent.

Figure 4.7: Total Percentage of Equipment Containing ODS and or Alternative Imported or Bought in Supermarkets for the Period 2012-2015



Source: Lesotho Meteorological Services

4.6.6 Textiles

Textile refers to a place concerned primarily with design, production and distribution of cloth and clothing.

Table 4.7 represents the quantity (in kilograms) of gas purchased in Textiles by type of ODS for the period 2012 to 2015. In 2012, ODS and ODS alternatives were 4.87 kg and 4.38 kg respectively. In 2013 ODS purchased in textiles reached maximum of 5.2 kg, whereas ODS alternative constituted 0.04 kg. ODS alternative purchased in textiles in 2015 was (0.36 kg).

Table 4.7: Quantity (in kilograms) of Gas Purchased in Textiles by type of ODS for the period 2012-2015

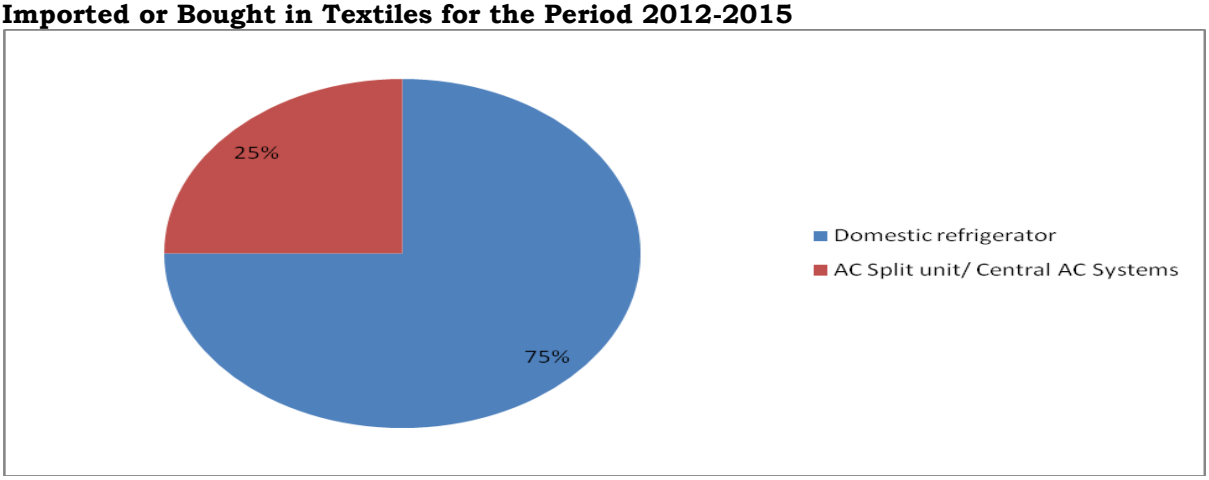
		Year			
ODS Alternative	**Pre 2012**	**2012**	**2013**	**2014**	**2015**
R134a	8.69	0.08	0.04	0.06	0.22
R600a	0.68	0	0	0.06	0.14
R410a	8.36	4.3	0	0	0
Total		**4.38**	**0.04**	**0.12**	**0.36**
ODS					
R22	0	3	5.2	0	0
R12	0.56	1.87	0	0	0
Total		**4.87**	**5.2**	**0**	**0**

Source: Lesotho Meteorological Services

Figure 4.8 represents Total Percentage of Equipment Containing ODS and or Alternatives Imported or Bought in Textiles for the period 2012 to 2015. It is depicted from the figure that domestic refrigerator constituting (75.0 percent) was

mostly imported as compared to AC Split unit/Central AC Systems (with 25.0 percent).

Figure 4.8: Total Percentage of Equipment Containing ODS and or Alternative Imported or Bought in Textiles for the Period 2012-2015



Source: Lesotho Meteorological Services

4.6.7 Garages

Garages refer to filling stations in districts where the survey was undertaken.

Table 4.8 shows the quantity (in kilograms) of gas purchased in Garages by type of ODS for the period 2012 to 2015. It is observed that ODS Alternative purchased in 2012 was only 0.32 kg. This increased to 1.61 kg in 2013. On the other hand, ODS purchased in 2013 was 11.48 kg.

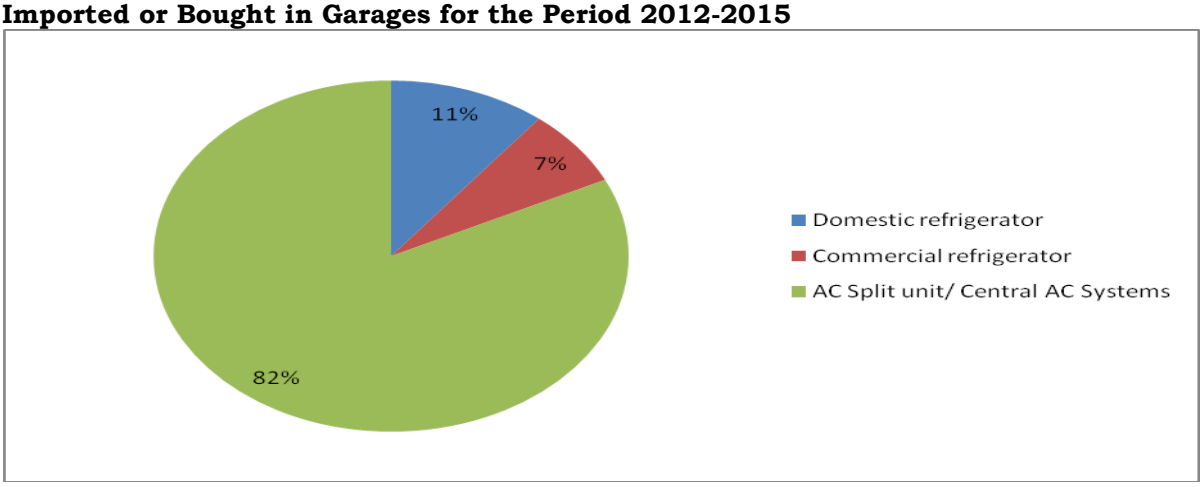
Table 4.7: Quantity (in kilograms) of Gas Purchased in Garages by type of ODS for the period 2012-2015

		Year			
ODS Alternative	**Pre 2012**	**2012**	**2013**	**2014**	**2015**
R134a	0.38	0.1	0.85	0	0
R600a	0.05	0	0	0	0.24
R410a	0	0.22	0.76	0	0
Total		**0.32**	**1.61**	**0**	**0.24**
ODS					
R22	4.91	0	11.48	0	0

Source: Lesotho Meteorological Services

Figure 4.9 represents Total Percentage of Equipment Containing ODS and or Alternatives Imported or Bought in Garages for the period 2012 to 2015. It is observed from the figure that AC Split unit/Central AC System (82.0 percent) were mostly imported or bought equipment followed by Domestic refrigerator with 11.0 percent and the least equipment bought was commercial refrigerator with 7.0 percent.

Figure 4.9: Total Percentage of Equipment Containing ODS and or Alternative Imported or Bought in Garages for the Period 2012-2015



Source: Lesotho Meteorological Services

4.6.8 OFF Sales

OFF Sale refers to a bar where one can buy alcoholic drinks and take them away and drink them somewhere suitable for the buyer.

Table 4.9 presents the quantity (in kilograms) of gas purchased in Off Sales by type of ODS for the period 2012 to 2015. In 2012, ODS alternative and ODS purchased in OFF Sales were 6.22 kg and 1.05 kg respectively. In 2013 ODS alternative purchased in OFF Sales increased to 14.1 kg and further increased to 15.21 kg in 2014. ODS reached only 7.0 kg in 2014. In 2015 ODS alternative reached a maximum of 30.97 kg.

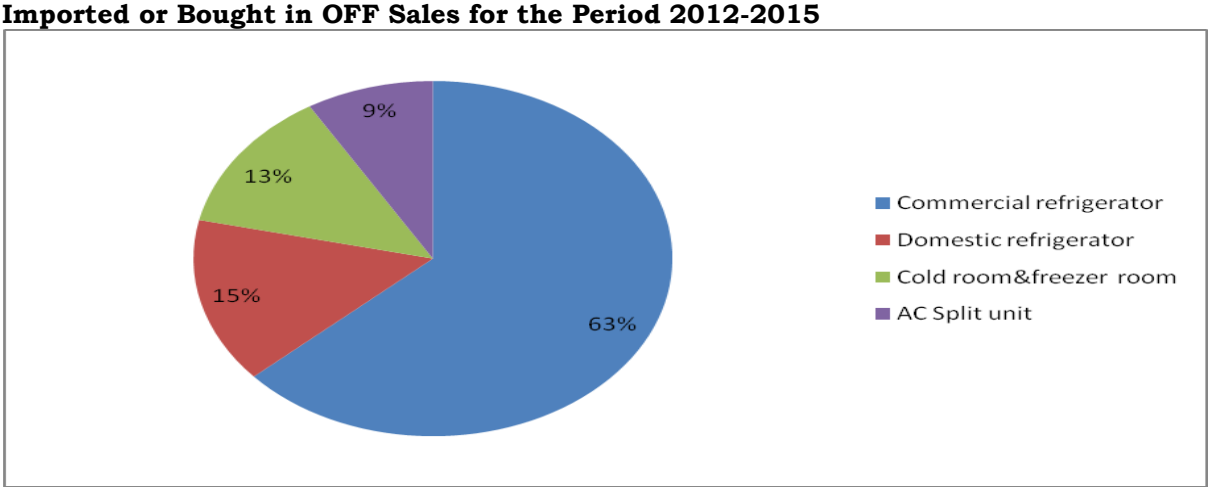
Table 4.9: Quantity (in kilograms) of Gas Purchased in OFF Sales by type of ODS for the period 2012-2015

		Year			
ODS Alternative	**Pre 2012**	**2012**	**2013**	**2014**	**2015**
R134a	62.46	3.98	2.95	9.55	4.97
R600a	0	0	0	0.14	0
R410a	9.7	0	0.4	0	26
R404a	16.37	1.98	10.75	5.37	0
R290	0.65	0	0	0.15	0
R717	0	0.26	0	0	0
Total		**6.22**	**14.1**	**15.21**	**30.97**
ODS					
R22	15.73	1.05	0	7	0

Source: Lesotho Meteorological Services

Figure 4.10 depicts Total Percentage of Equipment Containing ODS and or Alternatives Imported or Bought in OFF sales for the period 2012 to 2015. Commercial refrigerators (63.0 percent) were mostly imported equipment containing ODS and or ODS alternatives followed by Domestic refrigerators with 15.0 percent and the least were AC Split unit with 9.0 percent.

Figure 4.10: Total Percentage of Equipment Containing ODS and or Alternative Imported or Bought in OFF Sales for the Period 2012-2015



Source: Lesotho Meteorological Services

4.6.9 Furniture Shops

Furniture Shop refers to a shop that sells the movable articles that equip a house.

Table 4.10 shows the quantity (in kilograms) of gas purchased in Furniture Shops by type of ODS for the period 2012 to 2015. In 2012 ODS alternative purchased in Furniture Shops was 1.33 kg and ODS was 0.58 kg. In 2013 ODS alternative purchased decreased to 0.08kg from 2012. In 2014 ODS alternative increased to 3.6 kg. In 2015 ODS Alternatives increased to 5.48 kg.

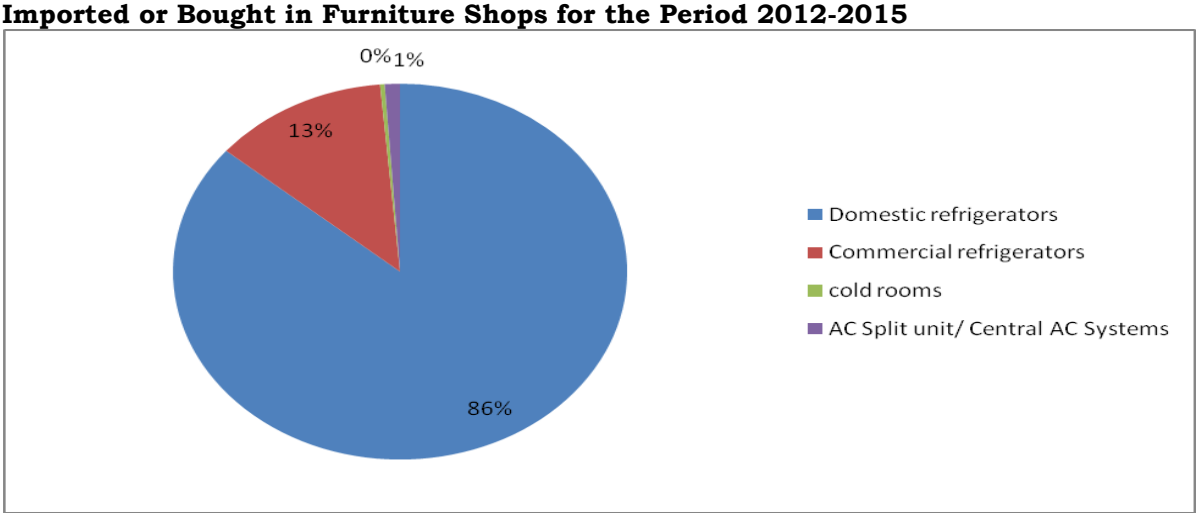
Table 4.10: Quantity (in kilograms) of Gas Purchased in Furniture Shops by type of ODS for the period 2012-2015

		Year			
ODS Alternative	**Pre 2012**	**2012**	**2013**	**2014**	**2015**
R134a	0	0.58	0	0.01	0.31
R600a	3.24	0.75	0.08	3.59	4.84
R717	0.69	0	0	0	0.33
Total		**1.33**	**0.08**	**3.6**	**5.48**
ODS					
R22	14.36	0.58	0	0	0

Source: Lesotho Meteorological Services

Figure 4.11 depicts Total Percentage of Equipment Containing ODS and or Alternatives Imported or Bought in Furniture Shops for the period 2012 to 2015. Domestic refrigerators (86.0 percent) were mostly imported or bought equipment in Furniture Shops followed by commercial refrigerator with 13.0 percent and AC Split with .01 percent respectively.

Figure 4.11: Total Percentage of Equipment Containing ODS and or Alternative Imported or Bought in Furniture Shops for the Period 2012-2015



Source: Lesotho Meteorological Services

4.6.10 Hotels

Hotel refers to establishment that provides accommodation, meals and other services on a short-term basis.

Table 4.11 represents the quantity (in kilograms) of gas purchased in Hotels by type of ODS for the period 2012 to 2015. In 2012, ODS Alternative bought was only 2.03 kg and ODS bought was 78.87 kg. In 2013, ODS alternative bought was 0.81 kg. ODS bought decreased to 34.05 kg in 2013. ODS alternative bought increased to 17.24 kg in 2014 while ODS decreased to minimum of 6.72 kg. In 2015 ODS alternative bought decreased to 3.7 kg while ODS bought increased to 27.2 kg.

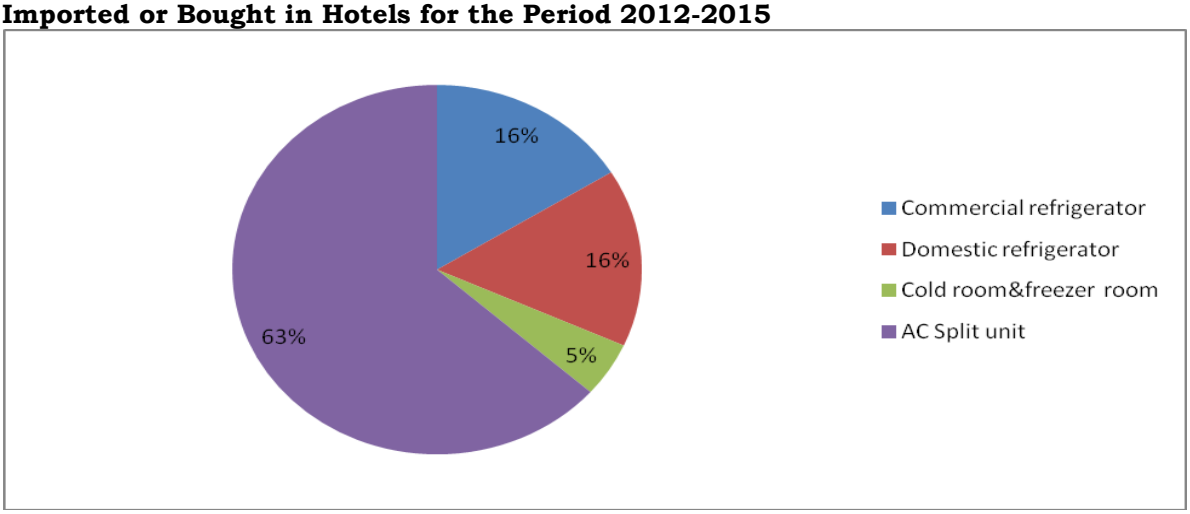
Table 4.11: Quantity (in kilograms) of Gas Purchased in Hotels by type of ODS for the period 2012-2015

		Year			
ODS Alternative	**Pre 2012**	**2012**	**2013**	**2014**	**2015**
R134a	13.72	1.98	0.57	3.14	3.59
R600a	0.56	0.05	0.24	0.03	0.06
R410a	0.82	0	0	14.07	0
Total		**2.03**	**0.81**	**17.24**	**3.65**
ODS					
R22	222.1	78.87	34.05	6.27	27.2

Source: Lesotho Meteorological Services

Figure 4.12 depicts Total Percentage of Equipment Containing ODS and or Alternatives Imported or Bought in Hotels in the country for the period 2012 to 2015. AC split unit (63.0 percent) was mostly bought equipment followed by domestic and commercial refrigerators constituting 16.0 percent each, while cold room & freezer room were the least with 5.0 percent.

Figure 4.12: Total Percentage of Equipment Containing ODS and or Alternative Imported or Bought in Hotels for the Period 2012-2015



Source: Lesotho Meteorological Services

4.7 Summary

The highest annual average maximum and minimum temperatures were observed in the month of January with 27.2 degrees Celsius and 14.3 degrees Celsius respectively. The lowest annual average maximum and minimum temperatures were observed in the month of July with 11.7 degrees Celsius and 2.0 degrees Celsius respectively. However, the highest average annual rainfall was reached in the month of July with 17.1 millimeters and the lowest average annual rainfall was experienced in the month of September with 3.0 millimeters.

It is observed that ODS has been more imported or bought in the country as opposed to ODS Alternatives by a difference of 42.7 percent for the period 2012 to 2015. It is also observed that equipment containing either ODS or ODS Alternatives were more imported or bought in the country for commercial use in Furniture (794) and Supermarkets (104) followed by AC Split unit system used in Hotels (106) and in Offices (89).

CHAPTER 5: BIODIVERSITY

5.0 Introduction

The expression or phrase biological diversity (or biodiversity) refers to the numbers and variability existing among living organisms and life supporting systems found in the living world (McNeely *et al.*, 1990). The phrase encompasses all species of plants, animals and microorganisms, together with the ecosystems and ecological process within which the species and organisms are found. The phrase includes natural wild types, as well as domesticated varieties of crops and livestock.

In Lesotho, biodiversity issues are a concern of a wide spectrum of people and organizations. Biodiversity loss is a concern to pastoralists, farmers, traditional healers (medicine-men and herbalists), fuelwood gatherers, ecologists and conservationists and Government.

Lesotho has three main areas of concern in terms of protection, preservation, conservation and sustainable use of its biological resources and as a consequence its biodiversity. These are establishment of an ecosystem based protected area system, public education and awareness of biodiversity issues and increased capacity for nature and biodiversity conservation. The establishment of protected areas beyond the presently established areas is a priority of the Government of Lesotho. Public involvement in matters that affect them, especially in natural resource management is a priority of the Government of Lesotho. The ability to conserve and sustainably use biological components by Basotho is also a priority area. *(https://www.cbd.int/doc/world/ls/ls-nr-01-en.pdf)*

5.1 Scope and Coverage

The results covered in this chapter are for the entire country and ranges from 2000 to 2014. Also, data used is secondary as it was collected from different Government Ministries.

5.2 Results

The results indicate the size and production of rangeland, ecological status, protected area, wetlands and Katse botanical garden collection of species seeds from 2009-2011.

5.2.1 Rangeland Species

Species are living organisms which may either be fauna or flora. They are classified into different groups depending on their characteristics. Only grass species were used to determine rangeland production.

Table 5.1 indicates Rangeland size and production for mini-grazing areas in the Khubelu Catchment for 2014. These areas were evaluated to determine their Yield and total useable forage.

It is observed in the table that Phapong was the largest mini-grazing area with 1,665.87 hectares followed by Moteaphala (1,054.06). Contrarily, Moteaphala had a larger yield of 486.4 Kg than Phapong with 358.15. There was a similar ratio of size and usable forage across the mini-grazing areas.

Table 5.1: Rangeland Size and Production for Mini-grazing Areas in the Khubelu Catchment, 2014

Mini-Grazing	Size (ha)	Yield (KG)	Total Usable Forage (KG/ha)
Phapong	1,665.87	358.15	596,631.34
Moteaphala	1,054.06	486.4	512,694.78
Ramosetsana	958.35	338.2	324,113.97
Motšeremeli	658.47	112.1	73,814.49

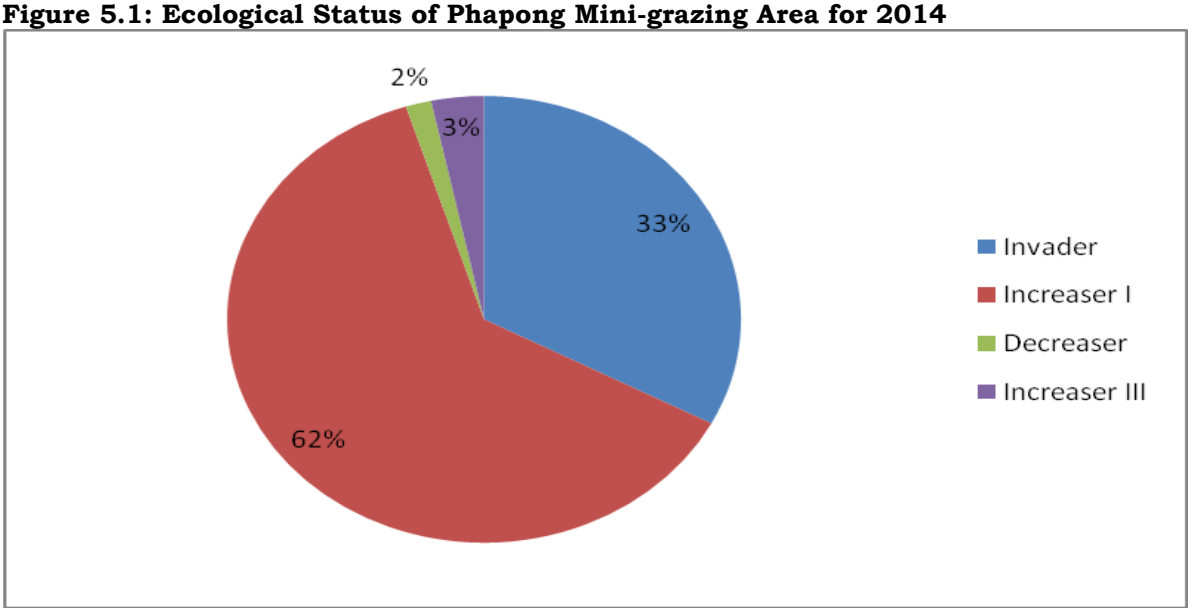
Source: Department of Water Affairs

5.2.2 Ecological Status

Ecological status mainly focuses on the classification of grasses, forbs and shrubs into groups on the basis of their reaction to livestock grazing.

Figure 5.1 depicts ecological status of Phapong mini-grazing area for 2014. At Phapong Increaser I grass species were observed to be the most dominant plant species constituting 62.0 percent followed by Invader with 33.0 percent. The least specie is Decreaser with 2.0 percent.

Figure 5.1: Ecological Status of Phapong Mini-grazing Area for 2014



Source: Department of Water Affair

5.2.3 Protected Areas

At present, there are only two nature reserve areas in Lesotho legally established specifically to protect biodiversity. These are the Sehlabathebe National Park and the Masitise Nature Reserve. Four other nature reserves which were established in Lesotho, within the Lesotho Highlands Water Project Phase 1A area are Bokong, Ts'ehlanyane, 'Muela and Liphofung. In addition, the Roma campus of the National University of Lesotho includes a botanical garden for teaching purpose.
Refer to Annex 5 (table 1) as there is no updated data thus far.

5.2.4 Wetlands

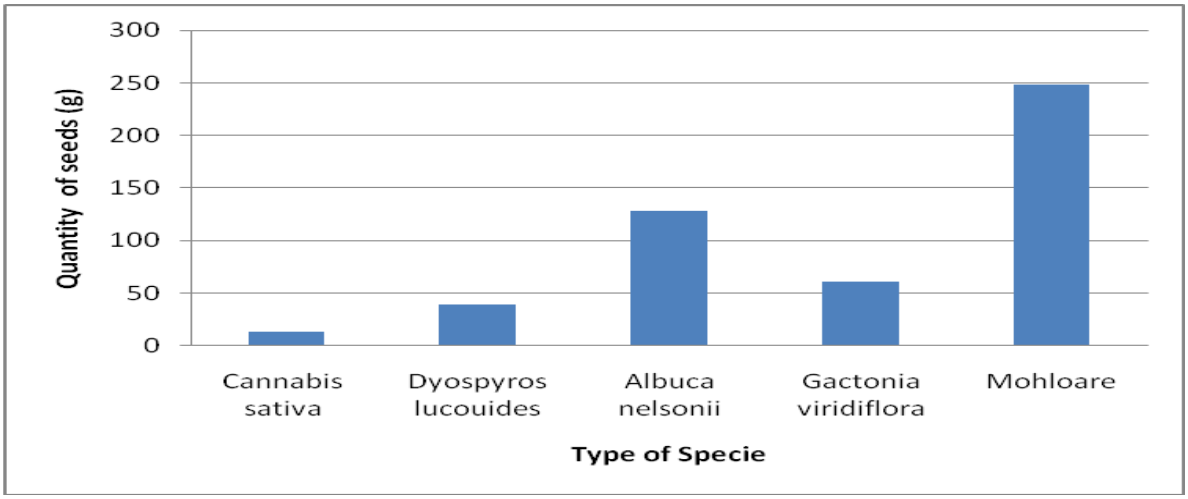
A wetland is a land area that is saturated with water, either permanently or seasonally, such that it takes on the characteristics of a distinct ecosystem. Primarily, the factor that distinguishes wetlands from other land forms or water bodies is the characteristic vegetation that is adapted to its unique soil conditions. Wetlands consist primarily of hydric soil, which supports aquatic plants.
Refer Annex 5 (Table 3).
(http://en.wikipedia.org/wiki/Wetland)

5.2.5 Botanical Garden

A botanical garden (or botanic garden) is a garden dedicated to the collection, cultivation and display of a wide range of plants labelled with their botanical names. It may contain specialist plant collections such as, herb gardens, plants from particular parts of the world, and others.

Figure 5.2 portrays the type and amount of seeds collected in grams for 2009 at Katse Botanical Garden. The highest amount of seeds collected were of Mohloare (248 grams) followed by Albuca nelsonii (128.3 grams). The least type of seed collected was Cannabis sativa with 13.1 grams.

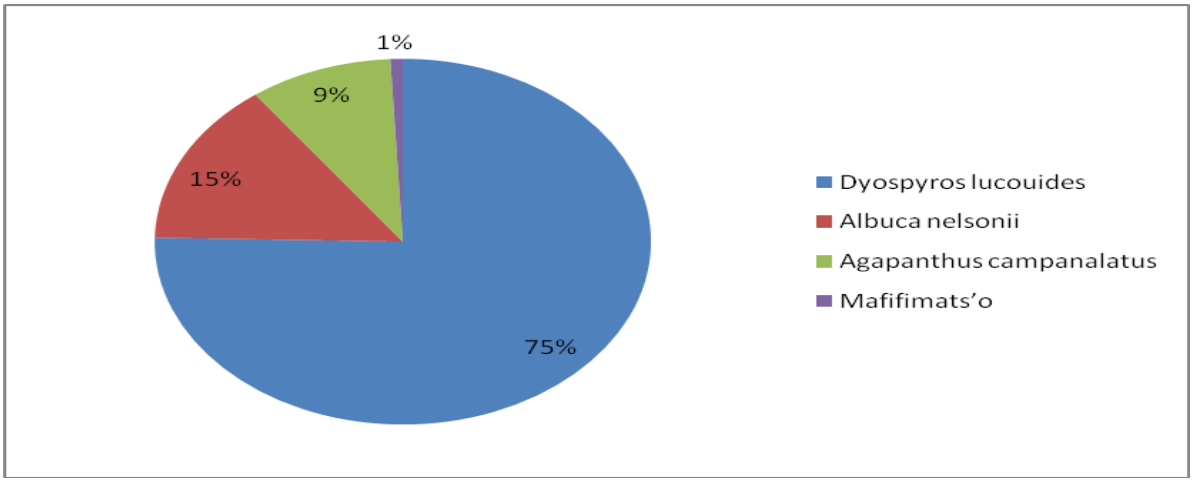
Figure 5.2: Type and Amount of Seeds Ccollected in grams for 2009 at Katse Botanical Garden



Source: Katse Botanical Garden

Figure 5.3 illustrates share of type of seeds collected in grams for 2010 at Katse Botanical Garden. It is observed from the figure that Dyospyros lucouides constituted a greater share of 75.0 percent followed by Albuca nelsonii with 15.0 percent. For the two successive years 2009 and 2010, Albuca nelsonii seeds have constituted a second greater share or amount of seeds collected.

Figure 5.3: Share of Type of Seeds Collected in grams for 2010 at Katse Botanical Garden

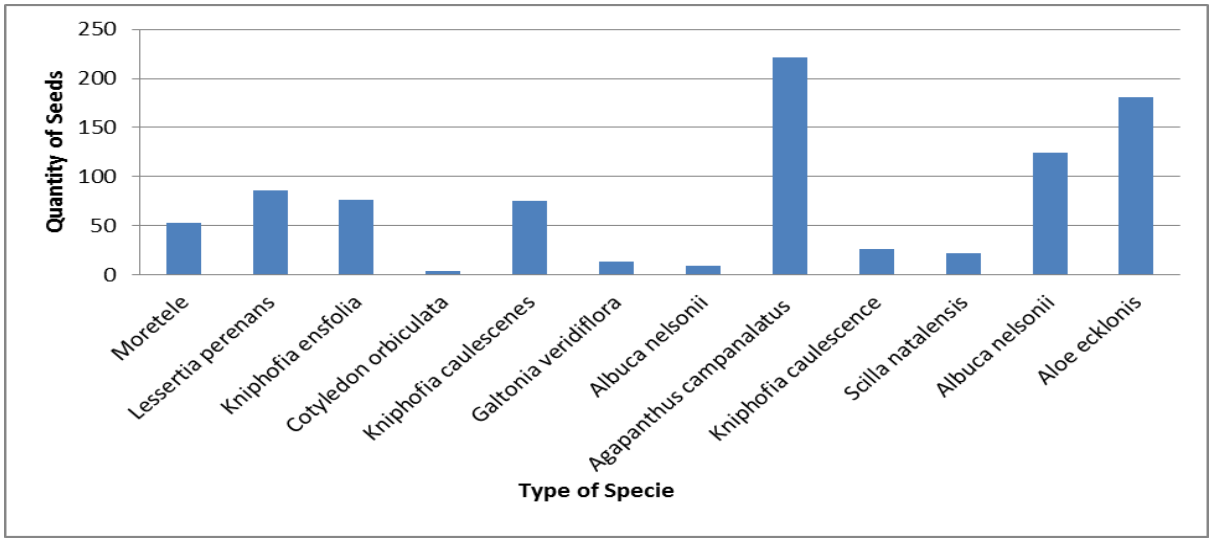


Source: Katse Botanical Garden

Figure 5.4 portrays the Quantity of type of seed collected in grams at Katse Botanical Garden for 2011. It should be noted that the seeds are not only collected at the botanical garden. Some are collected at Khubelu, Ramatseliso, Mt Moorosi and other places where the species are found in abundance.

The highest amount of seeds collected were of Agapanthus campanalatus with 221.8 grams. The least amounts of seeds were of Galtonia veridiflora, Albuca nelsonii and Cotyledon orbiculata with 13.2, 9.4 and 3.8 grams respectively.

Figure 5.4: Quantity of Type of Seed Collected in grams at Katse Botanical Garden for 2011



Source: Katse Botanical Garden

5.3 Summary

Phapong was the largest mini-grazing area with 1,665.87 hectares followed by Moteaphala (1054.06). Contrarily, Moteaphala had a larger yield of 486.4 Kg than Phapong with 358.15 Kg. When evaluating Phapong, Increaser I grass species were observed to be the most dominant plant species constituting 62.3 percent followed by Invader with 32.7 percent. For the two successive years 2009 and 2010, Albuca nelsonii seeds have constituted a second greater share or amount of seeds collected at Katse Botanical Garden.

ANNEX 1: Water and Sanitation

Table 1: Improved and non-improved water sources, Census 2016

Urban	Peri-Urban	Rural	Total
209,702	40,883	220,937	471,522
7,332	2,827	55,776	65,935
217,034	**43,710**	**276,713**	**537,457**

Table 2: Water Exports to South Africa

Date	Water Delivery (MCM)
Jan-15	47.4
Feb-15	48.2
Mar-15	58.6
Apr-15	62.7
May-15	72.9
Jun-15	77.7
Jul-15	80.6
Aug-15	75.6
Sep-15	63.8
Oct-15	64.4
Nov-15	62.8
Dec-15	65.1
Jan-16	47.0
Feb-16	47.3
Mar-16	50.9
Apr-16	63.0
May-16	74.3
Jun-16	74.9
Jul-16	84.6
Aug-16	83.8
Sep-16	68.7
Oct-16	71.0
Nov-16	63.7
Dec-16	50.7

ANNEX 2: Solid Waste

Table 1: Scrap Metal Waste (in tons) collected in Maseru by Month for the year 2016

Month	2016
January	81.4
February	129.8
March	73.5
April	244.0
May	253.2
June	128.8
July	177.3
August	204.6
September	243.8
October	157.6
November	154.4
December	7.7
Total	**3,872.0**

Table 2: Solid Waste Generated in tons by different Establishments in the year 2006

Establishment Category	Tons	Percent
Industrial	16,378.2	2.0
Commercial	380,459.2	47.4
Small-scale enterprises	347,403.8	43.3
Institutions	31,592	3.9
Households	26,556.3	3.3
Total	**802,389.5**	**100.0**

Source: Baseline Assessment of Waste Management in Maseru City, 2006

Table 3: Solid Waste Generated in tons by different Income Levels in Maseru in the year 2006

Type of waste	Low Income	Middle Income	High Income
Glass	5.84	7.67	2.19
Cans	5.11	4.75	0.73
Garden refuse	0.73	6.21	1.46
Kitchen leftovers	6.21	8.03	6.21
Paper	4.75	7.67	3.65
Plastic	3.65	4.38	0.11
Other	1.10	3.29	0.37
Total	**27.38**	**41.98**	**14.71**

Source: Baseline Assessment of Waste Management in Maseru City, 2006

Table 4: Number of Households by Solid Waste method of Disposal, Census 2016

Method of Disposal	Number of Households
Burnt	296,427
Own refuse dump	187,387
Burying/pit	31,670
Municipal collected/Private	21,496
Communal collected	9,813
Roadside dumping	8,742
Communal refuse dump	8,172
Other	750
Total	**537,457**

ANNEX 3: Land Use

Table 1: Area planted for all crops (ha) by District and Period (2011/2012 -2015/2016)

District	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
Botha-Bothe	8,763	8,997	6,440	7,122	2,590
Leribe	18,794	28,931	34,967	28,721	15,140
Berea	13,942	21,888	28,257	21,420	12,779
Maseru	18,934	25,462	27,843	31,919	20,746
Mafeteng	14,031	20,534	28,624	24,600	6,187
Mohale's Hoek	12,666	15,337	25,242	16,936	9,790
Quthing	9,601	12,577	10,633	9,195	5,779
Qacha's Nek	7,605	6,946	4,573	4,610	4,343
Mokhotlong	25,326	18,347	26,233	12,659	13,185
Thaba-Tseka	14,616	14,740	20,529	16,133	16,649
Lesotho	**144,278**	**173,759**	**213,339**	**173,316**	**108,106**

Table 2: Area Fallow (ha) by District and Period (2011/2012-2015/2016)

District	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
Botha-Bothe	2,588	1,208	602	1,121	5,240
Leribe	27,682	16,671	9,724	6,038	40,619
Berea	19,063	12,052	11,352	8,060	31,632
Maseru	20,172	7,564	8,766	7,924	44,926
Mafeteng	29,444	19,486	18,060	12,638	56,878
Mohale's Hoek	19,793	7,191	8,154	4,321	34,815
Quthing	8,128	3,927	2,883	1,484	19,145
Qacha's Nek	4,452	1,921	1,947	1,627	6,097
Mokhotlong	3,634	2,800	3,614	1,511	4,345
Thaba-Tseka	2,187	813	3,229	1,881	2,643
Lesotho	**137,143**	**73,632**	**68,329**	**46,605**	**246,340**

Table 3: Fertilizer Application by Type of Inorganic Fertilizer Used, Area in Hectares (ha) and Period (2012/2013-2015/2016)

Inorganic Fertilizer	2012/2013	2013/2014	2014/2015	2015/2016
Double supers	626	707	1,519	566
Single Supers	753	131	2,276	186
3:2:1(35)	891	3,300	3,430	720
3:2:1(25)	17,820	14,532	7,558	4,134
LAN	356	419	574	635
2:3:2(22)	5,381	7,393	4,988	1,076
Lime	95	77	-	335
Urea	907	12	-	1,582
3:2:1(32)	15,715	12,273	13,761	972
3:2:1(30)	795	1,768	3,873	17,620
Other	14,663	28,914	34,910	305
Total	**58,002**	**69,526**	**72,889**	**28,131**

Table 4: Fertilizer Application by Type of Organic Fertilizer Used, Area in Hectares (ha) and Period (2012/2013 -2015/2016)

Organic Fertilizer	2012/2013	2013/2014	2014/2015	2015/2016
Ash	1,847	3,563	1,240	2,636
Kraal manure	57,166	61,162	57,589	30,009
Poultry manure	688	941	248	71
Pig manure	196	414	182	295
Other (combination)	8,939	990	1,055	1,346
Total	**68,836**	**67,070**	**60,314**	**34,357**

Table 5: Number of Forests and Fruit trees and Area covered in hectares (ha) by Period (2006/2007- 2015/2016)

Period	Forest Trees		Fruit Trees			
	Trees Planted	Area	Trees Planted		Area	
			Peaches & Apples	Grapes	Peaches & Apples	Grapes
2006/2007	1,048,726	944	21,792	-	20	-
2007/2008	2,250,318	2,025	34,784	-	31	-
2008/2009	2,519,792	2,268	56,021	-	50	-
2009/2010	2,309,228	2,079	20,159	-	18	-
2010/2011	3,000,000	2,700	75,000	-	68	-
2011/2012	2,304,803	2,075	46,129	-	42	-
2012/2013	2,061,299	1,875	-	-	-	-
2013/2014	1,836,337	1,653	234,785	-	376	-
2014/2015	1,190,373	1,071	309,392	48,056	495	36
2015/2016	941,202	841	413,877		662	

ANNEX 4: Air and Climate Change

Table 1: Ozone Depleting Substances and or Alternatives in all Sectors for the period of 2012-2015

SECTORS	ODS TYPE	YEAR 2012	2013	2014	2015
Butchery	ODS Alternative	32.6	6.2	3.2	4.9
	ODS	1.3	0.0	3.6	7.8
Mortuaries	ODS Alternative	0.0	0.0	0.0	0.1
	ODS	20.7	21.0	16.6	20.2
Hospitals	ODS Alternative	1.28	3.33	11.45	7.73
	ODS	0	18.63	0.33	3.27
Offices	ODS Alternative	1.88	3.11	0.12	136.35
	ODS	4.13	0	0	358.49
Supermarkets	ODS Alternative	23.91	5.52	17.02	4.35
	ODS	1.96	0	0	0
Textiles	ODS Alternative	4.38	0.04	0.12	0.36
	ODS	4.87	5.2	0	0
Vodacom	ODS Alternative	0	0	3.98	0
	ODS	0	0	0	0
Garages	ODS Alternative	0.32	1.61	0	0.24
	ODS	0	11.48	0	0
Off Sales	ODS Alternative	6.22	14.1	15.21	30.97
	ODS	1.05	0	7	0
Furniture Shops	ODS Alternative	1.33	0.08	3.6	5.48
	ODS	0.58	0	0	0
Hotels	ODS Alternative	2.03	0.81	17.24	3.7
	ODS	78.87	34.05	6.27	27.2

Table 2: Total Equipment's bought or Imported in all Sectors By their Type of Operation for the Period of 2012-2015

SECTORS	Commercial refrigerator	Domestic refrigerator	Cold Room/Freezer room	AC Split unit/Central AC System	Mortuary	Vaccine refrigerator	TOTAL
Butchery	47	4	18	5	–	–	**74**
Mortuaries	–	2	3	11	–	–	**16**
Hospitals	–	20	–	37	1	55	**113**
Offices	3	15	–	89	–	–	**107**
Supermarket	104	19	11	5	–	–	**139**
Textiles	–	15	–	5	–	–	**20**
Vodacom	–	2	–	4	–	–	**6**
Garages	3	2	–	23	–	–	**28**
Off Sales	59	14	12	8	–	–	**93**
Furniture Shops	794	115	3	10	–	–	**922**
Hotels	27	26	8	106	–	–	**167**
Total	**1,037**	**234**	**55**	**303**	**1**	**55**	**1,685**

ANNEX 5: Biodiversity

Table 1: Lesotho's protected Areas by Area (ha) for the year 2000

Protected Area	Area (ha)
1. Sehlabathebe national park	6,475ha
2. Masitise nature reserve	20ha
3. National University of Lesotho (botanical garden)	1.5ha
4. Bokong nature reserve	1,972ha
5. 'Muela nature reserve	45ha
6. Ts'ehlanyane nature reserve	5,300ha
7. Liphofung national monument and reserve	4ha

Table 2: Mostly collected seeds in Katse Botanical Garden for the year 2009

Year	Cannabis sativa	Dyospyros lucouides	Albuca nelsonii	Gactonia viridiflora	Mohloare
2009	13.1	39.8	128.3	60.7	248

Table 3: Dominant Species and area (m^2) of wetlands monitored in Mokhotlong and Semonkong in winter season for the year 2013

Location	Dominant Species	Area (m^2)
Mokhotlong	1. Sehala-hala	483,502.94
	2. Festuca caprina (Joang)	220,767
	3.Scirpus spp(Roro)	413,414
Semonkong	1.Roro	59,851.88
	2. Joang	8,348.50
	3.Mohloa ts'epe	1,598.05
	4. Eragrostis curvula (Tsa'ane)	195,356.50
	5.Lesuoane	3129.70
	6.Moseha	162,414.30

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