.

Integrated Environmental Management Plan

SETSOTO LOCAL MUNICIPALITY

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Acronyms

AQMP – Air Quality Management Plan

CH_4 – Methane

CO – Carbon monoxide

CO_2 – Carbon dioxide

DPSS – Development Planning and Social security

DWAF – Department of Water and Forestry

ECA – Environmental Conservation Act

EIA – Environmental Impact Assessment

EMP – Environmental Management Plan

ES – Engineering Services

GHG – Greenhouse Gas

IAPS – Invasive Alien Plants

IDP – Integrated Development Plan

IEM – Integrated Environmental Management

IEMP – Integrated Environmental Management Plan

IWMP – Integrated Waste Management Plan

MIG – Municipal Infrastructure Grant

MSA – Municipal Systems Act

N_2O – Nitrous Oxides

NEMA – National Environmental Management act

NEMAQA – National Environmental Management: Air Quality Act

NEMBA – National Environmental Management: Biodiversity Act

NEMPAA – National Environmental Management: Protected Areas Act

NEMWA – National Environmental Management: Waste Act

NH_3 – Ammonia

NMVOC – Non Methane Volatile Organic Compounds

NO_2 – Nitrogen dioxide

PM_{10} – Particulate Matter (up to 10 micrometres in size)

SANBI – South African National Biodiversity Institute

SDF – Spatial Development Framework

SEA – Strategic Environmental assessment

SO_2 – Sulphur dioxide

WWTW – Wastewater treatment Works

1. Introduction

This IEMP is prepared for Setsoto Local Municipality for the purpose of providing a separate plan for managing the potential environmental impacts that are identified in the municipality.

Integrated Environmental Management (IEM) is a continuous process that is used to make sure that the environmental impacts are avoided and mitigated during the course of the project life cycle from the design stage to implementation, operation and decommissioning stage of the project (DEAT, 2004).

The IEMP helps municipality to comply with applicable environment protection legislation, identify environmental issues within the municipality and to propose the mitigation measures that will help to avoid, reduce and restore the identified negative impacts. It further helps in conserving highly significant aspects of biophysical, cultural and social environment, protect human health and safety and to propose monitoring plan such that the projects are sustainable and enhance resources use.

IEM includes principles and tools that are guiding South Africa on a path to sustainable development. Sustainable development is commonly known to include the need to incorporate social, economic and environmental features and also to address intra-generational and inter-generational equity. The goal for sustainable development of the South African Development Community is to accentuate on the importance of people-centred approach in the context of developing countries.

The goals for the sustainable development of the South African Development Community are to:

- Accelerate economic growth with greater equity and self-reliance;
- Improve the health, income and living conditions of the poor majority; and
- Ensure equitable and sustainable use of the environment and natural resources for the benefit of present and future generations.

According to DEAT (2004), IEM provides a general framework that can be comprised by all sectors of society for the assessment and management of environmental impacts and aspects that are associated with any activity for each stage of the activity life cycle, not forgetting to consider a broad definition of environment and with the overall aim of promoting sustainable development.

As part of the Integrated Development Plan, IEMP need to be developed in the municipalities in order to ensure that the environmental analysis of the municipalities is provided. The objectives and strategies are developed to address the environmental issues that are identified in the analysis.

Integrated development planning (IDP) is one of the key tools for local government to cope with its developmental role. The IDP process is meant to arrive at decisions on issues such as municipal budgets, land management, promotion of local economic development in a consultative, systematic and strategic manner. Integrated Development Plans, however, will not only inform the municipal management; they are also supposed to guide the activities of any agency from the other spheres of government, corporate service providers, NGO’s and

the private sector within the municipal area. IDP is an inter-sectorial, but priority focused planning process.

The Integrated Development Process (IDP) consists of five phases, namely

- The Analysis phase,
- The Strategies phase,
- The Projects phase,
- The Integration phase, and
- The Approval phase.

The Integrated Environmental Plan forms an integral part of the Integration phase, and it does play a very important role in capturing the environmental contributions from all the IDP projects in the context. It is a tool for mainstreaming all the environmental issues.

It can be said that an Integrated Environmental Plan demonstrates compliance with the IDP in respect of environmental policies, which helps to ensure a set of measures that is conclusive with regard to their environmental impact, and also serves as a basis for environmental monitoring. The first part of the Integrated Environmental Programme is the Environmental Analysis, where after the Environmental assessment, mitigation and implementation plan, and recommendations are discussed.

2. Study Area

Setsoto local municipality is situated in the eastern Free State within the regional boundaries of the Thabo Mofutsanyana District Municipality. The area of the local municipality measures about 5948.35 km² in extent and consists of four major urban areas namely Ficksburg, Senekal, Marquard and Clocolan, as well as their surrounding rural areas namely Meqheleng, Matwabeng, Moemaneng and Hlohlolwane. Setsoto is approximately 60% urbanised. The following is the map showing Setsoto local municipality in the district.

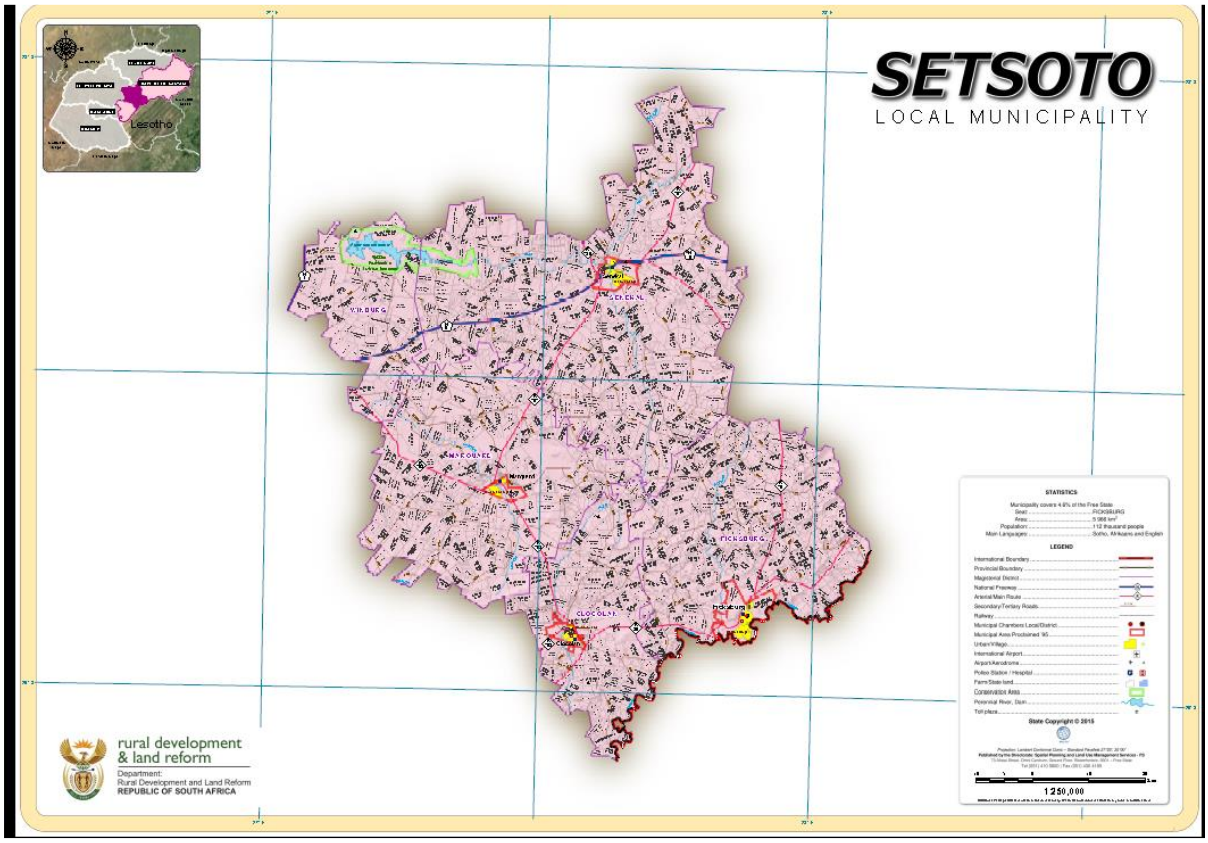


Figure 1: Map for Setsoto Local Municipality: Source (Rural Development & Land Reform)

According to Census 2011, Setsoto Local Municipality has a population of 112,597. Out of this population 92, 3% are black African, 5, 7% are white, with the remaining 2% made up by other population groups.

Central Statistical Services figure suggest that the population has decreased from 109 000 to 102 000 between 2001 and 2007 and DWAF's figures and the 2011 Census suggest it had increased to 113 000 by 2011. The main reason for this growth is given as due to Ficksburg's proximity to Lesotho.

Certainly, there are substantial industrial estates across the border in Maputsoe with little other development rather than low density residential. This suggests that a number of service providers and economic linkages to support these factories are across the border in Ficksburg.

The municipality's population is too sparse and the settlements are too far apart to warrant a municipal level system of this nature. These elements will rather be used at the settlement scale to promote restructuring of the towns.

Proposing a linked framework of nodes and corridors across the municipality is problematic. This happens because of the separation caused by the Witteberg Mountains and the link between Senekal and Ficksburg that passes outside the municipality through the adjacent Dihlabeng local municipality. Therefore, it is proposed that these elements are applied at the level of the settlements only.

Senekal is on the N1/N5 route between Bloemfontein and Natal that cuts through the north western quadrant of the municipality. Ficksburg and Clocolan are on the R26 regional route which operates more as a scenic tourism corridor along the western Lesotho border between Harrismith on the N5 and Rouxville on the N6 to East London. If the R701 between Wepener and Smithfield was upgraded there would be a direct scenic tarred route all the way from the N1 at the Gariep dam to Harrismith on the N3 to Durban that could offer an alternative to traffic passing along the N2 between Cape Town and Durban. This traffic would travel through Clocolan and Ficksburg.

There are major tourism destinations with major related attractions that can be visited in Setsoto local municipality. These include the following:

- Sangoma caves;
- Green Goose Organic Cheese and Down Products
- Ember Downs
- Angora Rabbit Farm
- Pinedene Small Arms Museum
- Ben Nevis Cherry Wine Farm
- Lesotho Border Post; and
- Sandstone Estate: Locomotive Museum
- A number of games, guest and hunting farms are prevalent in the municipality.

3. The Environmental Analysis

The purpose of the environmental analysis is to ensure that municipal development strategies and projects take existing environmental problems and threats into consideration as well as environmental assets that require protection or controlled management. The National Environmental Management Act (NEMA) (Act 107 of 1998), together with The Environmental Conservation Act (Act 73 of 1989), promotes Integrated Environmental Management (IEM) in South Africa in order to promote and support sustainable development.

3.1. Natural Environment

Other natural resources include the fertile agricultural land, grass that can be used for thatching, natural herbs and a good climate.

3.1.1. Topography

The topography of the municipality is generally diverse with the steeper areas located in the south around Ficksburg, and features strong elements, namely mountainous areas, river valleys and floodplains, sloping hills and grasslands. The dominant height is between 1400m and 1600m above sea level eastern portions of the municipality.

There are relative hilly mountains (Wintteberg Mountains) that are found towards the eastern parts of the municipality. These mountains have a dramatic sandstone cliff and views over the Caledon River and Maluti mountains in Lesotho.

Clocolan and Ficksburg are hemmed in by mountains and Marquard and Senekal are located in the general Highveld plain. The lowest lying area, between 1250m and 1400m above sea level is found around the Allermanskraal Dam in the north- western quadrant of the municipality.

3.1.2. Geology

Natural resources in the area are limited to the vast sandstone formations that hold significant mining potential and abundant water for the Caledon River and Meulspruit, Laaispruit and Willem Pretorius dams.

The municipality comprises of Four types of geological formations namely:

- Mudstone: is a fine sedimentary rock originating from clay or mud. Physical mudstone looks like hardened clay, and may show cracks like sun baked clay deposits. It is also referred as the mud rock, and located in the northern part of the municipality.
- Arenite: Is sedimentary rock with sand grains of a medium nature, it is formed by erosion of other rocks or by sand deposits, and is located southern of the municipality.
- Basalt: is a type of fine-grained volcanic rock usually with grey or black color, it contains minerals such as pyroxene (rich in calcium, magnesium, sodium), plagioclase (calcium, aluminum), and olivine (Magnesium, calcium, nickel, iron).
- Dolerite: is regarded as an underlying layer for foundation. It is the medium grained Basalt which forms spherical lumps.

The Natural resources in the area are limited to the vast sandstone formations that hold significant mining potential and abundant water for the Caledon River and Meulspruit, Laaispruit and Willem.

3.1.3. Vegetation

Setsoto is 100% covered by the Grassland biome, it comprises of ten vegetation types which includes Basotho Montane Shrubland, Bloemfontein Karroid Shrubland, Central Free State Grassland, Eastern Free State Clay Grassland, Eastern Free State Sandy Grassland, Eastern Temperate Freshwater Wetlands, Highveld salt Pans, Lesotho Highlands Basalt Grassland, Vaal-Vet Sandy Grassland and Winburg Grassy Shrubland.

Out of these ten vegetation types, one (Vaal-vet Sandy Grassland) is classified to be endangered according to South African National Biodiversity Institute (SANBI). It covers 0.22 % of the municipal area.

There are two vegetation types (Eastern Free State Clay Grassland and Eastern Temperate freshwater Wetlands) which are classified to be Vulnerable according to SANBI. They cover 29.61% and 0.06% of the municipal area respectively. There are no critically endangered vegetation types in Setsoto local municipality.

There is only one protected area (Willem Pretorius Nature Reserve) in Setsoto which covers 2.12% of the municipal area. There is a need to conserve Setsoto's biodiversity as there is some vegetation that is vulnerable and endangered. There are wetlands that are habitat to some of these endangered plant species.

If there are any agricultural activities in these areas they should be practiced sensitively, not to have negative impact on the Sensitive Biodiversity Areas.

Where the land is not under the plough or pastures it should be either encouraged to become a private conservancy or game farm of which there are already a number in the area; or be used for extensive agriculture (grazing) under strict veld

management and rotational grazing methods that will improve biodiversity as well as carrying capacity.

Formally protecting these sensitive areas will require massive resources so it is intended that land owners be encouraged to protect them via stewardship agreements or private conservancies in return for rates rebates and the appropriate use of land for eco-tourism and other income generating ventures. Funds for alien vegetation removal which also have benefits in terms of improving water quality and quantity can also be mobilised.

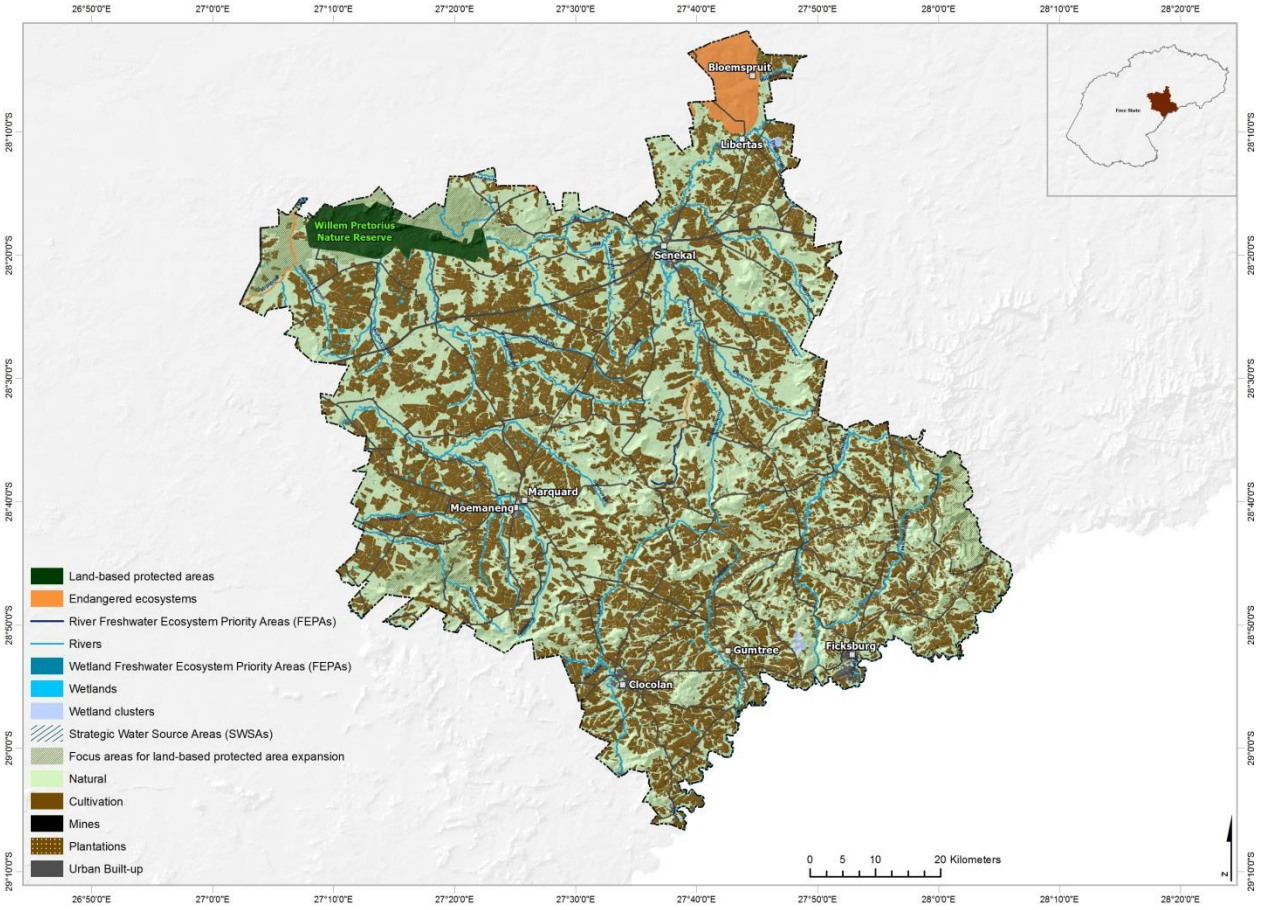


Figure 2: Setsoto municipality: Biodiversity map (SANBI, 2014)

3.1.4 Rainfall

The municipality falls within the summer rainfall area, of which differs with the season of the year. Rainfall is recorded where highest rainfall occurs in the summer season and least amount of rain in winter period. The highest rainfall in the central and southern parts of the municipality creates a favorable environment for agricultural activities, and could assist in water demand in times where there is less amount of rain.

Rainfall averages between 600 mm and 750 mm in Setsoto Local Municipality which is more or less the same as the whole district. Frost occurs usually from May to up to early October in the eastern Free State.

3.1.6 Temperature

Setsoto Municipality like the other eastern parts of the Free State province has a climate characterised by warm to hot summers and cold winters. It experiences snowfalls some years.

The area generally has a low average temperature; therefore, the design of buildings needs to carefully consider insulation, orientation, materials and environmentally sensitive designs linked to thermal considerations. The highest temperatures are experienced between November and February when an average temperature of up to 29^0C have been recorded. Then the coldest average daily temperature is experienced in June and July when average minimum temperatures are below 0^0C.

3.1.7 Climate Change

The change in climate change is directly proportional to the temperature and rainfall. It is expected that extreme dry years will be frequent in this area. This will lead to:

- Increased droughts and flooding and water availability,
- Change in biodiversity patterns, and
- Impacts on health, tourism, agriculture and food security.

An estimate of the average temperature in 2050 will be increased to 1-3^0 C. It is therefore important that the municipality contributes to the efforts reduce the emission of greenhouse gasses and thereby delay the impact of climate change. Climate change must be considered when it comes to new urban development. The planning of new urban development including building orientation, architecture and materials need to sensitively respond to the aspects, of climate change.

3.1.8 Water Resources (Hydrology)

The main river is the Caledon river forming the border bridge between South Africa and Lesotho, and the Sand river running along the northern sections of the municipality between the Allermanskraal Dam towards Senekal and Libertas in the north.

The Allermanskraal Dam is fed by the Klipspruit, Sand river and Verongelukspruit is located in the north- western corner of the municipality. A watershed cuts through the municipality. Rivers to the west drain their water into the Sand river and then into the Vaal and Orange Rivers.

The River Conservation Status:

- In terms of the SANBI (National Freshwater Ecosystem Priority Areas) the Mopeli River is one of the critically modified and is in the poorest condition compared to other rivers in the municipality. All other rivers are in an acceptable condition.

3.1.9 Biodiversity

The majority of the municipality falls within the Grassland biome with only a few almost insignificant patches of Azonal vegetation. The different vegetation types found under each biome. There is only nature reserve in the municipality, comprising an area of 12005ha, which is known as the Willem Pretorius. The Allmanskraal dam forms the central part of the reserve, and also there are a variety of wildlife, plants of which are among the attractions, also the world’s largest black wildebeest herd can be found here.

One of the most unique attractions in the reserve is the range of hillocks (small hills). On the summit of one of the hillocks, there are tribes that built very small huts, cattle kraals and walls from stone, with no mortar. One hut could only accommodate one person when sitting. The reserve also offers an environmental education centre, managed by the Directorate of Environmental and Nature Conservation.

3.2. Municipal projects

EIA as a tool that helps the organizations to assess the potential positive and negative environmental impacts of the proposed projects and their alternative options. It also proposes measures to mitigate the potential negative impact and enhance positive impacts. It assists the authorities in deciding whether the proposal of the project is economically, socially and environmental sustainable.

The table below briefly lists the relevant identified projects and the MIG references. These issues will be addressed in more detail in the Integrated Environmental Plan.

Table 1: Projects and their reference numbers for Setsoto

MIG Reference No.	Project name
MIG/FS0352/W06/08	Marquard: Augmentation of raw water supply: Construction of pipeline and reservoir
MIG/FS0448/W06/08	Marquard/Moemaneng: Upgrading of oxidation ponds
MIG/FS0707/W08/10	Meqheleng/Ficksburg: Upgrading of bulk water supply
MIG/FS0763/W09/11	Matwabeng/Senekal: Development of borehole
MIG/FS0765/R,ST/09/10	Ficksburg/Meqheleng: Construction of 2,3 km paved road and storm water drainage
MIG/FS0767/R,ST/09/10	Matwabeng/Senekal: Construction of 2,2 km paved road and storm water drainage
MIG/FS0794/CL/10/11	Marquard/Moemaneng: Installation of 2 high mast lights(MIS: 194946)
MIG/FS0795/CL/10/11	Senekal/Matwabeng: Installation of 5 high mast lights(MIS: 193454)
MIG/FS0796/CL/10/11	Ficksburg/Meqheleng: Installation of 7 high mast lights(MIS: 193462)
MIG/FS0797/CL/10/11	Clocolan/Hlohlolwane: Installation of 2 high mast lights (MIS: 193476)
MIG/FS0869/R,ST/11/13	Meqheleng/Ficksburg: Construction of 3 km paved road and storm water drainage
MIG/FS0870/R,ST/11/13	Matwabeng/Senekal: Construction of 3 km paved road and storm water drainage

MIG/FS0873/CF/12/14	Ficksburg/Meqheleng: Upgrading the recreational and sport facilities
MIG/FS0877/F/12/13	Clocolan/Hlohlolwane: Development of new solid waste disposal site
MIG/FS0878/F/12/13	Marquard/Moemaneng: Development of new solid waste disposal site
MIG/FS0879/F/12/13	Senekal/Matwabeng: Development of new solid waste disposal site
MIG/FS0880/F/12/13	Ficksburg: Development of new solid waste disposal site
MIG/FS0881/F/12/12	Marquard/Moemaneng: Fencing of all municipal properties
MIG/FS0882/F/12/12	Clocolan/Hlohlolwane: Fencing of all municipal properties
MIG/FS0883/F/12/12	Ficksburg/Meqheleng: Fencing of all municipal properties
MIG/FS0884/F/12/12	Senekal/Matwabeng: Fencing of all municipal properties
Not registered	Refurbishment of waste water treatment works and pump stations

There are projects that are requiring Environmental Impact Assessment (EIA) from the list made above. The municipality must make sure that EIA is conducted before the commencement of these projects. According to the EIA regulation R544 (Listing Notice 1) the following projects will require EIA.

Table 2: The municipal project that will require EIA

MIG Reference No.	Project name
MIG/FS0352/W06/08	Marquard: Augmentation of raw water supply: Construction of pipeline and reservoir
MIG/FS0707/W08/10	Meqheleng/Ficksburg: Upgrading of bulk water supply
MIG/FS0877/F/12/13	Clocolan/Hlohlolwane: Development of new solid waste disposal site
MIG/FS0878/F/12/13	Marquard/Moemaneng: Development of new solid waste disposal site
MIG/FS0879/F/12/13	Senekal/Matwabeng: Development of new solid waste disposal site
MIG/FS0880/F/12/13	Ficksburg: Development of new solid waste disposal site
Not registered	Refurbishment of waste water treatment works and pump stations

4. Legal Framework

4.1. Legislative and Policy Framework for Environmentally Sustainable Development

A major component of this environmental plan is an assessment of the legal requirement necessary for sustainable development in Setsoto. This section constitutes an indication of those requirements.

Sustainability is a concept that has been carried out through a statutory process when writing the Constitution of South Africa (Act No. 108 of 1996). There are legislations which include the White Paper on Local Government– 1998, the Local Government Municipal Structures Act (MSA) (Act No. 117 of 1998) and the Local Government Municipal Systems Act (Act No. 32 of 2000) that are forming the initial framework for the introduction of developmental local government. Municipalities are required to prepare Integrated Development Plan (IDP) for the area under their authority by the MSA. Each IDP must have a part of Spatial Development Framework (SDF) that must be well-versed by the environmental layer in the form of Strategic Environmental assessment (SEA).

Sustainable development as defined by the South African National Environmental Management Act (NEMA, Act 107 of 1998) means "the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations".

The South African Constitution (Act No. 108 of 1996), support the environmental sustainability. According to the environmental legislation, environmental sustainability should be enriched. Section 24 of the Act states that:

Everyone has the right:

"to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that… prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

4.1.1. The National Environmental Management Act (NEMA) principles:

Section 2 of The National Environmental Management Act (NEMA) (Act No. 107 of 1998), requires all organs of the State to implement and adhere to the principles set out in Chapter one of NEMA. All organs of State also have the responsibility to protect, promote and conserve the needs of the people. NEMA Section 2 also stipulates that the organs of State have to serve as a framework for environmental management and it is their duty to guide the implementation of this Act. It is therefore a prime requisite of Setsoto local municipality to incorporate this wider environmental analysis.

NEMA sets clear principles for guidance in the stipulation of general principles for the environmental programme (Section 2 of NEMA).

These principles are summarized below:

- Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.
- Development must be sustainable socially (people), environmentally (planet) and economically (prosperity).
- Sustainable development requires the consideration of all the relevant factors, including the following:

➢ To avoid and minimize:

    - the disturbance of ecosystems and loss of biological diversity
    - the disturbance of landscapes and sites that constitute the cultural heritage
    - pollution and degradation of the environment
    - waste (re-use or recycle)
- The responsible and equitable use of renewable and non-renewable resources
- That a risk prevention approach is taken, and
- The prevention of negative impacts on the environment and on people's environmental rights
- Environmental justice must be pursued so that adverse environmental effects shall not be distributed in such a manner as to unfairly discriminate against any person.

At the core of the NEMA principles are primarily the needs of the people, and social, environmental and economic sustainable development. These core guidelines act as excellent indicators when measuring all potential development.

The main aim of the Integrated Environmental Management according to Section 23 of the National Environmental Management Act (NEMA) (Act No. 107 of 1998) is to;

"Identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimize negative impacts, maximizing benefits, and promoting compliance with the principles of environmental management set out in section 2".

The following table lists the specific sections from the National Environmental Management Act (NEMA) (Act No. 107 of 1998) that are applicable to local government

Table 3: Sections of the NEMA applicable to Local Government (Source: DEA (LGS)).

Sections applicable	Implications for local government
Section 17 (1) Fair decision-making and conflict management: with reference to conciliation	Any municipal council may consider the desirability of first referring a matter to conciliation where a difference or disagreement arises concerning the exercise of any of its functions which may significantly affect the environment, or before which an appeal arising from a difference or disagreement regarding the protection of the environment is brought under any law. If the municipal council considers conciliation appropriate, it must either refer the matter to the Director-General for conciliation under this Act, or appoint a conciliator. If it considers conciliation inappropriate or if conciliation has failed, the municipal council must make a decision, provided that the provisions of Section 4 of the Development Facilitation Act prevail.
Section 35 (1) Environmental-management co-operation agreements: the conclusion of agreements	A municipality may enter into environmental-management co-operation agreements with any person or community for the purpose of promoting compliance with the principles laid down in this Act.
Section 45 (2) Administration of the Act: regulations for the management of co-operation agreements	A municipal council may substitute its own regulations or by-laws, as the case may be, for the regulations issued by the Minister, provided that such provincial regulations or municipal by-laws comply with the principles laid down in this Act
Section 46 (2,3) Administration of the Act: model environmental-management by-laws	Any municipality may request the Director-General to assist it with the preparation of by-laws on matters affecting the environment and the Director-General may not unreasonably refuse such a request. The Director-General may institute programmes to assist municipalities with the preparation of by-laws for the purposes of implementing this Act.

NEMA is the main legislation in that it provides the set principles for sustainability and this aspect supports all the following environmental statutes in the NEMA group. These include:

- National Environmental Management Amendment Act (Act No.8 of 2004),
- National Environmental Management Biodiversity Act (Act No.10 of 2004),
- National Environmental Management Protected Areas Act (Act No.57 of 2003)
- National Environmental Management Air Quality Act (Act No. 39 of 2004)
- The National Environmental Management: Waste Management Act No. 59 of 2008
- The National Environmental Management: Integrated Coastal Management Act No. 24 of 2008

Outlined below is a list the NEMA group sections that are applicable to environmental management in the municipalities. These sections will help the municipality to manage the environmental issues that are identified.

4.1.1.1. National Environmental Management Biodiversity Act (Act No.10 of 2004),

The National Environmental Management Biodiversity Act (NEMBA) expresses the commitments that South Africa made in approving the Convention on Biological Diversity (CBD). The Act aims at resolving the fragmented nature of biodiversity-related legislation that occurred at national and provincial levels by combining different laws and giving effect to the principle of co-operative governance, and at the same time responding to commitments made under the CBD (DEA (LGS)).

In line with the objectives of the CBD, NEMBA provides for:

- Management and conservation of South Africa's biodiversity within NEMA's framework;
- Usage of indigenous biological resources in a sustainable manner;
- Fair and equitable sharing among stakeholders of the benefits arising from bio-prospecting involving indigenous biodiversity;
- Protection of species and ecosystems that warrant national protection; and
- Establishment and functions of the South African National Biodiversity Institute (SANBI).

The following table lists the specific sections from the National Environmental Management Biodiversity Act (NEMBA) (Act No. 10 of 2004) that are applicable to local government.

Table 4: Sections of the NEMBA applicable to Local Government (Source: DEA (LGS)).

Sections applicable	Implications for local government
Section 48 (1)	The national biodiversity framework, bioregional plans and biodiversity management plans may not conflict with any integrated development plan (IDP) adopted by municipalities.
Section 54	Municipalities must adopt an IDP that takes into account the need for the protection of listed ecosystems.

Section 76 (2)	Municipalities must prepare an invasive-species monitoring, control and eradication plan for land under their control, as part of their IDP-related environmental plans in accordance with Section 11 of this Act. This plan must include: a detailed list of invasive species; a description of infested land; the extent of infestation; measures to monitor, control and eradicate the invasive species; and ways of measuring the progress and success of control and eradication programs. The South African National Biodiversity Institute (SANBI) may assist municipalities in performing these duties.

4.1.1.2. The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)

The purpose of the National Environmental Management: Protected Areas Act (NEMPAA) is to provide for:

- the protection and conservation of vulnerable ecological areas representative of South Africa's biological diversity and its natural landscapes and seascapes;
- the formation of a national register of all national, provincial and local protected areas
- the management of all protected areas according to the international and national norms and standards;
- Inter-governmental co-operation and public consultation in matters concerning protected areas.

Table 5: Sections of the NEM: Protected Areas Act applicable to Local Government (Source: DEA (LGS)).

Sections applicable	Implications for local government
The Act contains no specific requirements for local government, but it states that all municipal by-laws are subordinate to the provisions of the Act.	Local protected areas will continue to be regulated by provincial legislation and the national Minister of Environmental Affairs will set the norms and standards for management of local protected areas. Although there are no specific obligations on local government regarding the implementation of this Act, municipalities can play a crucial role in assisting national and provincial governments to reach their targets for areas under protection.

4.1.1.3. The National Environment Management: Air Quality Act (No. 39 of 2004)

The purpose of the National Environment Management: Air Quality Act is the reorganization of the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation. It also aims for securing ecologically sustainable development and simultaneously promoting justifiable economic and social development; to make the provisions for national norms and standards regulating air-quality monitoring, management and control by all spheres of government; for precise air quality measures; and for incidental matters.

This Act establishes national standards according to which municipalities have to monitor ambient air quality and atmospheric emissions from certain, uncertain and mobile sources.

The following table list the sections in the Act that are applicable to the local governments.

Table 6: Sections of the NEM: Air Quality act applicable to Local Government (Source: DEA (LGS)).

Sections applicable	Implications for local government
Section 11 (1)	A municipality may, in terms of a by-law, identify substances or mixtures of substances that (when deposited, concentrated or accumulated) may reasonably be believed to present a threat to human health and well-being or to the environment within the municipality. A municipality may establish local emission standards for each of these substances or mixtures of substances.
Section 11 (2)	Although national government sets standards for substances and mixtures of substances, provincial government may alter the standards only in as far as it establishes standards that are stricter than national standards. Similarly, municipalities may only alter national and provincial standards by establishing standards for the municipality, or any part of the municipality, that are stricter than the national or provincial ones.
Section 11 (3)	A municipality may phase in the provisions under this Act and may amend the provisions only by making them more stringent than national and provincial provisions.
Section 11 (4)	A municipality must follow a consultative process when passing by-laws.
Section 14 (3)	Each municipal administration must designate an air-quality officer to be responsible for coordinating matters of air-quality management in the municipality.
Section 15 (2)	Each municipality must include an air-quality management plan in its IDP.
Section 35 (2)	Municipalities are bound by prescribed national standards when controlling noise.
Section 36 (1)	Metropolitan and district municipalities are charged with implementing an atmospheric-emission licensing system under which no person may conduct any activity on the national or provincial list without an atmospheric-emissions license (or provisional license). Municipalities therefore perform the functions of licensing authorities.
Section 36 (2 & 3)	Metropolitan and district municipalities may delegate this licensing authority function to a provincial organ of state, or a Member of the Executive Council (MEC) may appoint a provincial organ of state if a municipality cannot or does not fulfill its obligations.
Section 36 (4)	If a municipality itself applies for an atmospheric emissions license, a provincial organ of state must be regarded as the licensing authority for the purpose of that application.
Section 38 (1)	A licensing authority (usually metropolitan or district municipalities) may: reasonably require anyone applying for an atmospheric emissions license to provide additional information about the application at the applicant's expense; conduct its own investigation into the likely effects of the proposed application; invite written comments from any organ of state that has an interest in the matter. Furthermore, it must afford the applicant the opportunity to defend the application in the light of any objections.
Section 38 (2)	Both the applicant and the licensing authority (metropolitan and district municipalities) must comply with Section 24 of NEMA and Section 22 of the Environment Conservation Act with regard to the application for, and granting of, atmospheric emissions licenses.
Section 40 (1)	The licensing authority (metropolitan and district municipalities) may grant or refuse an application for a license
Section 41 (1 & 2)	When approving a license, the licensing authority (metropolitan and district municipalities) must first issue a provisional license, subject to conditions as set out by the MEC, the Minister of Environmental Affairs or the licensing authority, to enable the applicant to commence the activity.
Section 44 (1 & 5)	A licensing authority (metropolitan and district municipality) may grant the transfer of an atmospheric emissions license (or provisional license) to a new owner of the activity, by taking into account all the relevant matters considered when the original license was granted.
Section 45 (1)	The licensing authority (metropolitan and district municipalities) must review all atmospheric emissions licenses (and provisional licenses) at intervals as specified in the licenses, or when circumstances demand it.
Section 46 (1)	The licensing authority (metropolitan and district municipalities) may vary the license in writing to the holder of the license (or provisional license): to prevent deterioration of air quality; to achieve ambient air quality standards; to accommodate changing socio-economic demands where this is in the public interest;

	at the request of the license holder; when transferred to another person or when renewed.
Section 47 (1)	The licensing authority (metropolitan and district municipalities) may renew an atmospheric emissions license. A provisional license may only be renewed once.
Section 48 (1)	An air-quality officer may, depending on the size and nature of the listed activity, require the license holder of an atmospheric emissions license (or provisional license) to appoint an emissions-control officer.
Section 49	The licensing authority (metropolitan and district municipalities) must determine whether a person is a fit and proper person to hold an atmospheric emissions license by determining whether: the person has ever previously contravened or failed to comply with this Act, the Atmospheric Pollution Prevention Act or any other air-quality legislation; the person has held a license (or was a director or manager in a company that held a license) that has been suspended or revoked; the management of the listed activity will be in the hands of a technically competent person.

4.1.1.4. The National Environmental Management: Waste Management Act (No. 59 of 2008)

This Act provides for the regulation of waste management in order to protect health and the environment by providing reasonable measures to prevent pollution and ecological degradation and for securing ecologically sustainable development; to provide national norms and standards to regulate the management of waste by all spheres of government; to provide specific waste management measures; to provide the permitting and control of waste management activities; to provide the remediation of contaminated land; to provide the national waste information system; and to provide for compliance and enforcement. The following table lists the sections of the Act that are applicable to the local governments.

Table 7: Sections of the NEM: Waste management Act applicable to Local Government (Source: DEA (LGS)).

SECTIONS APPLICABLE	IMPLICATIONS FOR LOCAL GOVERNMENT
Waste service standards Section 9 (2)	In terms of this section, every municipality must: • conduct municipal activities in accordance with the National Waste Management Strategy and any national or provincial norms and standards; • compile an integrated waste management plan with its integrated development plan;
Section 10 (4)	• may delegate a power or assign a duty to another official in that officer's administration, subject to such limitations or conditions as prescribed by the Minister or MEC; • may, under certain circumstances as set out in Section 71 (1) and (2), require any person to submit a waste impact report, in writing and in a specified form and within a specified period of time, to the waste management officer.
Section 16	In terms of the Act, any holder of waste, including municipalities must take all reasonable measures to: • avoid the generation of waste and where such generation cannot be avoided, minimize the toxicity and amount of waste that is generated; • reuse, recycle or recover waste; where waste must be disposed of, to ensure that the waste is treated and disposed of in an environmentally sound manner; • manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts;

	• prevent any other person from contravening a provision of this Act in respect of the waste; and • take reasonable measures to prevent the waste from being used for an unauthorized purpose. • Further responsibilities of local government contemplated in this section include measures to: • investigate, assess and evaluate the impact of any waste on health and the environment; • stop, modify or control any act or process causing pollution, environmental degradation or harm to health; • ensure that local industries, businesses, communities, and the council itself, comply with prescribed standards of waste management; eliminate any source of pollution or environmental degradation; and • remedy the effects of any such pollution or environmental degradation.
Section 17	In terms of the Act, a municipality may, by notice, require any person making use of the municipal collection service to separate specific types of waste from general waste for the purposes of recovery, re-use or recycling. The Section also specifies however, that unless otherwise specified, every person who undertakes a recovery, re-use or recycling activity must, before undertaking that activity, ensure that the recovery, re-use or recycling of the waste uses fewer natural resources than disposal would; and, to the extent possible, is less harmful to the environment than disposal would be.
Section 23	Every municipality is obliged to ensure increasingly efficient, effective and affordable waste collection services are provided in its area. This duty is subject to: • the need for an equitable allocation of services to all communities in the municipal area; • the obligation of those receiving the service to pay any reasonable prescribed charges; • the right of the municipality to limit the provision of collection services if the recipients fail to comply with reasonable conditions set for the provision of such services: provided that this limitation does not pose a risk to human health or the environment; and • the right of the municipality to differentiate between categories of users and geographical areas when setting service standards and levels related to waste collection. • Every municipality must attempt, as far as is reasonably possible, to provide containers or receptacles for the collection of recyclable waste that are accessible to the public.
Section 24	The following requirements are enforceable by municipalities: • No person may allow waste to be removed from his or her premises unless the waste is collected by: • a municipality or municipal service provider; • a person authorized by law to collect that waste, where authorization is required; or • a person who is not prohibited from collecting that waste.
Section 25	In terms of the transporting of waste: • The Minister or MEC may, by notice in the Gazette, require any person or category of persons who transports waste for gain to register with the waste management officer in the department or province where the transportation takes place and to furnish such information as is specified or that the waste management officer may require. • Municipalities must ensure that any person engaged in the transportation of waste must take all reasonable steps to prevent any spillage of waste or littering from a vehicle used to transport waste.

	• Where waste is transported for the purposes of disposal, a person transporting the waste must ensure that the facility or place to which the waste is transported is authorized to accept such waste prior to offloading the waste from the vehicle. In the case of hazardous waste, written notification that the waste has been accepted must also be obtained. • A person who is in control of a vehicle, or in a position to control the use of a vehicle which is used to transport waste for the purpose of depositing waste is deemed to knowingly cause such waste to be deposited
Section 27	In terms of the Act a municipality (or an owner in the case of privately owned land to which the public has access) must ensure that sufficient containers or places are provided to contain litter that is discarded by the public.

4.1.2. The Environmental Conservation Act (Act 73 of 1989)

The MEC may, through the Environmental Conservation Act (ECA), identify those activities that will have a detrimental effect on the environment, and those activities will be prohibited. The MEC also has the right to identify areas of limited development for any activities relating to infrastructure, land use or resources. This could be areas with red-data species, wetlands or any other environmentally sensitive areas.

The following table is a summary of the environmental management functions of the different departments and the applicable legislation.

Table 8: Environmental management functions and applicable legislation (Source: Setsoto EM Programme)

RESPONSIBLE DEPARTMENT	ENVIRONMENTAL MANAGEMENT FUNCTION	APPLICABLE LEGISLATION
Department of Tourism, Economic and Environmental Affairs	Nature Conservation, game management, control of alien species.	♦ Environmental Conservation Act, No. 73 of 1989 ♦ National Environmental Management Protected Areas Act, No 57 of 2003
Department of Economic Development, Tourism, and Environmental Affairs	Impact Assessments.	♦ Environmental Conservation Act, No. 73 of 1989 ♦ National Environmental Management Act, No. 107 of 1998 ♦ National Environmental Management Waste Act, No. 59 of 2008 ♦ National Environmental Management Biodiversity Act, No 10 of 2004 ♦ National Environmental Management Air Quality Act, No 39 of 2004 ♦ Mineral and Petroleum Resource Development Act, No. 28 of 2002 ♦ Atmospheric Pollution Prevention Act, No. 45 of 1945

RESPONSIBLE DEPARTMENT	ENVIRONMENTAL MANAGEMENT FUNCTION	APPLICABLE LEGISLATION
		♦ Hazardous Substance Act, No. 15 of 1973 ♦ Health Act, No. 63 of 1977 ♦ SABS Code of safe disposal of medical waste ♦ National Heritage Resource Act ♦ National Parks Act, No. 57 of 1976 ♦ National Road Act, No. 54 of 1971 ♦ Occupational Health and Safety Act, No. 85 of 1993 ♦ National Water Act, No. 36 of 1998 ♦ Development Facilitation Act, No. 67 of 1995
Department of Agriculture	Land Care; Soil Conservation	♦ Subdivision of Agricultural Land Act, No. 70 of 1970 ♦ Conservation of Agricultural Resources Act, No. 43 of 1983
Department of Agriculture, Forestry and Fisheries	Public Health; Animal Health; Veterinary services	♦ Pest Control Act, No. 36 of 1963 ♦ Fencing Act, No. 31 of 1963 ♦ Veld an Forest fires Act, No. 101 of 1998 ♦ Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, No. 36 of 1947
Department of Health	Integrated Environmental Health; Safe food; Air pollution control	♦ National Water Act, No. 36 of 1998 ♦ Water Services Act, No. 108 of 1997 ♦ Health Act, No. 61 of 2003 ♦ Meat Safety Act ♦ Environmental Conservation Act, No. 73 of 1989 ♦ Guidelines on sewerage sludge ♦ National Sanitation policy ♦ Hazardous Substance Act, No. 15 of 1973 ♦ Food Premises Hygiene Regulations R918 of 30 July 1999

RESPONSIBLE DEPARTMENT	ENVIRONMENTAL MANAGEMENT FUNCTION	APPLICABLE LEGISLATION
Department of Local Government and Housing	Land Use Control	♦ Development Facilitation Act, No. 67 of 1995 ♦ Township Ordinance, No. 9 of 1969 ♦ Removal of Restrictive Conditions, No. 84 of 1967 ♦ Physical Planning Act, No. 125 of 1991 ♦ Subdivision of Agricultural land Guidelines ♦ Regulations for the amendment or withdrawal of regional or urban structure plans ♦ Free State LDO regulations (PG 246 of 14 November 1997) ♦ National Heritage Resource Act of 1999 ♦ Local Government Municipal Systems Act, No. 32 of 2000 ♦ Guidelines for Human Settlement and Design
Provincial office of Department of Water Affairs	Water Resource management; Waste management	♦ National Water Act, No. 36 of 1998 ♦ Water Services Act, No. 108 of 1997 ♦ National Environmental Management Waste Act, No. 59 of 2008 ♦ Health Act, No. 61 of 2003 ♦ Environmental Conservation Act, No. 73 of 1989 ♦ Mountain Catchment Areas Act, No. 63 of 1970
Provincial office of Department of Mineral and Energy Affairs	Mineral resources management; Assessing of EMP's	♦ Mineral and Petroleum Resource Development Act, No. 28 of 2002 ♦ National Environmental Management Act, No. 107 of 1998 ♦ National Water Act, No. 36 of 1998 ♦ Water Services Act, No. 108 of 1997 ♦ Health Act, No. 61 of 2003 ♦ Environmental Conservation Act, No. 73 of 1989

RESPONSIBLE DEPARTMENT	ENVIRONMENTAL MANAGEMENT FUNCTION	APPLICABLE LEGISLATION
		♦ Mountain Catchment Areas Act, No. 63 of 1970 ♦ Development Facilitation Act, No. 67 of 1995 ♦ Atmospheric Pollution Prevention Act, No. 45 of 1945 ♦ National Nuclear Regulatory Act, 1999 ♦ Mine Health and Safety Act, 1996 ♦ Conservation of Agricultural Resources Act, No. 43 of 1983 ♦ Free State Nature Conservation Ordinance, No. 8 of 1969 ♦ National Monument Act, No. 28 of 1969 ♦ National Heritage Resource Act, 1999 ♦ Free State Township Ordinance, No. 9 of 1969

4.2. Components of IEM

4.2.1. Strategic Environmental Assessment (SEA)

SEA is a process that incorporates the concept of sustainability into strategic decision-making (DEAT, 2004).

Strategic Environmental Assessment principles:

Strategic Environmental Assessment (SEA) aims to ensure that environmental issues are addressed from an early stage in the process of formulating policies, plans and programmes, and incorporated throughout this process. In The development and understanding of SEA will assist in practically implementing sustainability and moving towards a true integration of economic, social and biophysical goals.

Ten principles are proposed for SEA in South Africa. These principles are the fundamental premises underpinning SEA methodologies in South Africa and provide the theoretical base for the development of local SEA processes.

The following are the ten principles of SEA for South Africa:

(a) SEA is driven by the concept of sustainability;
(b) SEA identifies the opportunities and constraints, which the environment places on the development of plans and programmes;
(c) SEA sets the criteria for levels of environmental quality or limits of acceptable change;

(d) SEA is a flexible process, which is adaptable to the planning and sectoral development cycle;
(e) SEA is a strategic process, which begins with the conceptualization of the plan or programme;
(f) SEA is part of a tiered approach to environmental assessment and management;
(g) The scope of a SEA is defined within the wider context of environmental processes;
(h) SEA is a participative process;

4.2.2. Environmental Impact Assessment

The purpose of Environmental Impact Assessment (EIA) is to provide information on the environmental consequences of proposed activities in order to inform decision-making. The provided information must be available to a wide range of users including the decision-makers and stakeholders involved.

4.2.3. Environmental Management Plan

Environmental Management Plan (EMP) is an environmental management tool that can be used to provide assurance that the project proponent has made suitable for mitigation of negative environmental impacts and enhance the positive impacts. It provides the methods and procedures that can be used to mitigate and monitor these environmental impacts (DEAT, 2004)

EMP comprises of environmental objectives and targets which the developer needs to achieve in order to avoid and eliminate the negative impact of the environment (DEAT, 2004). It will help the municipality to improve its environmental performance. It should be revised regularly to reflect changes in the municipal objectives and targets.

3.2.4 Environmental issues and Projects in Setsoto

Below there are two tables one that shows the various environmental problems, and the other one is associated with the projects in the municipality is presented with the most prominent causes of these environmental problems. The various effects of these environmental problems on the people, the communities/towns being affected by these problems, also mitigation on how these problems can be monitored or eliminated are also presented.

Table 9: Environmental Issues

Area/ Location	Nature of the problem/ complaint	Possible cause of the problem/ Complaint	Action taken be to address the situation	Current Remedial Action	Permanent Remedial Action
Senekal Mapidipiding Mathabo West	Illegal dumping (manageable)	Insufficient collection of waste	Clean up of that area but the community continued to dump	None	-Educational awareness - Cleanup campaign
Senekal Loaning Matwabeng	Illegal dumping/ corner dumps (Hotspot)	Insufficient collection of waste	-Clean up -Continuation of dumping	None	-Educational awareness - Cleanup campaign
Senekal opposite Mohatladi Primary School Loaning Location	Illegal dumping (Hotspot)	Insufficient collection of waste	-None -Pilling up of waste dumped at this area.	None	- Awareness - Cleanup campaign and plant a tree.
Senekal Opposite Rorisang Primary School	Illegal dumping (Hotspot)	Insufficient collection of waste	Clean up	None	-Educational awareness - Cleanup campaign and plant a tree.
Senekal Down the road from Matwabeng Bakery	Illegal Dumping	Non collection of recyclable waste	Clean up	None	-Awareness to educate the community. -Clean up campaign.
Senekal opposite	Illegal dumping	Waste created by the shop across and also	Clean up	None	-Educational awareness

Matwabeng Bakery		the people who are passing by that area.			- Cleanup campaign and plant a tree.
Senekal opposite Modisa Ya Molemo Creche	Illegal dumping at the field/ open space all corners of the field have corner dumps (Hotspot)	Waste from grass cut is pilled up at all corners of the field. They also dump domestic waste at this area that is not being collected	Clean up because the area looks clean but there these piled up waste.	None	-Awareness educating the community. - Cleanup campaign and plant a tree.
Area /Location	**Nature of the problem / complaints**	**Possible cause of the problem/ complaints**	**Action taken be address the situation**	**Current remedial action**	**Permanent remedial action**
Marquard Tshimong location Next to Moemeneng Funeral Parlour	Illegal Dumping	Waste collection is not continuous collected where it may happen that the truck does not collect waste for two consecutive weeks.	-Clean up campaigns	None	-Educational awareness - Cleanup campaign and plant a tree. - Regular waste collection.
Marquard Tshimong location behind Moemeneng Funeral Parlour	Stagnant water	Construction of the reservoir, of which the site is incomplete leading to pipes being dug but not closed, when it rains water fill this hole.	None	-Closing of that hole -Fencing the reservoir to restrict access to that area.	**-**Educational awareness -Clean up campaign - Regular waste collection.
Marquard Mokodumela (opposite the Dam)	Illegal Dumping	They are located at a distance far from where the waste is collected.	None	-Restrict area of construction from the community to prevent any injuries.	-Educational awareness - Regular waste collection. -A sign that will reflect “No Dumping or Will be Finned”

Marquard Old Cemeteries at the location	Illegal Dumping On the fence of the cemeteries on top of trees that were planted on the previous cleanup campaign	Insufficient collection of waste for two consecutive weeks. The people who are passing this place also contribute to illegal dumping.	Clean up campaign and planting of trees, but the community still dumps domestic waste at that area.	None	-Educational awareness - Sign of which indicates that “No Dumping, or else you will be finned”
Marquard Opposite Itemoheng Primary School	Illegal Dumping (Hotspot)	-Collection of waste is insufficient -Lack of proper handling of waste	-None	None	-Educational awareness - Regular waste collection. -A sign that will reflect “No Dumping or Will be Finned”
Marquard Mandela Park	Illegal Dumping (Hotspot) Stagnant water	Inconsistence of waste collection -Lack of proper handling and Storage of waste - Stagnant water resulted from the rain	**-** Cleanup campaign	None	Educational awareness - Sign of which indicates that “No Dumping, or else you will be finned” **-**There must be pipes or channels which will allow free movement of water to prevent the water to stand at that public space

Area /Location	**Nature of the problem / complaints**	**Possible cause of the problem/ complaints**	**Action taken be address the situation**	**Current remedial action**	**Permanent remedial action**
Clocolan Extension 6 corner of the public field/ground	-Illegal Dumping (hotspot)	Insufficient collection of waste due to the truck no functioning, they are using a tractor.	Clean up campaign, but the community continues to dump their domestic and construction waste at the spot.	None	Educational awareness - Cleanup campaign and plant a tree. - Regular waste collection when the truck is fixed.
Clocolan Extension 6 (Potomani)	-Illegal Dumping (hotspot)	Insufficient collection of waste due to the truck no functioning,	Clean up campaign, but the community continues to dump their domestic	None	Educational awareness - Cleanup campaign and plant a tree.

		they are using a tractor.	and construction waste at the spot.		- Regular waste collection when the collection truck is fixed
Clocolan Extension 6 opposite house number 3876	-Illegal Dumping (hotspot) -There is effluent waste water close to the dumping site making it difficult to clean that area	Insufficient collection of waste due to the truck no functioning, they are using a tractor.	Clean up campaign, but the community continues to dump their domestic and construction waste at the spot.	None	Educational awareness - Cleanup campaign taking into consideration the waste effluent - Regular waste collection when the truck is fixed and functional.
Clocolan Extention 6 next to the main road that leads to Marquard Town	-Illegal Dumping (hotspot)	Insufficient collection of waste due to the truck no functioning, they are using a tractor.	Clean up campaign, but the community continues to dump their domestic and construction waste at the spot.	None	Educational awareness - Cleanup campaign and plant a tree. **-**Waste collection

3.4. Environmental Assessment

3.4.1. Background

This section, aims to describe the identified environmental issues for Setsoto and assessing such. There are a lot of activities and processes that pose negative impact on the environment in Setsoto local Municipality.

In order to ensure that the negative environmental impacts are minimized, there should be an understanding of the relationship between the causes and the effects of the issues (the aspects and the impacts). This will help with the mitigation of the negative impacts.

The aim of environmental management practices and processes 'is to preserve our scarce, natural resources (water, land and vegetation) for the future generations and to protect the natural beauty of our environment'.

Setsoto Local Municipality and its community are responsible in ensuring that human rights as outlines in the Constitution Republic of South Africa (Act No. 108 of 1996) section 24 are protected. This can happen by taking care of the environment.

3.4.2. Biodiversity

Setsoto is 100% covered by the Grassland biome, it comprises of ten vegetation types which includes Basotho Montane Shrubland, Bloemfontein Karroid Shrubland, Central Free State Grassland, Eastern Free State Clay Grassland, Eastern Free State Sandy Grassland, Eastern Temperate Freshwater Wetlands, Highveld salt Pans, Lesotho Highlands Basalt Grassland, Vaal-Vet Sandy Grassland and Winburg Grassy Shrubland.

Out of these ten vegetation types, one (Vaal-vet Sandy Grassland) is classified to be endangered according to South African National Biodiversity Institute (SANBI). It covers 0.22 % of the municipal area.

There are two vegetation types (Eastern Free State Clay Grassland and Eastern Temperate freshwater Wetlands) which are classified to be Vulnerable according to SANBI. They cover 29.61% and 0.06% of the municipal area respectively. There are no critically endangered vegetation types in Setsoto local municipality.

There is only one protected area (Willem Pretorius Nature Reserve) in Setsoto which covers 2.12% of the municipal area. There is a need to conserve Setsoto's biodiversity as there is some vegetation that is vulnerable and endangered. There are wetlands that are habitat to some of these endangered plant species.

3.4.3. Water and Wastewater Management

There are three water management areas in Setsoto which are Middle Vaal (occupying 67.38% of municipal area), Upper Orange (occupying 32.5% of municipal area) and the unnamed one which occupies 0.12% of municipal area.

There are eight (8) rivers in Setsoto which are Caledon, Klein-vet, Laaispruit, Meulspruit, Moperi, Sand, Sandspruit and Wonderkopspruit. These rivers are supplying water for Setsoto

community. Caledon and Meulspruit are the biggest rivers supplying Ficksburg and other 3 towns. The other 6 rivers are supplying the other 3 towns especially during rainy seasons.

According to SANBI the wetlands in Setsoto covers about 1.7% of the municipal area.

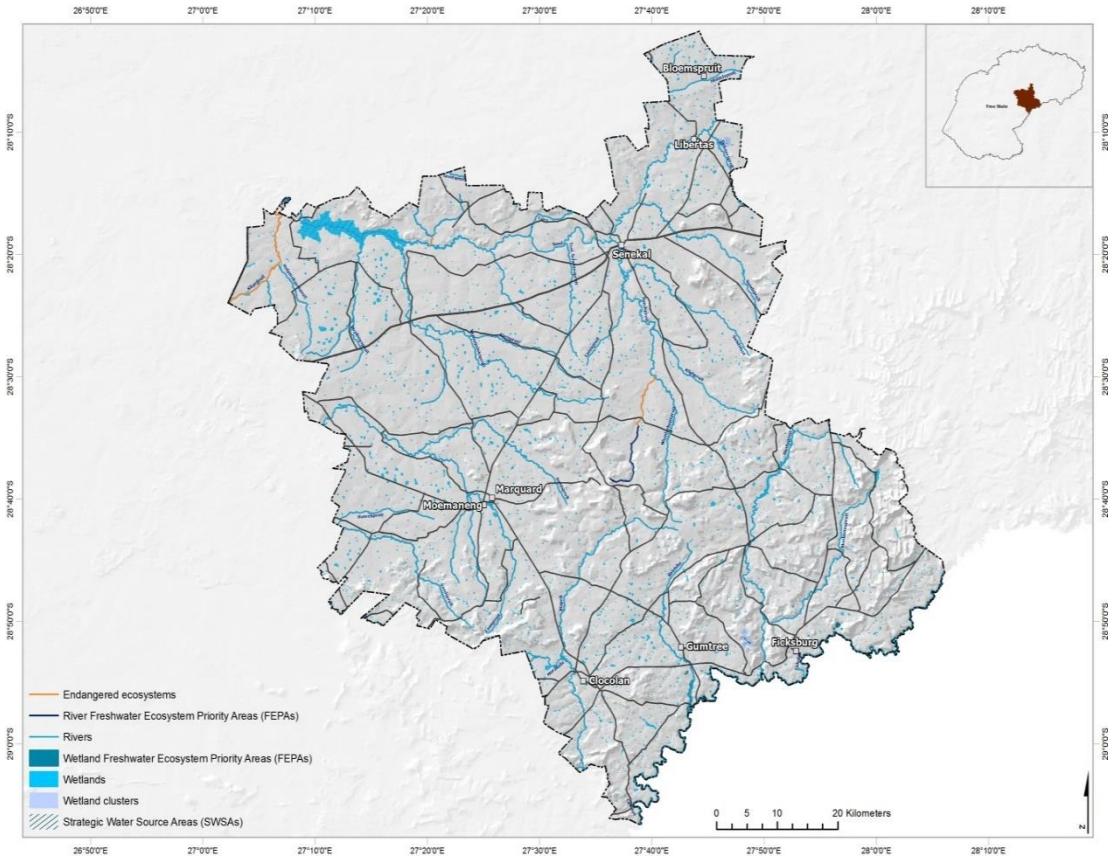


Figure 3: Setsoto's freshwater map (Source: SANBI)

A key aspect of the municipality's sustainability is the protection of its river systems and water bodies many of which are in a critically endangered state as identified by SANBI. For this reason, the municipality needs to limit bank side and development in the high catchments to the greatest extent possible.

In order to protect water quality, careful management is required which includes the alignment of a no ploughing or urban development setback line. In the absence of a 1: 50 year flood line, a minimum 32m setback line is required from the banks of all river and water bodies unless otherwise delineated by hydraulic engineers (flood lines) and or ecological set back lines (fresh water ecologists) The Allemanskraal dam, providing the reservoir for the Sand River irrigation scheme west of the municipality, is protected within the Willem Pretorius nature reserve. The Meulspruit dam, supplying Ficksburg's water is also protected by a nature reserve.

According to Setsoto SDF river corridors and wetlands, including ephemeral pans, must be protected from urban, agricultural and mining activities to a distance of at least 32 metres from their banks unless closer setback lines have been determined, e.g. 1:50 year flood line by a geohydrologist and freshwater ecologist.

Ficksburg extract water from Caledon River, during rainy seasons Meulspruit dam is the one supplying Ficksburg with water. Clocolan is supplied by Moperi River and when the water is not enough in the dam; it is supplied by Caledon River from Ficksburg. Marquard is extracting its water from the Laaispruit River and when the water is not enough, they are supplied by Caledon River from Ficksburg through Clocolan. Senekal extract their water from Sand River and Sandspruit and there is also a borehole.

Many river systems in the municipality have, however, suffered environmental degradation due to the continued mismanagement and misuse of natural resources in their catchment area

Water in the streams (especially in Ficksburg) is becoming increasingly polluted by the waste from the community.

There are several wetlands in Setsoto area which some of them have suffered as a result of degradation by human activities. Some of them are contaminated by waste that is being dumped by residents near or on them. Some are damaged by wastewater and cattle.

Wetlands are very important to environmental sustainability. They also important for water retention and filtration and flood mitigation and must be conserved as far as possible. No one should convert or drained wetlands without the approval from the Department of Agriculture and Environmental Affairs.

Storm water pollution is one of the problems facing Setsoto. They are full of domestic waste. Some of storm water drainage is also not in good conditions due to the blockage and contaminations and needs urgent attention and maintenance. When it rains, the storm water prevents the community to cross over it. The school children are being helped by the municipal tractor to cross over. It is dangerous and can cause harm to the children living around it. There are major spillages of raw sewage that end up in Caledon River.

There is one wastewater treatment plant (WWTP) in Ficksburg which accept wastewater from town and township. The domestic and industrial wastewater is treated in the same wastewater treatment plant. Clocolan has one WWTP that treats both domestic and industrial wastewater from town and townships. Marquard also has one WWTP that treat wastewater from domestic and industrial in both town and townships. Senekal has two WWTP which treat both domestic and industrial wastewater from town and townships.

There are a number of sewerage spillages and blockages that are found in the township. Some of them are located in front of households that are harmful to the health of the people living there; children are the most vulnerable to this kind of situations.

There are streams that are situated close to the settlements in Setsoto (especially in Ficksburg) and they are contaminated by the waste that is illegally dumped. Waste from some of the wastewater treatment plants is buried and it can contaminate ground water.

3.4.4. Waste Management

Setsoto municipality serves and deliver services to four towns (Ficksburg, Senekal, Marquard and Clocolan and the surrounding townships which are; Meqheleng, Matwabeng, Moemaneng and Hlohlolwane) as mentioned earlier.

The biggest challenge in the municipality is poor waste management of the landfill sites. The landfill sites have licenses but their conditions are not adhered to, due to lack of manpower and machinery which are not enough or takes long to be repaired resulting in backlog on covering and compacting waste. Setsoto has waste by-laws which are not properly enforced.

One of the major challenges in municipalities regarding refuse removal is the vehicle breakdowns which is caused by vehicle age, poor road conditions, overloading and lack of routine maintenance. These breakdowns of the vehicles result in inconsistent collection services. Most of the times, the disrupted waste collection services are resulting in waste being dumped illegally (CSIR, 2011).

All four towns have the licensed landfill sites but there are two (Ficksburg and Senekal) that are functional while Clocolan and Marquard licenses are not functional as yet. Only Ficksburg and Senekal have their landfill sites constructed. These landfill sites are registered with the Waste Information System and are reporting. They are allowed to accept general and industrial waste but not hazardous waste and electronic waste. Hazardous waste such as medical waste should be disposed of at the hospital and be incinerated or transported to landfill sites that accept hazardous waste. The other two towns (Clocolan and Marquard) are still using the dumping sites that are not complying with the license requirements. In these landfill sites the communities dump any kind of waste. There is a designated Waste Management Officer in Setsoto.

There is medical waste (hazardous waste) which were found in one of the landfill sites which can pose a health and safety risk to the people exposed to it. It is not known whether they come from the hospital or veterinary. Refer to the figures below:

Figure 4: Medical waste in one of the landfill sites in Setsoto

Figure 5: Medical waste found in the landfill site

There is a very serious problem with the illegal/corner dumping in all townships of the four towns. There are waste dumps in almost every corner of every street. There is general waste, garden waste and also building rubble materials that are dumped at the corners, some of this waste is being burned.

Some of the waste is dumped next to the storm water which sometimes blocks the storm water.

The disposal of waste both formally and informally changes the natural topography of the land.

Litter and illegal dumping is an aesthetically unpleasant and releases odours and leads to urban decay. Illegal dumping has a potential to disrupt natural processes on land and in the water. It can interfere with proper drainage of runoff. Areas with improper drainage of runoff are more vulnerable to flooding when waste blocks streams, channels, and drainage basins.

In rural areas, burning dump waste can cause forest fires which most of the times cause severe erosion as fires burn away trees and undergrowth. Dumping of waste also has a negative impact on plants and wildlife. Fish and other aquatic species are dying when decaying litter and food wastes in streams reduce oxygen supplies in the water. Refuse in a stream can also block fish spawning areas (Green Sweep).

This also contribute to pollution of air in the areas. Waste placed in low lying areas could block or obstruct the flow of water which could result in flooding.

There is little that is done for recycling in Setsoto. Some of the community members are collecting the recyclable waste and sell them to the recyclers who fetch the waste in the landfill sites. Municipality is working with privately owned recyclers which are stationed around the municipality. There are two recycling centres in Ficksburg which buy recyclable waste from Meqheleng community.

Setsoto has a designated Waste Management Officer in accordance to NEM: Waste Act. It has an Integrated Waste Management Plan which was approved by Council in 2009 and is the process of being reviewed.

Waste can affect ecosystems and could change biomes if species are eradicated. Emissions from landfill sites and from burning of illegally dumped waste releases pollutants into the air. Some of the pollutants are volatile organic carbons which could be harmful to human health. These volatile organic carbons are also harmful greenhouse gases which are depleting Ozone layer. The disposal of waste both formally and informally changes the natural topography of land.

3.4.5. Air Quality Management

Air quality means the state of the air surrounding us. Good air quality refers to clean, clear and unpolluted air. Clean air is important to maintain the delicate balance of life on this planet. This include not only for humans but wildlife, vegetation, water and soil. Poor air quality is caused by a number of factors which include emissions from various sources, both natural and anthropogenic activities. Emissions from anthropogenic activities have potential to have negative impacts on the social and environmental health of the community. Natural sources of air pollution include wild/veld fires, wind-blown dust, sea spray, pollen and ash from volcanic eruptions (Hanlie, 2014).

Poor air quality occurs when pollutants reach high enough concentrations to endanger human health or the environment. Most of the emissions in Setsoto municipality are emanating from vehicles; agricultural activities; domestic fuel and waste burning; landfill sites; small industries and wastewater treatment works (WWTW).

3.4.5.1. Vehicle emissions

Vehicles are likely to contribute significant amounts of pollutants into the atmosphere. These pollutants are not only affecting localised areas but also throughout the surrounding air sheds. Transport emissions cause health impact which is often located away from the source of contamination due to spreading effects and the emissions are considered a major source of urban pollution. Petrol and diesel from vehicles are contributing to Benzene, lead, SO_2, CO and NO_x emissions (van Nierop *et al, 2014*).

The emissions from vehicles have identified is a great concern with increased emissions in the transport sector due to the increased number of vehicles, the age of the vehicles and lack of emission control. Emission concentrations from the vehicles differ according the vehicles age, engine, size, fuel specification and travelled speed. The old vehicles have significantly increased emissions compared with the newer vehicles (van Nierop *et al, 2014*).

Table 10: Vehicle emissions based on fuel sales for petrol

Town	Total petrol sale [kg/year]	Total petrol sale [ton/year]	Total petrol emissions [tonne/year]				
			NO_x	CO	SO_2	Benzene	Lead
Clocolan	2,123	1,565	3	17	0.06	0.03	0.0
Ficksburg	3,801	2,802	6	30	0.11	0.06	0.0
Marquard	858	633	1	7	0.03	0.01	0.0
Senekal	3,839	2,830	6	30	0.11	0.06	0.0

Table 11: Vehicle emissions based on fuel sales for diesel

Town	Total petrol sale [kg/year]	Total petrol sale [ton/year]	Total petrol emissions [tonne/year]				
			NO_x	CO	SO_2	Benzene	Lead
Clocolan	7,544	7,166	84	25	11.0	0.0	4.6
Ficksburg	2,123	2,587	30	9	4.0	0.0	1.7
Marquard	3,828	3,637	42	13	5.6	0.0	2.3
Senekal	13,683	12,999	152	46	20.0	0.0	8.3

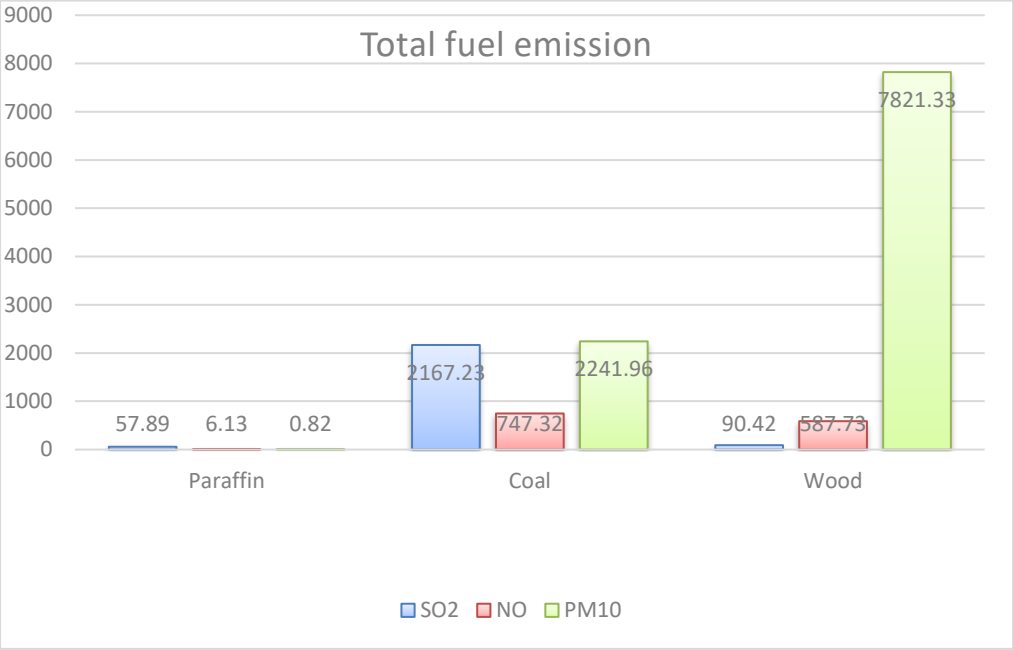
The increased demand of fuel in South Africa is resulting from increased mobilisation and economic development with the main vehicle types polluting mode of passenger transport in urban areas (van Nierop *et al, 2014*).

Greenhouse gases (GHG) such as CO_2 and NO_x are part of the highest pollutants emitted from vehicles. South Africa is one of the countries in which GHG emissions have the fastest growth due to the rapid expansion of road networks (van Nierop et al, 2014)

3.4.5.2. Domestic fuel burning

In Free State province domestic fuel is used for cooking, heating and lighting. This domestic fuel contains a wide range of sources which include animal dung, candles, coal, electricity, gas paraffin, solar power and wood. The total number of households were used to quantify the emissions from each fuel source. The census 2011 data shows that the total number of households in Setsoto Local Municipality was 33,687. Paraffin, wood and coal are the main fuels with quantifiable emissions.

From the total number of households in Setsoto local municipality, 152 households are using coal, 2055 households are using wood and 4087 households are using paraffin. The total usage per fuel is as follows: total paraffin usage is 578,869 kg/year; total coal usage is 186,830 kg/year and total wood usage is 452,100 kg/year. The following chart show the quantified emissions from coal, wood and paraffin for Setsoto local municipality (van Nierop *et al*, 2014).



Densely populated, low-income and informal settlements are normally placing with high usage of domestic fuel. Fuel such as wood, paraffin and coal are usually used for cooking and heating, especially in the winter. Domestic fuel burning is also source of atmospheric emissions and it contributes to PM, SO_2 and CO emissions (van Nierop *et al, 2014*).

Household coal and wood burning contributes to human health impacts. These human health impacts remain the most serious and pressing national air pollution problem (van Nierop *et al, 2014*).

Burning of coal emits large amount of gaseous and particulate matter pollutants such as SO_2, total PM, PM_{10}, heavy metals and inorganic ash, CO, polycyclic aromatic hydrocarbons (PAH) which are known as carcinogens. PM_{10}, NO_2, CO, PAH, and particulate benzo(a)pyrene are pollutants arising from combustion of wood (van Nierop et al, 2014).

3.4.5.3. Biomass Burning

The Free State is dominated by the grassland biome which covers the most part of the province. Setsoto Local Municipality is totally covered by grassland biome. There is a risk of veld fires in Setsoto Local municipality due to extent of grasslands combined with the climatic conditions. Open fires, either veld fire or burning of garden refuse and domestic

waste emit CO, NO_x, SO_2, non-methane volatile organic compounds (NMVOCs) PM, ammonia (NH_3) and GHG to the atmosphere (van Nierop et al, 2014).

Farming chemicals such as fertilizer dust and insect/pest killers emit harmful chemical into the air and cause pollution. The country of Lesotho also contributes to air pollution that is affecting the communities in Setsoto through the industries that are emitting emissions to the atmosphere.

In Free State economic sector is dominated by agricultural activities. Crops are produced and livestock reared for consumption both nationally and internationally. Thabo Mofutsanyana District Municipality is on the municipalities in Free State which contains a highest proportion of agricultural activities. These agricultural activities can be sub-divided into crop production and agricultural soils, and livestock activities.

Crop production and agricultural soils contribute to NH_3 which cause acidification and eutrophication of natural ecosystem and also form secondary PM. PM emissions have potential negative impact on human health. NO and NMVOCs are also contributed by crop production and play a role in the formation of O_3 which when is near the Earth's surface can have a potential negative impact on human health and plant growth (van Nierop et al, 2014).

3.4.5.4. Small Boilers

Small boilers used by the industries, schools, hotels, restaurants, municipal offices, hospitals and a variety of commercial enterprises are contributing to air pollution. Emissions associated with small boilers include SO_2, PM_{10}, NO_x and CO. In Setsoto Local Municipality there are not a lot of small boilers. The following is the table showing the emissions from small boilers.

Table 12: Emissions from small boilers (source: Van Nierop, 2014)

Town	Name of Boiler	Capacity [ton/year]	Boiler Emissions [kg/year]			
			SO_2	**PM_{10}**	**NO_x**	**CO**
Clocolan	Clocolan Hospital	4,800	165,470	13,063	16,329	13,063
Ficksburg	Ficksburg District Hospital	4,800	165,470	13,063	16,329	13,063
Senekal	Senekal Provincial Hospital	4,800	165,470	13,063	16,329	13,063

3.4.5.5. Landfill sites

Emissions emitted from landfill sites are determined by the type and volume of waste in the landfill site, and the length of time the waste has been in the landfill. Waste in Setsoto Local Municipality is being disposed in the licensed landfill site. The waste from landfill sites has a potential negative impact on the environment in many ways which include the contribution of emissions to the atmosphere. The emissions result in nuisance, odour and health impact. The

pollutants emitted by waste in the landfill sites are PM and C_6H_6. There are GHGs emissions that are emitted by waste in landfill sites and these include CH_4 and NO_2 (van Nierop et al, 2014). Below are the results of the emissions calculated for all four landfill sites in Setsoto Local Municipality.

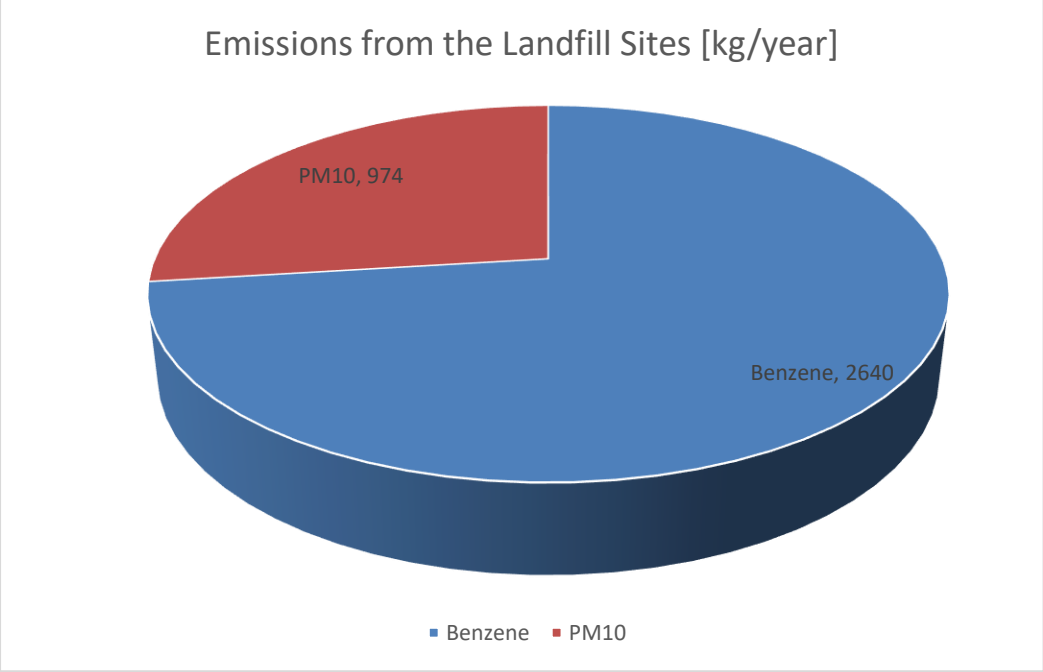


Figure 6: Emissions associated with Landfill sites

According to the National Environmental Management: Air Quality Act NEM: AQA (Act No. 39 of 2004) every municipality should have a designated Air Quality Officer that will be responsible for co-ordinating matters pertaining to air quality management in the municipality. The Act also require municipalities to develop Air Quality Management Plans (AQMPs) to help in managing the quality of air.

5. Mitigation

Mitigation measures are measures that effectively control, eliminate, or significantly reduce an initiative's adverse environmental effects (Foreign Affairs, Trade and Development Canada, 2007)

5.1. Water Management

All water courses and wetland areas should be protected from erosion, solid waste, and spills of pollution such as sewerage, chemicals, oils and wastewater. Wetland areas and streams that are polluted by waste disposals should be cleaned.

Wetland should be rehabilitated and protected from pollution or any other human activities. Removal of cattle, sheep, goats and pigs from residential area to municipal commonages situated on the outskirts of town.

For people who are living near water body, may plant lots of trees and flowers around their homes, so that when it rains, chemicals from their homes do not easily drain into the water.

Relocating people who are living within flood line areas to residential areas can also mitigate the water pollution.

Upgrading of the sewerage disposal system, to a waterborne system and other existing infrastructure will also help mitigating water related problems.

Removal of domestic animals from residential area to areas such as commonages situated outside of town.

Removal of alien species around Setsoto local municipality will help preventing soil erosion and extinction of indigenous plant species.

Awareness and education campaigns should be conducted to help the communities understand the importance of the environment and why it is important to save and use water wisely and to not contaminate the streams, rivers and storm water drainage.

5.2. Waste Management

The mitigation of waste disposal starts with better waste collection services from the municipality should be provided to the communities. Municipality should be provided with enough equipment to render a better service to the whole of Setsoto local municipality.

To mitigate or reduce waste, illegal dumping should be restricted. The amount of solid waste that is produced can be minimized and recovering through recycling and reusing.

Waste must be disposed of at a properly designed and permitted operated landfill. The landfill sites must have a permit from Department of Water Affairs. In communities where there are no landfill sites, transfer stations should be used to dump waste.

To have enough operational vehicles is very important as this will ensure a continued service when vehicles are serviced. To avoid problems with refuse removal, the vehicles must be used for their meant purpose and training must be provided to the staff and drivers of the vehicles (CSIR, 2014).

The municipality must implement and enforce their waste by-laws so that the community can adhere to them.

Domestic waste can be decomposed and used as fertilizers for agricultural use. Community members can start gardening and use the decomposed waste as fertilizers for the plants.

Hazardous waste such as medical waste should not be disposed of in the landfill sites. Since there are no landfill sites that accept hazardous waste in Setsoto local municipality, they should be incinerated at the hospital. Incineration should be practiced only if the incinerator is licensed/ permitted. If there are no incinerators in the hospital, this hazardous waste should be transported to the registered landfill sites that accept such waste.

No waste should be burned in the landfill sites and on the street or anyone’s home. Provision of more refuse bins or skips throughout the whole area. Make use of transfer stations where the community that don't have a waste removal service can dump their refuse. From here the municipality can then dispose the refuse at the registered landfill site.

For used oils that contaminate soil and ground water from vehicle and machinery workshops, the owner should make sure that oil or diesel is collected into a conservancy tank so that it can be collected by a registered service provider to be disposed of at a registered landfill site that accept these kinds of waste.

Awareness and education campaigns should be conducted to help the communities understand the importance of the environment and why it is not good to dispose waste anywhere.

5.3. Air quality Management

Awareness and education campaigns should be conducted to help the communities understand the importance of the environment and why they should not burn waste in their homes. Programs that help on how to burn fire should be part of the awareness campaigns.

Communities that are still without electricity should be provided with electricity as this will reduce the burning of wood and coal as energy source. Making use of smokeless stoves will also help in reducing air pollution. Preventing veld fires especially the high rate at which they can occur.

6. Implementation Plan

Table 13: Environmental implementation plan for Setsoto

	Action	To be completed end of year					Responsible institute	Performance Indicator
		1	2	3	4	5		
		2019	2020	2021	2022	2023		
1	Environmental Policy		X	X			**Setsoto (DPSS & ES Departments)**	Environmental policy to be put in place
2	Implementation of Environmental By-Laws		X	X			**Setsoto (DPSS & ES Departments)**	Number of By-Laws formulated and need to be Implemented (Cemetery and waste by-laws in place) Other environmental By-Laws to be put in place
3	Review and monitor the IEMP for Setsoto		X	X	X	X	**Setsoto (DPSS Department)**	IEMP updating and monitoring of the document.
4	Conduct Environmental Education and Awareness Campaigns	X	X	X	X	X	**Setsoto (DPSS & ES Departments)**	Number of campaigns to be organized • Campaigns on Waste management • Biodiversity • Water management • Air quality • Land use management
5	Facilitate & monitor projects in Waste (Waste management)	X	X	X	X	X	**Setsoto (Waste Management Division)**	Number of projects to be implemented • Awareness campaign (Reduce, Reuse and Recycle)

								• Cleaning of storm water, rivers and streams (YES Project) • Recycling projects • Rehabilitation of illegal dumping areas and planting of trees. • Metal and glass depots
6	Monitor Water catchment (Water management)		**X**	**X**	**X**	**X**	**Setsoto (Water and Sanitation Division)**	Number of control measure and programmes to be put in place • Awareness campaigns • Working on Water (Alien plants clearance)
7	Biodiversity management	**X**	**X**	**X**	**X**	**X**	**Setsoto (DPSS & ES Departments)**	Number of programmes to be put in place • Conservation (protection areas) • Indigenous plants projects • Rehabilitation and protection of wetlands • Wetland cleaning and management
8	Facilitate Environmental programmes and celebrations	**X**	**X**	**X**	**X**	**X**	**Setsoto (DPSS & ES Departments)**	Number of event/ celebrations implemented on the environmental calendar.
9	Projects to be implemented (Land use management)	**X**	**X**	**X**	**X**	**X**	**Setsoto (Parks, Cemetery and Housing Divisions)**	Number of projects and programmes to be implemented • Soil erosion control • Management of alien plants • Rehabilitation of degraded lands • Greening and open Space Sub-programme (planting trees and creation of infrastructure in the form of recreational parks)
10	Oversee the development of new environmental projects	**X**	**X**	**X**	**X**	**X**	**Setsoto (DPSS & ES Departments)**	Development of sustainable new environmental projects according to recommendations of IEMP

7. Recommendations

- Recommendations help achieve the mitigation measures for the environmental impacts. There are a number of projects and programmes that can help with the mitigation of the environmental impact. Such are outlined below;

7.1. Water Management

As there are alien species that are identified in Setsoto, they need to be eradicated. Working for Water programme can help to remove invasive alien plants (IAPs) and mitigate their effects on the quality and quantity of water, biodiversity and functioning of our natural ecosystem.

If IAPs are cleared along the rivers, this will result in stream flow increase of approximately 800 to 12000l/ha/day during winter rainfall region and up to 34000l/ha/day in summer rainfall region according to DEA.

IAPs have dramatic and destructive impacts on the quality of water, soil and human health and food security. They pose the risk of wild fires and increase soil erosion (DEA).

Wetlands are very important to our lives as they help reduce flood and drought impacts, purifying water and working as sponges in landscapes.

Working for Wetland programme helps with the rehabilitation, protection and sustainability of our wetlands.

According to DEA the rehabilitated wetlands have benefits which include: improved livelihoods, protection of agricultural resources, enhanced biodiversity, cleaning water, reducing flood impacts, increasing water security, reducing greenhouse gas emissions and disease control.

7.2. Waste Management

There is a programme called Working on Waste that is established by the department of environmental affairs. Working on Waste programme helps the municipalities with their waste management. It helps with the street cleaning, collection of waste, construction of buy- back centres, recycling centres, waste transfer stations, development of landfill sites, and rehabilitation of illegal dumping sites.

It also helps in addressing the current backlog in waste management while creating mechanisms for better future waste management.

There is another programme called *Rekgoeba ka Diratswana* that has been established by the Department of Agriculture. This programme helps reduce the waste that is going to the landfill sites and reduces also the illegal corner dumping on the streets. People can turn their domestic waste into fertilizers and use them for gardens where they grow fruits and vegetables. It will help in saving people's money.

Degraded land due to illegal waste dumping can be rehabilitated. Greening and Open Space sub-programme helps in rehabilitating the open spaces that have been degraded. It helps the communities through planting of trees and creation of infrastructure in the form of recreational parks.

The Greening project according to DEA, contribute to the protection and conservation of the environment and also with the maintenance of cultural resources. “Other aspects of greening initiatives include the projects that install alternative renewable technologies in communities so as to mitigate the impacts of climate change”.

7.3. Air quality Management

Appropriate burning management can be formulated and where communities (including farmers) are educated in respect to burning of veld and waste. These programmes include working for Fire and *Baza nje ngoMagogo* clean fire program. These two programmes could help in managing the air pollution caused by illegal burning.

The establishment of national norms and standards and by-laws will help to prevent and reduce unhealthy air for the community. Providing increased opportunities for public to be involved and to participate in the protection of air quality will also help reduce air pollution.

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