PIGG'S PEAK
TOWN COUNCIL
P.O. Box 479, Pigg's Peak, Swaziland
Tel: 437 1720 Fax: 437 1720
IMPROVEMENT IN SERVICES AND
QUALITY OF LIFE THROUGH UNITY

PIGG'S PEAK TOWN COUNCIL

FINAL DRAFT

INTERGRATED WASTE MANAGEMENT PLAN

Waste Avoidance	Waste Recycling	Waste Disposal

January 2016

This Study Report on the Intergrated Waste Management Plan for Piggs Peak Town is submitted to the Swaziland Environment Authority (SEA) in conformity with the requirements of the Environmental Management Act, 2002 and the Environment Audit Assessment and Review Regulations, 2000.

TABLE OF CONTENTS

DECLARATION 5

EXECUTIVE SUMMARY 6

LIST OF ABREVIATIONS &ACRONYMS 7

IWMP SUMMARY INFORMATION 8

1. INTRODUCTION 9

1.1 Background and Appointment 9

1.2 Scope of Work 9

1.3 Aims and goals 11

1.4 Background of the IWMP 12

1.4.1 Impacts of waste on the environment 12

1.4.2 Economic Effect of Waste in Towns 13

2. GEOGRAPHIC AREA 14

3. IWM KEY PLANNING RESPONSIBILITIES 15

3.1 Overview of relevant Policies and Legislation 15

3.1.1 Swaziland Constitution (2005) 15

3.1.2 Environmental Management Act (No. 5 of 2002) 16

3.1.3 Waste Regulations Act, 2000 16

3.1.4 National Solid Waste Management Strategy, *Volume 1* 17

3.1.5 National Water Act no. 7of 2003, as amended 17

3.1.6 The Public Health Act No. 5 Of 1969 18

3.1.7 SEA Minimum Requirements for Landfill 18

4. STATUS QUO 19

4.1 Town Council Description & Background 19

4.2 Governance and Administration of Town Council 20

4.3 Current Status Quo 22

4.3.1 Waste Streams 22

4.4 Municipal Services 24

4.4.1 Waste Collection 24

4.4.2 Town Council Structuring 27

4.5 Summary of Staff 28

4.6 Status on illegal dumping 28

4.6.1 Dumping Hotspots within PPKTC 28

4.7 Landfilling Operations 30

4.7.1 Glen Township Landfill Facility 31
4.7.2 Old Dumpsite 35

5. WASTE ANALYSIS 38

5.1 Waste generation 38

5.2 Demographics and Wastes Statistics 38

5.3 Waste Generation Trend and Future Estimates 39

5.4 Waste Characteristics 40

5.5 Estimated Waste Quantities 41

5.6 Recycling 42
5.6.1 Summary of Commercial Waste Stream Studied 45

6. DEVELOPMENT OF IWMP 46

6.1 Methodology on the IWMP Development 46

6.2 Gaps and Needs Assessment 46

6.3 Local Authorities Obligations 52
6.3.1 Town Council Obligation: 52
6.3.2 Operational issues 53
6.3.3 Regulations issues 53
6.3.4 Waste Management Planning: 53

6.4 Town Council Goals and Targets 56

7. IWMP IMPLEMENTATION STRATEGIES 65

7.1 Policy/Legislative Relevant Framework 65

7.2 Roles and responsibilities 66
7.2.1 Board of councilors 66
7.2.2 Municipal Manager/ Town Clerk 66
7.2.3 Environmental Public Health Department 66
7.2.4 Waste Management Officer 66
7.2.5 Engineering Department 67
7.2.6 Line Department Managers 67
7.2.7 Stakeholder Responsibilities 67

7.3 Awareness Campaign and Public Participation 68

7.3 Public Information 69

7.4 Public and Stakeholder Participation 69

7.5 Implementation Program 70
7.5.1 Implementation Parameters and Policies 70

7.6 Implementation Requirements 73
7.6.1 Recurring budget costs 74

7.6.2 Capital expenditure for IWMP 74

7.7 Financial Resources: *84*

7.7.1 Local Sources Financing 85

7.7.2 International Financing Sources 85

8. MONITORING AND REVIEW 86

8.1 Introduction *86*

8.2 Monitoring *86*

8.2.1 Monitoring process 86

8.3 Evaluation and Review of IWMP *89*

9. RECOMMENDATIONS AND CONCLUSION 90

9.1 Financing Mechanism *90*

9.2 Bylaws and Enforcement *90*

9.3 Landfill Site Requirements *90*

9.4 Receptacles and Waste collection *91*

9.5 Clinical Waste Management *92*

9.6 Community awareness, capacity building and public participation *92*

9.7 Illegal dumping *93*

REFERENCES 94

DECLARATION

The Consultant submits this study report (Intergrated Waste Management Plan) for Piggs Peak Town Council (PPKTC) as the project proponent. The opinions expressed in this report have been based on information supplied to Swazi Hazmat Consulting by PPKTC. The findings presented in this report apply to the site conditions and features as they existed at the time of audit inspections and the historical information of the site.

We certify to the best of our knowledge that the information contained in this report is truthful representation as presented by the client.

Criteria:

This report is prepared on the basis of research, literature and field (visual) surveys. The Environmental (field) assessment was conducted on various days in November and December 2015 to compile data information.

EXECUTIVE SUMMARY

The IWMP is the working guideline that PPKTC will follow in the next short-term planning period to achieved sustainable intergration program of waste management function and a long-term waste management planning plan promoting waste reduction, recycling etc. The IWMP for PPKTC represents a long-term plan (2015 up to 2025) for addressing key waste management issues, needs and problems experienced with waste management in PPKTC.

The Integrated Waste Management Planning process consists of two phases, the first being an assessment of the status quo and a needs analysis, and the second consisting of future planning and the finalisation of a Comprehensive Plan. The Status Quo for Phase 1 consists of an assessment of the current status of waste collection systems and facilities, service delivery capacity and a needs analysis for each of these aspects. The Status Quo and Needs Analysis in conjunction with the projection for the project area forms the platform for all planning activities and are included in the first sections of this document. The Goals, Objectives and Targets are then identified, and based on the options selected for implementation. The implementation programme is developed and cost estimates compiled to facilitate inclusion of the plan into the IDP.

The intent of Integrated Waste Management as adopted by the international community is that of a waste hierarchy which starts with waste prevention and minimization, followed by recycling/re-use, treatment and finally, disposal as the last resort. It must be noted that hazardous waste such as; fluorescent tubes, asbestos, vehicles used oil, laboratory chemicals etc. are not discussed or addressed in this report.

LIST OF ABREVIATIONS &ACRONYMS

DWA	Department of Water Affairs
EA	Environmental Assessment or Environmental Audit
EAARR	Environmental Audit Assessment and Review Regulation, 2000
ECC	Environmental Control Consultant
EMA	Environmental Management Act, 2002
EMP	Environmental Management Plan
EPH	Environmental Public Health
ISD	Infrastructure and Service Department
IDP	Intergrated Development Plan
IWM	Intergrated Waste Management
IWMP	Intergrated Waste Management Plan
MOE	Ministry of Education
MOET	Ministry of Environmental Affairs and Tourism
MOHE	Ministry of Health
MOU	Memorandum of understanding
MHUD	Ministry of Housing and Urban Development
NSWMS	National Solid Waste Management Strategy
PPK	Piggs Peak
PPKTC	Piggs Peak Town Council
RSP	Royal Swaziland Police
SEA	Swaziland Environment Authority
SMART	Specific Measurable Achievable Realistic Time-bound
PPE	Personal Protective Equipment
WIC	Waste Information Centre
WIS	Waste Information System

IWMP SUMMARY INFORMATION

The useful information on this IWMP is presented in the tables below and the subsequent outline thereafter.

Table 1: Baseline Audit Information	
SEA File Reference number	N/A
Date SEA notified Proponent of Audit	N/A
Date of submission of Audit	January 2016
Reason of Audit study	Development of an IWMP
Current Land Use Zoning	Urban
Inkhundla	Piggs Peak Inkhundla
Site Name	Piggs Peak Town Council
GIS coordinates of site	25°57'48.41"S and 31° 14'50.40" E elevation 3304 ft
Site Area	N/A

1. INTRODUCTION

1.1 Background and Appointment

The Piggs Peak Town Council (here-in after referred to as PPKTC) is a small service town centre located in the North-Western part of Swaziland, situated approximately 70 kilometres North of Mbabane (the Capital City of Swaziland) and 40 kilometres South of the Matsamo Border Post. The Town's economy is sustained by the commercial sector as well as the tourism sector. Although Pigg´s Peak herself does not have a strong Tourism Industry, but many of her residents are employed within Tourism Activities taking place within the hinterland of the town.

PPKTC has an overall population of 5400 and comprises of 6 wards representing a range of settlements; from urban to municipal service centres, forest landscapes, industrial, semi-rural (traditional) residential settlements.

Swazi Hazmat Services (Pty) Ltd (here-in after called the Consultant) was appointed by the PPKTC to assist in the preparation of their Integrated Waste Management Plan (IWMP). The compilation of this IWMP was done pursuant to a directive by SEA to all town councils and municipalities including PPKTC to develop IWMP document.

1.2 Scope of Work

The Integrated Waste Management Planning process consists of two phases; the first being an assessment of the status quo and a needs analysis, and the second consisting of future planning and the finalisation of an Intergrated Plan.

- The Status Quo for Phase 1 consists of an assessment of the current status of waste collection systems and facilities, service delivery capacity and a needs analysis for each of these aspects.
- The Status Quo and Needs Analysis in conjunction with the projection for the area forms the platform for all planning activities and are included in the first sections of this document. The goals, objectives and targets are then identified and based on the options selected for implementation. An implementation programme is developed and cost estimates compiled to facilitate inclusion of the plan into the IDP.

The IWMP addresses the following:

- Development of Goals and Objectives.
- The Town Council Geographic Baseline Information
- The Town Council Current Status Quo
- A Waste Generation Model.
- A Waste Information System that includes collection needs
- Relevant Legislations.

- A Gaps and Needs Analysis.
- Identifying Recycle and Re-use Initiatives.
- Analysis on Applicable Legislation and Compliance Level
- Analysis on Landfill Sites.
- Analysis on Capacity Building.
- Programme Implementation of IWMP.

In addition to the above, certain key priorities have been identified for this IWMP. These priorities are:

- Outline of the impacts of waste on the environment.
- Plan for future waste management needs and requirements.
- Integrated and holistic approach to waste management ensuring that each stage of the waste hierarchy is addressed.
- Align of the IWMP with the institutional and financial capacity.
- Minimise waste management costs by optimising the efficiency of the waste management system in terms of usage of infrastructure, labour and equipment.
- Minimise adverse social and environmental impacts related to waste management.
- Sustainable protection of the environment and public health.
- Provision of adequate waste collection services for all.
- Transparency in conflict resolution.
- Achievement of a municipal Waste Information System.
- An integrated approach to waste management regulations or by-laws within the town.
- Development of a holistic and integrated environmental planning capability that takes into account cross-cutting implications.
- Effective monitoring and enforcement of waste management measures and regulations;
- Adherence to the polluter pays principle.
- Achievement of full cost accounting for waste services.

1.3 Aims and goals

The main goal of the IWMP is to optimize waste management by maximizing efficiency, and minimizing associated health and environmental impacts and financial costs; thereby improving quality of life of all Swazi citizens and the globe as a whole.The intention is to incorporate a fully integrated waste management approach based on the waste management hierarchy as presented below. The hierarchy consists of options for waste management during the lifecycle of waste, arranged in descending order of priority.

All stakeholders within PPKTC must apply the waste hierarchy in making decisions on how to manage waste. Waste avoidance and reduction is the first priority in using the waste hierarchy approach, followed by minimization and reduction of waste. Recovery, Re-using and recycling of waste involve reclaiming particular components or materials, or using the waste as energy. Treatment, remediation and disposal of waste are the least preferred resort.

The Waste Hierarchy

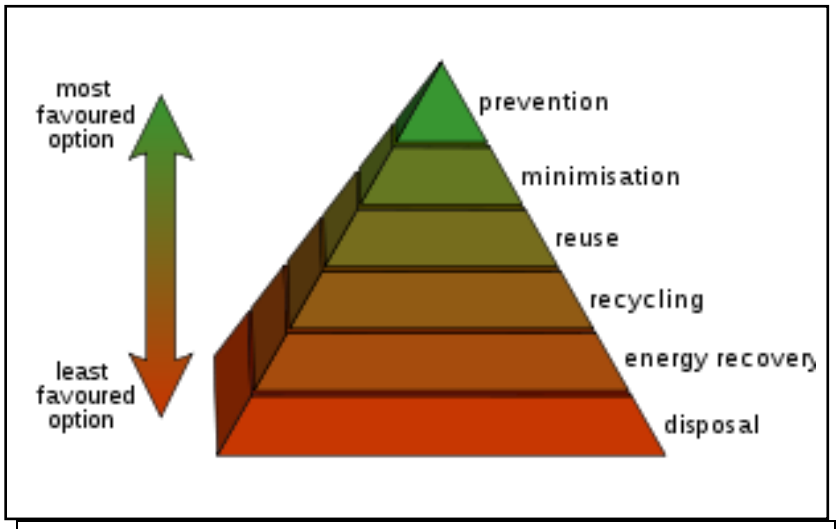


Figure 1 showing the waste hierarchy

However, PPKTC's primary focus for this IWMP is the achievement of programs, activities and services that will go hand-in with the waste hierarchy (collection and disposal of waste). Also there is also a set of broader social and economic objectives which the strategy aims to achieve.In addition, the other main objectives for this IWMP are to:

- Improve waste management systems and facilities within the town council.
- Access the current waste management system and highlight positive, as well as deficiencies in respect to waste management within the PPKTC.

- Institute a process of waste management aimed at pollution prevention and minimization of waste generation from source.
- Manage the impact of pollution by waste on the receiving environment.
- Manage waste in a holistic and integrated manner.
- Ensure sustainability of all services, programs/schemes and facilities which are aimed at improving waste management in the town.

1.4 Background of the IWMP

In terms of the National Solid Waste Management Strategy for Swaziland (NSWMS, *volume 1 and volume 2*) and the Waste Regulations Act of 2000, town councils and municipalities are required to develop Intergrated Waste Management Plans (IWMP) and to submit such plans to the regulating authority (SEA) for review and approval.

The primary objective of the IWMP development for PPKTC is to integrate waste management methods and improve efficiency in the current waste collection services thus reducing environmental impacts across all sectors of the town including but not limited to;

- Town CBD
- Town Landfill Facility
- Townships
- Town Industrial Area

1.4.1 Impacts of waste on the environment

Generally, poor waste management in most town councils or municipalities in developing countries like Swaziland has resulted into many environmental, health and safety, and socio-economic problems. The uncontrolled and un-scientific dumping of municipal/town councils' solid wastes coupled with the poor sanitation status have brought about serious pollution problems; from which contamination of both surface and ground water which is in turn a threat to human health emanates. The analysis results obtained from this study revealed that;

- Indiscriminate waste disposal can negatively affect ecosystems and could change biomes if species are eradicated.
- Streams situated close to a waste disposal site can be contaminated by leachate generated by the landfill.
- Ground water can also be contaminated if leachate percolates through the ground into aquifers.

- Emissions from landfills and illegal burning of waste releases pollutants into the air; some of these pollutants are volatile organic carbons (such as dioxins and furans which could be harmful to health) and greenhouse gases (which have adverse effects to the environment).
- Land may be sterilised due to large volumes of waste disposed of on land.
- Hazardous waste poses a health and safety risks to life.
- Pathogens and viruses found in waste can pose a health risk.
- The disposal of waste both formally and informally changes the natural topography of land.
- Litter and illegal dumping is aesthetically unpleasant and releases odours and leads to urban decay.
- Waste placed in low lying areas could block or impede the flow of water which could result in flooding.

1.4.2 Economic Effect of Waste in Towns

Everyone wants to live and visit locations that are clean, fresh and healthy. A town with poor sanitation, smelly surroundings with waste matter all over the place does not attract people, investors and tourists and as a result such towns have poor living standards. Towns that do not invest in recycling and proper waste control miss out on revenue from recycling. They also miss out on job opportunities that come from recycling/composting businesses that could work with them.

2. GEOGRAPHIC AREA

The geographic area of PPKTC, is defined in the map below attached below map. The town area is subdivided into 6 wards, namely; Ward 1, Ward 2, Ward 3, Ward 4, Ward 5, and Ward 6 to which this IWMP is applicable.

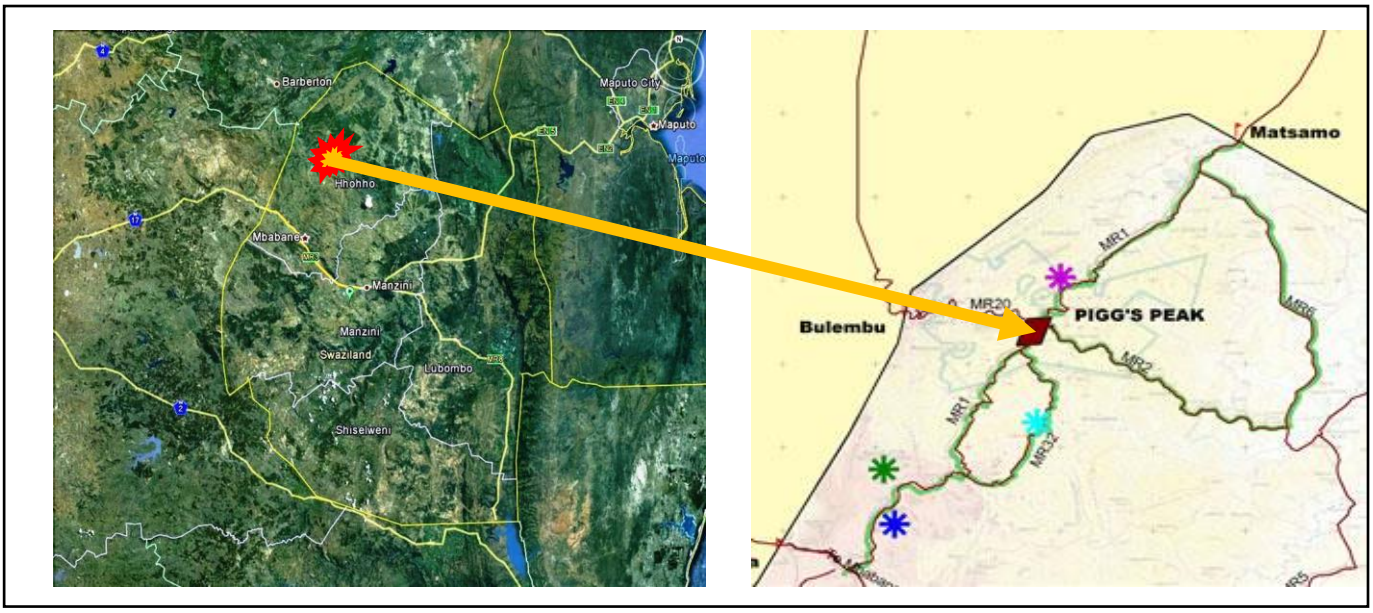


Figure 2 showing the map of Swaziland (left) and the project site (PPKTC)zoomed (right)

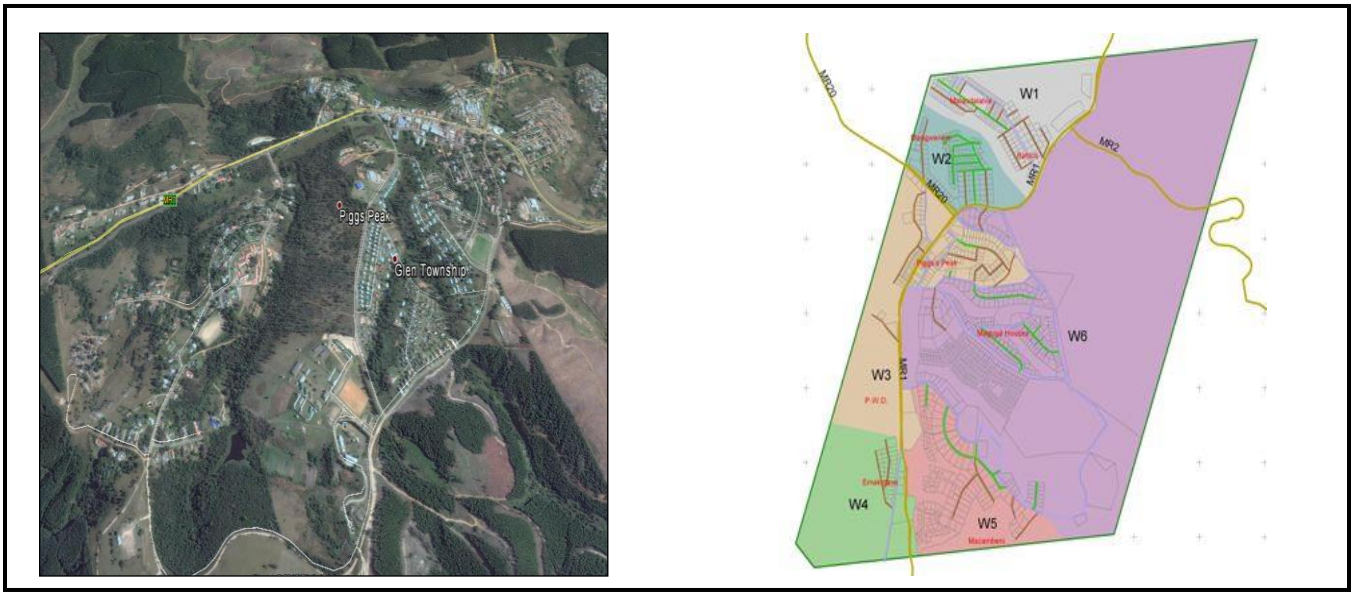


Figure 3 showing the aerial view of the project site (left) and the subdivided residential wards

To the South, West, North and East of the town, it is completely surrounded by commercial forests belonging to Swaziland Plantation and Peak Timbers Limited.

3. IWM KEY PLANNING RESPONSIBILITIES

The Environmental Management Act (*EMA, 2002*), Waste Regulations *(2000*) and the National Waste Management Strategy (NWMS, *volume* 1 *and volume 2*) allocates the following responsibilities for IWMPs:

- The Swaziland Environment Authority (SEA) must draft and promulgate regulations and guideline documents for integrated waste management planning for all waste types.
- Local Authorities must develop and submit plans for integrated waste management to the SEA for approval. The approved IWMP must be included in the municipal/ town council Integrated Development Plan (IDP).
- Waste management plans for industrial waste that is disposed of at private and/or dedicated disposal facilities, must be prepared by the *developers/owners* and submitted to the SEA for review and approval.

3.1 Overview of relevant Policies and Legislation

The Waste Regulations Act, 2000, EMA, *2002* and the NSWMS obliges all municipalities or town councils including PPKTC to develop an IWM system. In order to achieve the policy objectives, the municipalities/ town councils are required to develop and implement a local waste management plan which articulates strategies and initiatives for IWM. The IWMP has to translate policy objectives into practice and address the deficiencies and gaps in the municipal/ town council waste management systems. Shown below is a brief overview of some of the policies and legislation related to municipal/ town council IWMP.

3.1.1 Swaziland Constitution (2005)

The Swaziland Constitution is the supreme law of the land. All law, including environmental waste management planning must comply with the Constitution. The Constitution states that the people of Swaziland have the right to an environment that is not detrimental to human health, and imposes a duty on the state to promulgate legislation and to implement policies to ensure that this right is upheld. All organs of state or administration in the national, provincial or local levels of government have similar obligations. The principles of co-governance are also set out in the Constitution and the roles and responsibilities of the three levels of government are defined.

According to the Constitution, responsibility for waste management functions is to be devolved to the lowest possible level of government. Local authorities, including the PPKTC therefore, is assigned the responsibility for refuse removal, landfill sites and solid waste treatment and disposal. National government (MHUD) has the exclusive responsibility to ensure that local authorities carry out these functions effectively.

3.1.2 Environmental Management Act (No. 5 of 2002)

The aim of the Act is to: reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development to provide for institutional arrangements and planning matters; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management measures; to provide for the licensing and control of waste management activities; to provide for the remediation of contaminated land; to provide for the national waste information system; to provide for compliance and enforcement; and to provide for matters connected therewith.

It further states that:

- everyone has the constitutional right to have an environment that is not harmful to his or her health and to have the environment protected for the benefit of present and future generations through reasonable legislative and other measures that:

a. prevent pollution and ecological degradation;
b. promote conservation: and
c. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development;

- Waste management practices in some areas of the town are not conducive to a healthy environment and the impact of improper waste management practices are often borne disproportionately by the poor
- Poor waste management practices can have an adverse impact both locally and globally.

3.1.3 Waste Regulations Act, 2000

Functions of local authorities

1. Each local authority shall, within the local authority's jurisdiction-
   - Collect, or arrange for the collection of, all household waste at least once a week and ensure that it is disposed of at an approved facility;
   - Ensure that all waste is collected , transported and disposed of in accordance with these regulations;
   - Take all practical measures to promote and support the recovery of waste, particularly at the point at which it is produced;
   - Provide litter receptacles in public areas in accordance with regulation 29; and
   - Prepare management plans in accordance with regulation 31.

2. Each local authority shall report annually to the authority on the quantity of household, commercial, industrial, hazardous and clinical waste generated and disposed of within its area of jurisdiction and on the implementation of its waste management plan (Section 8).

Collection and disposal of household waste

1. Every local authority shall ensure that skips or common receptacles are placed along access routes to and from any premises within its area or jurisdiction that are inaccessible to waste collection vehicles, for the collection of household waste.

3.1.4 National Solid Waste Management Strategy, *Volume 1 and Volume 2*

The overall objective of this strategy is to reduce the generation of waste and the environmental impact of all forms of waste and thereby ensure that the socio-economic development of Swaziland, the health of the people and the quality of its environmental resources are no longer adversely affected by uncontrolled and uncoordinated waste management. The internationally accepted waste hierarchical approach of waste prevention/minimisation, recycle/reuse, treatment and finally disposal was adopted.

The strategy outlines the functions and responsibilities of all relevant government Agencies and where possible, firm plans and targets are specified. During the development of the strategy a number of priority strategic initiatives were identified which were categorised into short-term, medium-term and long-term. Action plans have been developed for the short-term initiatives for;

- ***Integrated waste management planning***: Local government will be responsible for the compilation of general waste management plans for submission to SEA.
- ***Waste Information System*****:** Local government will be responsible for data collection.
- ***Waste Minimisation*****:** Local government will implement and enforce appropriate national waste minimisation initiatives and promote the development of voluntary partnerships with industry.
- **Recycling;** Local governments are to establish recycling centres and/or facilitate community initiatives.
- ***Waste collection and transportation***: Local authorities are to improve service delivery and to take responsibility for the establishment and management of landfill sites.

3.1.5 National Water Act no. 7of 2003, as amended

The National Water Act contains a number of provisions that impact on waste management, including the disposal of waste in a manner which detrimentally impacts on a water resource, and the discharge of waste into a water resource. The Act allows the Minister responsible to make regulations for:

- Prescribing waste standards, which specify the quantity, quality and temperature of waste that may be discharged or deposited into or allowed to enter a water resource

- Prescribe the outcome or effect, which must be achieved through management practices for the treatment of waste before it is discharged or deposited into or allowed to enter a water resource.
- Requiring that waste discharged or deposited into or allowed to enter a water resource be monitored and analysed according to prescribed mechanisms.

3.1.6 The Public Health Act No. 5 Of 1969

The Health Act of 1969 provides measures for the promotion of health, for the rendering of health services and defines duties of certain authorities which render health services in the country. The Act sets out the duties and powers of local authorities. It provides that every local government is obliged to take measures to maintain its district in a clean and hygienic condition and to prevent the occurrence of any nuisance, unhygienic or offensive condition or any other condition, which could be of danger to the health of any person.

3.1.7 SEA Minimum Requirements for Landfill

The Minimum Requirements provide applicable waste management standards and/or specifications that must be met, as well as providing a point of departure against which environmentally acceptable waste disposal practices can be assessed. The objectives of setting Minimum Requirements are to:

- ✓ Prevent water pollution and to ensure sustained fitness for use of Swaziland's water resources.
- ✓ Attain and maintain minimum waste management standards in order to protect human health and the environment from the possible harmful effects caused by the handling, treatment, storage and disposal of waste.
- ✓ Effectively administer and provide a systematic and nationally uniform approach to the waste disposal process.
- ✓ Endeavour to make Swaziland waste management practices regionally and internationally acceptable.
- ✓ Before a waste disposal site licence is issued, adherence to the Minimum Requirements conditions will be required from the licence applicant. The Minimum Requirements promote the hierarchical approach to waste management, as well as a holistic approach to the environment.

4. STATUS QUO

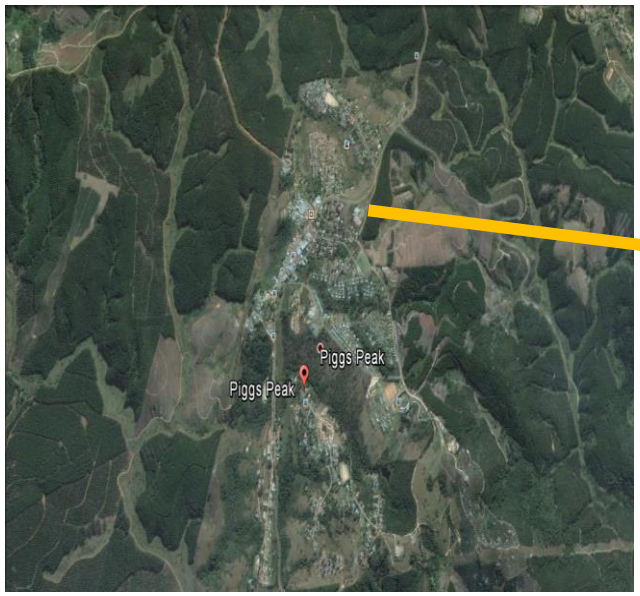
4.1 Town Council Description & Background

Piggs Peak Town Council (PPKTC) is a small service town centre located in the north-western parts of Swaziland, situated approximately 70 kilometres north of Mbabane, the Capital City of Swaziland and 40 kilometres south of the Matsamo Border Post. The town's economy is sustained by a Commercial Sector as well as the Tourism Sector, although Pigg´s Peak itself does not have a strong Tourism Industry, many of its residents are employed within Tourism Activities taking place within the hinterland of the town.

PPKTC has a population of 5400 which comprised 43% of the total workforce and comprises 6 wards representing a range of settlements; from urban to municipal service centres, agricultural landscapes, industrial, semi-rural and rural (traditional) residential settlements.

Population of Piggs Peak	
Town Daily Population	***Town Dwellings***
Daily visitors estimated at – 1000 people	Formal settlement - 879 households
Resident working in town – 2322 people	Informal settlement- 371 households
	Combined residential population - 5400

Table 2 showing the population of the project site



Google Map – Piggs Peak area

Zooming into Project sit (locality google map)

Figure 4 above shows the aerial picture (locality map) of Piggs Peak Town Council

New town and residential developments planned within the town council area include:

- Mixed development consisting commercial and residential areas.

These new developments will all result in an increase in general, as well as commercial and to some degree industrial waste generation.

4.2 Governance and Administration of Town Council

The following figure shows the organisational management of the town and level of responsibility structure (Company organogram). Table briefly outlines the responsibilities of each division and/or responsible person in ensuring the correct implementation of the IWMP.

Figure 5 showing PPKTC management and responsibility hierarchy structure

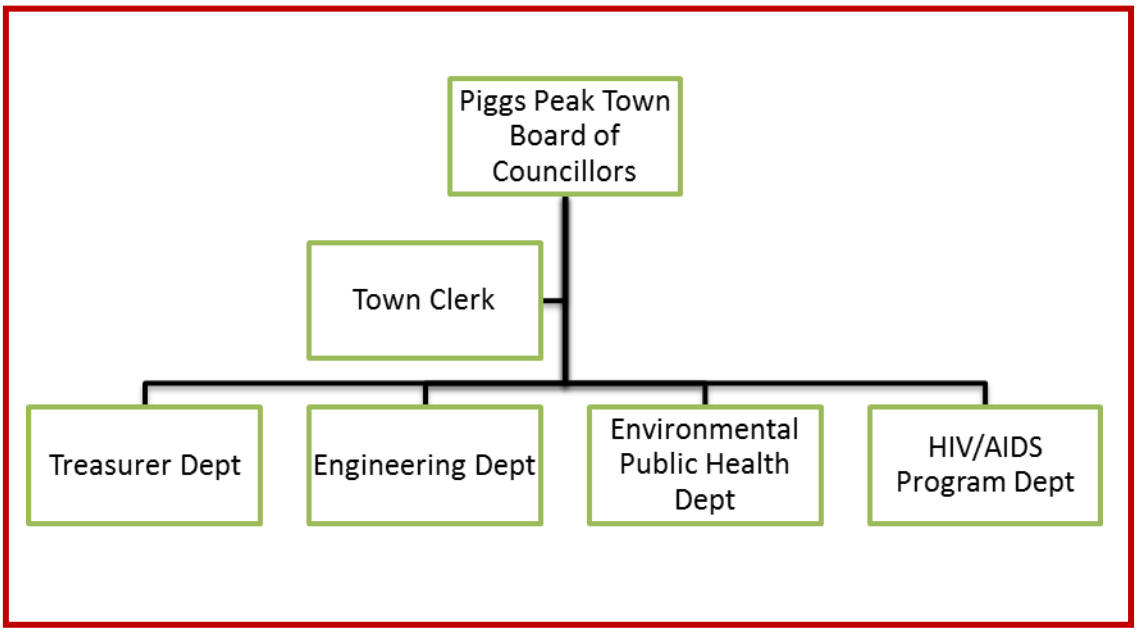


Table 3 showing the Project Management and Responsibilities

ENTITY/JOB TITLE	RESPONSIBILITIES
Pigs Peak Town-Board of Councilors	The town council board of councillors have an overall responsibility for council operation, approves and makes all the necessary policies to ensure good governance and provide efficient and effective services using public participation and to be a fully-fledged town council providing citizens and clients with quality services that promotes economic development of the town.

Town Clerk	Responsible for the day to day running of the council. Ensuring that the functions undertaken within the council are performed to a consistently high standard and in a professional and efficient manner. Responsible for the environmental performance, health and public safety relating to all wards falling within council boundaries and all council employees, in line with the council policy.
Treasury Department	Responsible for the commitment of financial resources- The cost associated with implementation of capital and operational projects. Department ensure that all on-going or planned projects are included in the recurrent operation costs. The department is also responsible for the rate billing, collection of all Council revenue, management accounting books and records, and expenditure as approved by the budget.
Engineering Department	Responsible for repair, service and maintain Council vehicles, tools, equipment, buildings and maintenance of the landfill site. Implementation and Management of Council's capital projects from the various departments. Department also responsible for street furniture, recreational facilities, parks, open spaces etc.
Environmental & Public Health Department	Has the responsibility to oversee that all environmental and public health related permits and licenses conditions of issuance are adhered to on a daily basis; Ensure environmental regulatory compliance for local requirements. Track all environmental laws and acts applicable to the council operations, advises and directs PPKTC staff and subcontractors on environmental/ public health regulations and compliance issues. Plans waste collection services for the town and sound maintenance of the landfill, waste receptacles, cemetery and pound.
HIV/AIDS Program Department	Responsible for encouraging council employees, PPKTC community to go for voluntary counselling on HIV, STI's and also ensuring that employees and the local authority community have access to primary health care (in-house or nearby clinic). Develop HIV/AIDS awareness program and make available prevention devices to restrict STI transmission such as condoms etc.

4.3 Current Status Quo

4.3.1 Waste Streams

Hazardous and medical waste collection

The disposal of industrial hazardous and chemical waste is in general handled by private companies in their areas of responsibility. The PPKTC is not involved in the collection, transportation of hazardous waste. Although medical waste produced from Government facilities is collected and incinerated at the Piggs Peak Hospital, it is unclear what happens to the health waste produced by the private medical facilities, located within town boundaries. PPKTC does not appear to have a strategy in place for the safe disposal of any hazardous domestic waste and it is assumed that these waste products find their way to the landfill. It is absolutely imperative that the town council puts proper, effective systems in place to ensure that accurate reports and monitoring of hazardous and medical waste is always available, the town council must as a matter of urgency raise awareness of the waste disposal requirements for this sector.

Moreover, the private institutions include clinics and pharmacies. Findings of this report project show that the identified sources of medical waste produce the following waste;

Table 4 showing the types of medical waste produced by private sector in PPKTC

WASTE STREAM PRODUCERS	TYPE	DISPOSAL
Clinics and Pharmacies	Pharmaceuticals	• Stored at the storeroom • Return to the supplier burn
	Sharps	• Store in receptacles (sharps container) in the storeroom • Taken to Mbabane government hospital • Wrap in plastic bag , labelled dangerous waste and disposed at the PPKTC receptacles • Disposed at a pit latrine at home
	Infectious waste	• Taken to Mbabane government hospital for incineration • Burning at the backyard pit
Home based care waste	Pharmaceuticals, sharps, and infectious waste	• Patients do not have storage facilities and appropriate disposal method for such waste. • Currently waste is burned at the backyard pit or disposed in the town's waste

		receptacles • Dogs overturn waste bins and help themselves on the contents including human excreta in diapers

NB: The findings show that these producers of waste store their waste appropriately but there is a gap on the final disposal of the waste. For example sharps are stored in 5L, 10L, 20L or 25L sharps' receptacles and boxes, and infectious waste is burnt at the backyard in a pit. *See figure 5 below:*

Figure 5: showing medical waste management practices by private sector in PPKTC

Backyard pit where burning of medical waste occurs

storage equipment for sharps and other pharmaceuticals

General waste

This report will mainly deal with general waste from domestic, industrial/ commercial. The waste as described below is divided into the following waste types as per the audit findings in PPKTC.

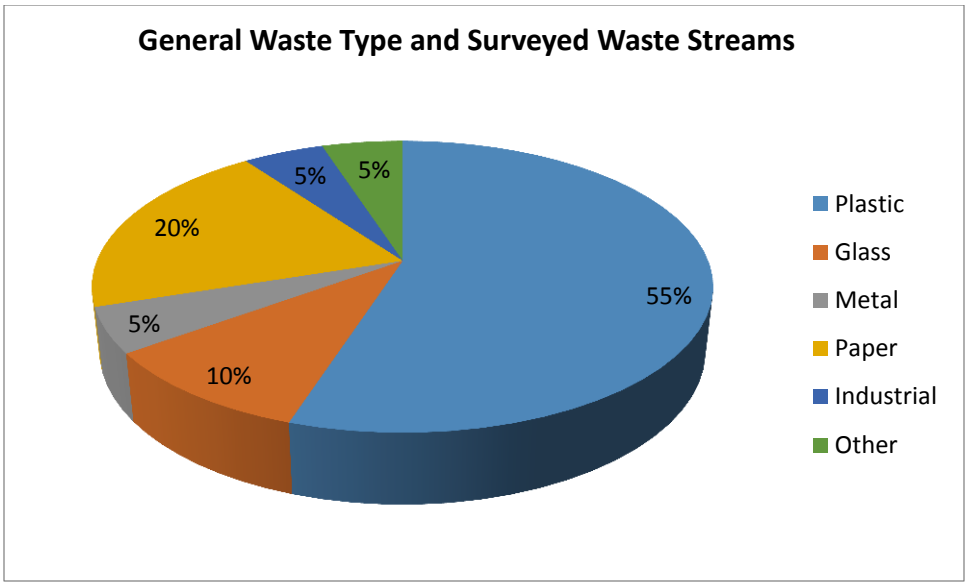


Figure 6 above showing waste types and the predicted percentage of each waste stream

The PPKTC has also increased its area of jurisdiction in recent years, taking on additional settlements and collecting waste from previously un-serviced areas, which has resulted in additional streams of waste that require transportation and disposal. Based on the current trending it can be estimated that waste generated within the PPKTC will increase year on year by at least 10%.

4.4 Municipal Services

4.4.1 Waste Collection

Urban areas (this includes residential suburbs, as well as all the formal townships surrounding the PPKTC CBD) receive weekly waste removal. Currently the town council owns one refuse truck, one refuse tractor complete with refuse skips for the collection of waste around the town. The following table shows the current Municipal collection schedule;

Waste collection sites	Service intervals
Formal settlement/ townships (domestic)	2 x weekdays
Town CBD- business sector	3 x weekdays
Institutional centres, i.e. Mhlatane, government hospital etc.	1 x weekdays

Carcasses removal (dead animals)	As and when required

Table 5 showing town council waste collection services

Street cleaning (litter picking, sweeping, and cleaning of ablution facilities) is done from Mondays to Fridays within the CBD area. Illegal dumping of waste within the PPKTC CBD does not seem to be a major concern; this could be due to the fact that there no not being any gate fee/ charge for disposal at the landfill site. This may, however, change once the weighbridge is operational and the public charged for waste disposal. The town council collects domestic refuse from service points twice per week and once per week for those issued with waste skips bins. Refuse from business premises and industrial areas are removed at least three per week, but service points handling food are provided with a collection service three times per week. Institutions in the town (such as schools, government service centres) are provided with an appropriate waste skips which are cleared once weekly. Town council skips are provided in and around town wards (townships) for general refuse disposal. Skips are also used for central collection of domestic waste in areas that do not receive door to door waste collection service. There are reportedly 13 skips in and around PPKTC, but irrespective of the intended use for the skips, domestic waste is disposed of in and around the skips. Informal reclaimers and poverty stricken indigents rummage through the skips in search of food scraps and other items.

Waste skips are also provided at points of high litter generation (such as taxi ranks, bus stops and communal areas) and are cleared three times weekly. The CBD streets areas within the town council are litter-picked on a weekly basis by council employees.

Garden waste and Builder's rubble is taken to the old dumpsite. Garden refuse is not being utilized at this point, with all garden refuse being landfilled. The town council must review a business plan for converting all garden refuse into compost. Builder's rubble is utilized as cover material and/or ground reinforcement, especially during the rainy season.
The table below shows a few institutions and wards and their current waste management practises.

Institution/Ward	**Waste stream**	**Storage**	**Disposal**	**Comments/ complaints**
Peak Nazarene Primary	• Plastics+Paper • Garden Waste • Ash (from the	• Waste bins and skip • Garden • Heaped on	• Town Council Landfill • Garden composting • Garden	• Collection is delayed sometimes until skip is overfilled. • Closed skip is

	kitchen) • Food scraps	the yard • Buckets	composting • Food scraps given to farmers for animal feed	required because on windy days the accumulated waste is blown out around the site.
Mhlatane High School	• Plastics + Paper • Garden Waste • Builders rubble • Food scraps	• Waste bins and skip • Garden • Waste storage area • Buckets	• Town Council Landfill • Garden • As instructed by the Town Council • Food scraps removed by farmers for animal feed	• Site need an aditional skip
Mangwaneni	• General waste and other domestic waste	• Skip	• Town Council Landfill	• Collection is done once a week • There is only one skip servicing the whole ward • Skip placed far from other residential areas (poor access)
Bahloli	• General waste	• Waste bins in each compound (temporal storage)	• Gate collection by PPKTC once a week for disposal ate the Town	n/a

			Council landfill	
Malandalahle	• General waste	• Skip	• Collection by PPKTC for disposal at the Town Council landfill	• Skip not closed • Skip not big enough for the whole community (it is often overfilled)

Table 6 showing waste generation in sampled schools and Wards of PPKTC

4.4.2 Town Council Structuring

Town waste collection and transportation falls under the Environmental Public Health Department, whilst the management of landfill sites and landfilling operations is administered between the Department of Engineering Services & Environmental Public Health Department.

A basic breakdown of the 2014/2015 financial year expenditure, as well as full time personnel employed, for the Environmental Public Health Department are discussed in Table below:

Environment Public Health Department	
Bill item	**Estimated costs**
Admin- Wages/ Salaries/ licence fees/ training/ awareness programs	E 180,000.00
Personnel- PPE	E 85,000.00
Heavy plant fuel	E 250,000.00
Transportation- service and maintenance	E 50,000.00
Waste collection hand tools- refuse bags and	E 50,000.00
Operations and maintenance including the Landfill	E 20,000.00
Waste receptacles furniture	E 20,000.00

Table 7 showing Financial Expenditure 2014/2015 and staff employment by the Department

This financial expenditure for the EPH Department show the commitment the town already have in hand in the waste collection from domestic, business/ commercial and light industrial.

4.5 Summary of Staff

The Environmental Public Health Department has employed permanent and temporary staff in order to fulfil their obligation function. The total number of staff members in the environmental Public Health department is 21 (see table below).

Staff position	No. Of staff
EPH Officer	1
Landfill supervisor	1
Refuse Pickers Leader	2
Landfill clerk	1
Equipment/ machinery operators	2
Refuse pickers	12
Security officer	2

Table 8 showing PPKTC's permanent and temporal staff

4.6 Status on illegal dumping

4.6.1 Dumping Hotspots within PPKTC

Illegal waste dumping areas were observed around the town boundaries, among the most common areas where dumping took pace were noted and recorded as shown in the table below:

Table 9 showing areas where illegal dumping is visible in PPKT

Areas observed (common areas where illegal dumping noted)	Monitoring photos	Monitoring photos

a. **Buycash paradise flats**
b. **Killarney gravel road ka-Khoza/ stadium**
c. **Glen township opposite civic centre & kaNdlovu**
d. **Mangwaneni-KanGcwane**
e. **Bahloli**
f. **Forest behind prison**
g. **Area behind Government Hospital**
h. **Old dumpsite**




Type of waste dumped

House hold	*Construction*	*Hazardous/ other*
General house hold rubbish	Building rubble	Asbestos sheeting
Larger domestic items such as furniture and white goods	Excavation waste	Fluorescent tubes

Who does the dumping

Householders who dump their unwanted items in nature strips in the hope someone will take them or that council will remove them.	Business/ contractors who transport and dump their waste such as demolition/ rubble wastes in other areas.	Commercial / businesses, who do not want to pay disposal fees to dispose of hazardous waste such as asbestos appropriately, but choose to dump it instead.

What Motivates Dumpers?

While there is some variation in what motivates dumpers, depending on the type of waste illegally dumped, there are some recurring themes;

- **Uncaring attitude**: was mentioned by many councils, particularly in relation to garden organic material and household waste. This attitude could change if people were to receive information about the impacts of illegal dumping on the environment and on government resources.
- **Unwillingness to pay:** study survey identified that the town council provide subsidised collection, disposal of household waste type. On further assessment, it may be due to lack of information about waste disposal options and perceived fees.
- **Convenience:** study indicated that residents and businesses may not be aware or do not know how to access the landfill site. Some business people commented that they lack information about other disposal options that are available.

Understanding Illegal Dumping Impact

Environmental Impact	Social Impact
• Can destroy local vegetation land and reduce biodiversity value. • Can degrade land including plant and animals habitats. • Run-off from dumpsites may contaminate water sources such as creeks and water supplies systems.	• Dumped items reduce aesthetic value and deter people from visiting areas where there is frequent illegal dumping. • Dumped sites attract pests and insects that pose health risk.

The rubbish dumps lying around in the above areas is an eyesore, which will turn visitors including tourist away. Illegal dumping occurs on roadsides, including nature strips and bushland, drains and private property, including vacant lots.

4.7 Landfilling Operations

PPKTC has two refuse disposal site the Glen Township landfill, situated to the south east of the town council by the access road to the Piggs Peak Correctional Facility and the Glen Township. The access road is maintained and but notice boards are inadequate in terms of license requirements. The Glen Township landfill site is planned to serve the municipality up until 2020. All collected domestic, commercial and industrial general refuse is disposed of at this site. The site is permitted by SEA for the disposal of non-hazardous waste only and is operated by the town council.

There is also an old dumpsite located on the west side of the town by the CTA workshop. The operation of the landfill is not to a standard that would satisfy the requirements of the regulator (SEA) and there is no evidence of a well-documented operational plan. The area is not fenced and there is no control gate and access is generally unrestricted. Unrestricted access at this site results in the disposal of garden waste, building rubble and hazardous waste which is a known problem.

The two disposal sites have been examined through observation, document review and consultation and the following assessments have been made:

4.7.1 Glen Township Landfill Facility

The Glen Township Landfill Facility has been examined through observation, document review and consultation and the following assessment have been made;

Table 10 showing Glen township landfill classification

Glen Township Landfill Classification

Site licence/ permit	**Operational methods**	**Type of waste handled**	**Fencing**	**Proximity to**	**Available air space**	**General observation**
Yes	Yes	General waste	Yes , but needs repairs	Correctional Department	15 years old, left with 5 years before decommissioning	Site air space available is less than 5 years. Recycling programs must be urgently initiated.
Operation analysis						
Access/ control points	**Weigh-bridge**	**Washbay**	**Cover material**	**Pollution/ littering**	**Leachate management**	**General observation**
1 x gate, with 24hr	No	Yes	Yes	Un-tidy, cleaning	Yes	Site poorly managed-

security				required		loose waste materials must be periodically cleaned.

Annual Waste Received- Glen Township Landfill

Waste type	Transported volume- council	Deposited volumes-private	Recycled volume	Land-filled volumes
Solid waste	795 882	N/A	557117.4	238 764.6
Condemned food waste	N/A	N/A	N/A	N/A
Mixed waste	N/A	N/A	N/A	N/A
Building rubble	N/A	N/A	N/A	N/A
Special waste	N/A	N/A	N/A	N/A
Garden waste	N/A	N/A	N/A	N/A
Pulp waste(timber)	N/A	N/A	N/A	N/A
Cover material	N/A	N/A	N/A	N/A

Note: *N/A – Not available (data/information)*

The operation of the landfill is not to a standard that would satisfy the requirements of the regulator and the absence of a weighbridge render records and data unreliable.

Figure 7 showing the aerial view and the entrance to Glen Township Landfill

Source: Google Map

Figure 8 showing improper management of waste in the landfill

Windblown litter is not picked on a regular basis hence is everywhere on and around the site. This presents a serious housekeeping non-compliance issue.

4.7.2 Old Dumpsite

The old dumpsite has been examined through observation, document review and consultation and the following assessment have been made;

Table 12 showing the old dumpsite classification

Old Dumpsite Classification						
Site licence/ permit	**Operational methods**	**Type of waste handled**	**Fencing**	**Proximity to**	**Available air space**	**General observation**
No	None	General and garden waste	None	CTA workshop	None, Council must close and rehabilitate site	
Operation analysis						
Access/ control points	**Weighbridge**	**Washbay**	**Cover material**	**Pollution/ littering**	**Leachate management**	**General observation**
None	None	None	None	Un-tidy, require a larger cleaning operation	None	

Table 13 showing the estimate of the annual waste received by the old dumpsite

Annual Waste Received- Old Dumpsite

Waste type	**Transported volume- council**	**Deposited volumes-private**	**Recycled volume**	**Land-filled volumes**
Solid waste	n/a	n/a	n/a	n/a

Condemned food waste	n/a	n/a	n/a	n/a
Mixed waste	n/a	n/a	n/a	n/a
Building rubble	n/a	n/a	n/a	n/a
Special waste	None	None	None	None
Garden waste	n/a	n/a	n/a	n/a
Pulp waste(timber)	n/a	n/a	n/a	n/a
Cover material	None	None	None	None

NB. *n/a: Not available(information on activity)/ None: refer to zero activity*

The old dumpsite at present is not a facility the town can be proud of. Litter is visible on and around the facility. The disposal site surface is defaced with windblown litter which has resulted in the site being turned into a state which can be described by nothing less than informal disposal facility reaching the classification of illegal dumping. The gradient of the sides of the waste body presents an unfriendly visual impact and no attempt has been made by the town council to suspend, close and rehabilitate the site.

Figure 9 showing the aerial view of the old dumpsite and waste accummulation in the site

The dumpsite does not conform to Waste Regulations requirements and SEA licencing requirements. Site must be closed and rehabilitated in accordance with laid down requirements. It is possible to rehabilitate the site and satisfy the requirements of the regulator. Once the site has closed according to SEA conditions, it must be allowed to return to the natural environment.

5. WASTE ANALYSIS

5.1 Waste generation

All human activities give rise to residual materials which are not immediately used where they arise. These residuals may be recycled, reclaimed, or re-used; else they constitute waste which will ultimately be released into the environment. The biosphere has the capacity to transform many wastes over time, either into harmless products or nutrients which can be used again. However, the natural assimilation capacity of the environment can be easily exceeded if wastes, particularly from human activity, are not properly controlled. With the development of new chemical components like plastics, tin cans, bottles, computer hardware, the environment appears to have little or no assimilative capacity. In these circumstances, pollution and loss of environmental quality will result in loss of biodiversity.

Proper planning, management and control of wastes are thus required. Ideally, waste management should be viewed as a unit, with integrated control directed at all three waste receiving spheres; namely water, land and air. The relationship between these three spheres must always be considered – a reduction in air pollution by removing particle matter before discharge will produce either a solid or sludge waste for disposal, and the reduction of water pollution also normally produces a waste sludge. Some attempts to treat solid waste may only shift the waste load into the atmosphere i.e. through poorly controlled incineration, therefore exchanging one pollutant for another.

In the absence of a weigh bridge at the Piggs Peak disposal sites, the amount of waste generated in Piggs Peak can be estimated using the lower end of the waste generation scale, which estimates that one person generates and average of 0.5kg of waste per day. If the middle and upper income group and the business and industrial sector are taken into account, this figure could go up to between 1 and 1.5 kg per person per day. Assuming a population of 5400 this translates into a range of between704, 632 to 795,882tonnes produced by the town council per annum. The town council's IWMP estimates Piggs Peak's percentage of waste generated rates according to human settlement patterns as shown in the Figure 9.

5.2 Demographics and Wastes Statistics

A waste analysis conducted on waste destined for the Piggs Peak landfill, completed in November and /December 2015 yielded the following results. From the table below it can be seen that 70% of the domestic waste generated is recyclable and therefore consists of items of economic value. Estimated current waste quantities and characteristics are summarized in the table below:

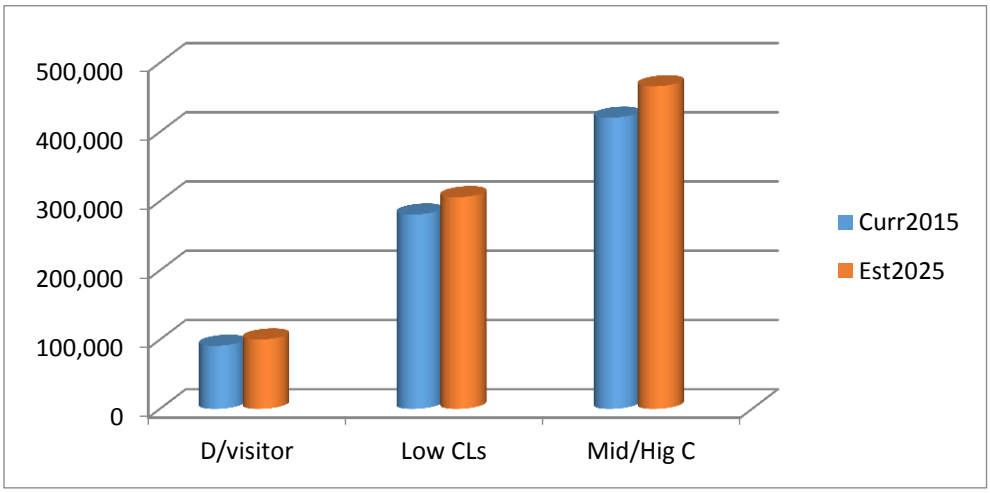
Table 14 showing the total population of PPKT

Population of Piggs Peak	
Town Daily Population	***Town Dwellings***
Daily visitors estimated at – 1000 people	Formal settlement - 879 households
Resident working in town – 2322 people	Informal settlement- 371 households
	Combined residential population - 5400

5.3 Waste Generation Trend and Future Estimates

The trend in the generation of waste produced by human activities differs from cities and towns.An estimated 704,632 to 795,882 Kilograms of waste (2015 estimated waste trend) is collected and deposited daily within the PPKTC landfill area. Based on the current trending it can be estimated that waste generated within the PPKTC will increase by at least 10% for the near future amounting to an estimated 775,095 to 875,415 (2025 estimated waste trend) due to increase in current population plus an increase in economic sectors that will result in the up-liftment of the lower class majority. The waste generation trend and future estimates are summarized in graph below:

Current Waste Generation and Estimated Future Trend Chart



Socio-economic groups

SIZE	*Daily visitors-2015*	*Low Class-2015*	*Mid/High Class-2015*	*Daily visitors-2025*	*Low Class-2025*	*Mid/High Class-2025*
Waste size	*91 259kg*	*280,867kg*	*420,765kg*	*100,384kg*	*305,954kg*	*466,141kg*
Escalation	*Current*	*Current*	*Current*	*10%*	*10%*	*10%*

Figure 10 showing the comparison between the current and future waste generation trend

Also, to note is the waste generated by visitors the town receives per day and per annum. Per capita value reveals that per day in a town a visitor generates atleast 0.25Kg. If PPKTC receives 1000 visitors daily as researched in this study, this means that per day PPKTC would collect 250Kg waste from visitors. And in a year the town will collect an estimated 91 259Kg of waste from her visitors only.
Estimated population for the town was used to calculate per capita waste generation and future trend, assuming that most waste generated (combined) is from areas occupied by middle-to-high class residents and some waste are produced by low class residents and only a small fraction comes from town daily visitors (or rural areas).

Data on actual waste generated was not readily available at the council, hence a global per capita amount of 0.5kg/capita/day is assumed for urban areas. *(This estimates is based on the USAID 2009 publication on "Environmental Guidelines for Small-scale Activities in Africa*").

5.4 Waste Characteristics

This report will mainly deal with general waste from domestic, industrial/ commercial. The waste as described below is divided into the following waste types for the PPKTC.

Table 15 showing the waste type and the predicted percentage of that waste stream

Waste type	Predicted % of waste stream
Plastic	55%
Glass	10%
Metal	5%
Paper	20%
Light industrial/ commercial	5%
Garden / building rubble/ Other	5%

The PPKTC has also increased its area of jurisdiction in recent years, taking on additional settlements and collecting waste from previously un-serviced areas, which has resulted in additional streams of waste that require transportation and disposal. Based on the current trending it can be estimated that waste generated within the PPKTC will increase yearly by at least 10%.

5.5 Estimated Waste Quantities

Table 16 showing Estimated Current Waste Quantities for PPKTC (tons per annum)

Waste quantities	Medical	Hazardous	Industrial	Business	Domestic	Total
Generated	√	-	√	√	√	887 141
Collected	√	-	√	√	√	887 141
Recycled	X	-	√	√	√	107 568
Incinerated	√	-	X	X	X	N/A
Treated/ landfilled	√	X	√	√	√	779 573
Total estimated waste disposed at Landfill annually						779 573

Note: Ticks (√) for applicable and the crosses (X) for non-applicable| N/A- not available (data)

Notes:

- These quantities are estimates, based on waste volumes, as waste disposed of by landfill is not currently weighed. PPKTC should install a weighbridge at the Landfill, which should provide more accurate data.
- A private contractor Pick It Up Waste Solutions manages all recyclable waste for PPKTC, which is transported recycle and for re-use. Quantities of recyclable waste –no reliable data information was found with the contractor, audit exercise found a lot of discrepancies in the total recycled waste volume such as improper calculations.
- Piggs Peak Government Hospital handles selected health waste from the various health centres located in the Hhohho, this waste is transported to the hospital incinerator and residual ashes are then disposed at the PPKTC landfill site. Quantities are not known due to lack of data.
- The town council currently has no reporting systems in place for recording the generation of hazardous wastes by industry or health care facilities. Therefore, there is no known information available on the types and volumes of hazardous and medical waste generated within town boundaries.

5.6 Recycling

The PPKTC is not involved in any formal recycling program. Currently there is a private recycling company, Pick It up Waste Solutions, based at the Glen township landfill and the company has got its own waste pickers. Below is a table summarising waste stream recycled from the landfill annually by Pick It Up Waste Solutions. It is noted that the figures presented below represent the current situation (e.g. Pick-it Up Solutions collects or targets only waste that is 100% recyclable).

Table 17 showing annual estimates of waste recycled by Pick It Up Waste Solutions

Waste stream	**Annual waste generated (kg)**
KraftPaper	90540
Cans	312
PET	1560
Plastics	8388
White paper	2340
Glass	3600
Tetra Pak	720
HD bottles	108
Total	**107568**

PET Bottle ***Kraft Paper***

Figure 11: showing waste that have been segregated for recycling

The lack of structured waste separation initiatives impacts on downstream waste management activities within the municipality as a result of:

- Unrecovered recyclables occupying valuable airspace at the landfill site;
- Negative environmental impacts due to pollution and inefficient use of natural resources; and
- The loss of potential empowerment opportunities and jobs which could be created by recycling project.

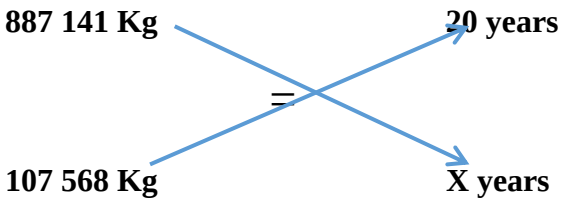
Recycling by Pick It up Waste Solutions has impacted positively on the airspace of the landfill. The calculations below are based on the population of PPKTC, the estimates of waste generated by residents of the town and visitors to the town, and the estimated lifespan of the landfill since it was put to operation.

Table 18 summarizing information essential to calculate the impact of recycling of the airspace of the landfill

PPKTC population	5 400
Life expectancy of the landfill since its operation	20 years
Waste generated by visitors per annum	91 259Kg
Waste generated by residents (average of 704 632 and 795 882)	795 882Kg
Waste streams recycled by Pick It Up Solutions per annum	107 568Kg

The calculations below estimate that the current recycling by the identified recycler has increased the airspace of the landfill by 2½years. Increased recycling activities and waste minimization which include adherence to the waste hierarchy could increase the airspace of the landfill.

91 259 Kg + 795 882Kg = **887 141Kg** (***total waste generated by both residents and visitors per annum)***



= 2½years

5.6.1 Summary of Commercial Waste Stream Studied

A survey was conducted on commercial waste found at the landfill and study revealed the following to be recyclable.

Table 19 showing the summary of commercial waste stream studied

Item	Recyclable Material
Plastics	➢ Soft drinks bottles ➢ Packaging bags
Paper	➢ Boxes ➢ White paper (documents, exercise books)
Glass	➢ Clear glass (beverages bottles) ➢ Green glass (beer bottles) ➢ Brown glass (beer bottles)
Tin	➢ Food cans ➢ Soft drinks
Corrugated material	➢ Papers (boxes)

It should be noted that no market price of the identified recyclable material was conducted. Further assessment on the market price of recyclable wastes shuold be undertaken

6. DEVELOPMENT OF IWMP

6.1 Methodology on the IWMP Development

The implementation plan is based on an action plan developed from the logical framework. The plan allocated resources required, responsibilities and time frames for implementation. The time frames focus on a 5 to 10 year implementation schedule with allowance made for longer term goals. A waste information system (WIS) that provides reliable information on amounts, types, generators and transporters of waste, as well as the private waste collection service provision, must be put in place.

6.2 Gaps and Needs Assessment

Table 20 below is a summary of the relevant acts versus compliance level

National legislation/ Act	
Relevant Act/ Regulations/ Policy	***Compliance level***
The Waste Regulations, 2000 Development of Integrated Waste Management Plan(IWMP) in Swaziland has been given a clear legal basis through the Environmental Management Act: Waste Regulations (2000), which states that the local authorities responsible for waste management must prepare IWMPs. The Act/ Regulations further requires a town council/ municipal to: - Submit its IWMP to the SEA for approval; and - Include the approved IWMP in its Integrated Development Plan (IDP) as contemplated in Urban Government Act (1969).	This is PPKTC first IWMP and previously there was no integrated systematic plan for its waste management function. The Town Council is currently using its own developed procedures although it is a legislative requirement that the local town council must develop and implement its own IWMP. The completion and acceptance of this IWMP will bring the town council into compliance with the Waste Act, but PPKTC will face challenges in extending efficient and sustainable access to waste services in terms of the Waste Act. Currently, not all residents receive waste services.
National Waste Management Strategy and Action Plans The draft National Waste Management Strategy, the overall objective of which is to reduce the generation of waste and the	Prior to the production of this IWMP, PPKTC did not have an IWMP to implement the objectives of the draft National Waste Management Strategy (NWMS). This IWMP and its integration into the town council's IDP will represent a first step in

environmental impact of all forms of waste, thereby ensuring sound socio-economic development, a healthy population and that the quality of our environmental resources are no longer adversely affected by uncontrolled and uncoordinated waste management. The internationally accepted waste hierarchy approach for waste avoidance/reduction, reuse/recycle, recovery, treatment and disposal is adopted in the strategy.	implementing the NWMS.
Environmental Management: Waste Act,(Act No.5 of 2002) The purpose of these standards is to redress past imbalances in the provision of waste collection services, it is imperative that acceptable, affordable and sustainable waste collection services be rendered to all Swazi Citizens.	PPKTC should use these standards when implementing their IWMP.
Town Planning act / IDP/ Strategic Plan This act and the town IDP/ SP provides guidance to ensure that poor (indigent) households have access to at least basic (essential) refuse removal services from the concerned town council. It provides the key legislative framework and financial mechanisms for providing basic refuse removal services in an efficient and sustainable manner.	PPKTC should use this policy as a guide when planning to achieve 100% basic refuse removal to its residents. The level of service to be provided to different settlement types can also be informed from this policy.
Selective Legal/ Legislation **The Public Health Act, no. 5 of 1969** "Every local authority shall take all lawful, necessary and reasonably practicable measures to maintain its boundaries at all times in a hygienic and clean condition." and	The landfill is not managed in compliance with the permit conditions and the health and safety of informal reclaimers is seriously at risk. By-laws are not enforced, litter and illegal dumping is prevalent and some hazardous wastes, including asbestos are dumped in open areas within council boundaries.

"Every local authority shall take all lawful, necessary and reasonably practicable measures to prevent the occurrence within its district of any nuisance, unhygienic condition, offensive condition or any other condition dangerous to the health of any person." and	The old dumpsite site particularly does not comply with minimum requirements and permit conditions and uncontrolled leachate means that toxic/contaminated water enters the watercourses. No known leachate management systems are in place at the old dumpsite, thus exacerbating the contamination of the water sources.
SEA Minimum Requirements for Landfill, The Minimum Requirements provide for applicable waste management standards or specifications that must be met, as well as providing a point of departure against which environmentally acceptable waste disposal practices can be assessed. The objectives of setting minimum requirements are to: - Prevent water pollution and to ensure sustained fitness for use of Piggs Peak's water resources. - Attain and maintain minimum waste management standards in order to protect human health and the environment form the possible harmful effects caused by the handling, treatment, storage and disposal of waste. - Effectively administer and provide a systematic and nationally uniform approach to the waste disposal process. - Endeavour to make Swaziland waste management practices internationally acceptable. - Before a waste disposal site permit is issued, adherence to the Minimum Requirement conditions will be required from the permit applicant. The Minimum Requirements promote the hierarchical approach to waste management, as well as a holistic approach to the environment.	PPKTC is breaching these requirements by not implementing the required management procedures for its landfill. The SEA Minimum Requirements are enforceable within the permitting process for landfills. The Environment Management Act. Under the Waste Act, the SEA Minimum Requirements are enforceable as part of the licensing process for landfills. Minimum requirement for landfill is presented on the recommendations sections on page 83.

The PPKTC Integrated Development Plan (IDP) The Integrated Development Plan provides the basis for the managed development of the town council and is used by the political, business and community leadership to determine activities and operational plans and guides the allocation of resources. The IDP identifies the following municipal developmental priorities: - electricity - water and sanitation - sports and recreation - housing	The IDP includes planning on waste management. In the IDP report, waste management is listed as a basic service and is recorded under the PPKTC Key Priority Areas. In terms of the Act, the town council's IWMP must be included in the IDP.

Table 21 below outlines the gaps and needs identified within the PPKTC in terms of waste management:

Key issues	*GAPS*	*Needs*
Integrated Waste Management Planning	• Lack of waste avoidance • Poor resource recovery • Poor waste disposal practices	• Implement separation at source • Start recycling programmes • Improve waste disposal practices
Waste Management	• Lack of WIS • Lack of IWMP	• Waste minimization • Recycling and re-use
Waste Collection Services	• Poor state of access at the main landfill during the rainy season	• Rubble waste used as a dry platform • Change the access road
Waste	• No separation at source	• Implement separation at

Minimisation and Recycling	• Segregated waste is mixed in one truck during collection • Disposal of garden waste in landfill sites • No composting facilities • Poor coordination of recycling activities	source to facilitate formation of more recycling centres • Designate a separate waste collection vehicle for recyclable waste • Identify a potential recycler who will collect segregated waste from the collection points • Encourage people to use biodegradable materials to build their own composts Establish composting facilities to make use of all of garden wastes and other biodegradable materials • Recycling infrastructure • Market for recyclables
Glen Township Landfill	**Poor design of landfill sites** • No waste screens resulting in waste debris scattered in and around the landfill sites • Lack of weighbridge • Landfill information plate • Landfill Gas Management	• Erect waste screens to prevent waste debris flying around • Installation of weighbridge, information plate, and landfill gas management facilities
Old Dumpsite	• Poor site capping • Poor ground water monitoring • Poor site monitoring	• Use correct and sufficient capping material • Ground water needs to be monitored to determine the extent of groundwater contamination • Site monitoring should be done on an ongoing basis

	• none rehabilitation of abandoned landfill sites • Unlicensed Landfill sites • Lack of fencing and poor access control • Scavenging by people • No waste screens resulting in waste debris scattered in and around the landfill sites • Co-disposal of waste like garden waste with domestic waste, construction and demolition waste	using pre-determined parameters • Closed landfill sites should be rehabilitated as per SEA Minimum Requirements • Unlicensed landfill should be closed down • Landfill site should be fenced to Control access. • Scavenging should be controlled. • Erect waste screens to prevent waste debris flying around • Different types of wastes should be separated and disposed of appropriately
Institutional/ Organizational	• Institutional and organisational capacity • Clearly defined roles and responsibilities	• To have an organizational structure in line with all waste management planning requirement • Implement appropriate mechanisms for monitoring and enforcing waste management
Education, Capacity Building and Awareness Needs	• Inadequate education and awareness on waste management issues • Lack of comprehensive understanding of waste management issues	• Educate communities and run awareness campaigns on waste management issues • Conduct refresher courses on staff involvement with waste management issues

6.3 Local Authorities Obligations

Role of Local authorities

1. Within its area of its jurisdiction each local authority shall-
    - Collect and dispose of, or arrange for the collection and disposal of, all household waste in accordance with this act.
    - Ensure that waste is collected, transported and disposed of in accordance with this act.
    - Take all practical measures to promote and support the minimisation of waste and the recovery of waste, particularly at the point at which it is produced. (EMA 2002, Section 45(1))

Designation of waste control areas

1. Where the Minister, acting on the advice of the authority, and after consultations with the organs of Government responsible for rural development and any other competent authority with responsibility for a non-urban area, considers that the disposal of waste in that non-urban area is resulting in an adverse effect, or that there is significant risk that will result in an adverse effect, the Minister may, by notice in the Gazette, designate the area as a waste control area.
2. The organ of Government or public body that has primary responsibility for waste management in a waste control area-
    - Shall prepare and submit to the Authority for approval, a plan for the management of waste in the waste control area that conforms to the requirements of the Authority including any national waste strategy published by the authority;
    - Shall designate one or more local waste disposal sites or local waste collection sites within each waste control area.
    - Shall inform the public within the waste control area of the location of these designated waste disposal and waste collection sites; and may request the Minister to prescribe guidelines for the disposal of waste within the waste control are, either by regulation or in the form of a code of practise issued in accordance with section 88;
    - Shall report at least once annually to the Authority on the implementation of its waste management plan.(section 48)

6.3.1 Town Council Obligation:

Implementation of new legislation and requirements regarding waste management requires a review of the management and organization of waste management in the PPKTC. There are two Departments within the Town council involved in waste management which must meet the needs of waste management while also meeting the social and economic aspirations of the area (reducing poverty and unemployment). This requires a description and evaluation of:

- Functions of the town council in waste management administration, with particular reference to four key roles, which they are required to discharge: as regulating

authorities; waste management planning; provision of services; and controlling the operation of service providers.

- Regulations, which cover the legal obligation of the town council, waste producers and those engaged in collection and disposal of waste.

6.3.2 Operational issues

The function of collection, recycling or disposal of waste including advantages and disadvantages of public, private and combination of public/private involvement in the waste management system shall be carried out by the Town Council.

6.3.3 Regulations issues

The enforcement of waste management regulations presents a major challenge to the town council in terms of resources and management systems. Implementation of local regulations (by-laws) requires ongoing review and compliance monitoring. Such review should cover:

- Waste collection schemes, market conditions and controls;
- Recycling centers, buy-back centers, composting plants, disposal site, etc. which should be subject to annual reviews, regular spot checks and compliance with operational plans;
- Collection of information about waste quantities and types reported and analysis of this data;
- Illegal dumping. The town council should assess compliance with regulations and by-laws on the basis of these inspections and assessments. Actions resulting from the supervisory role could include: Follow up inspections of waste generators, collectors, transporters and disposers where irregularities in waste type or quantity are indicated in spot tests, and fines can be imposed accordingly. Repeat offences, which result in environmentally irresponsible handling of waste, can be dealt with by revoking their licenses or through legal remedy; Fines and/or imprisonment of offenders who illegally dump their waste.

6.3.4 Waste Management Planning:

- Waste management planning includes the continuous review of the IWM Plan, public participation, environmental impact assessment process, data collection, recording of collection, recycling, treatment and disposal methods, and feasibility studies on the technical, financial and administrative aspects of waste systems, monitoring and evaluation. The following illustrates in general the tasks/activities that will be required for integrated waste management planning:

- Establish by-laws to implement national and provincial regulations, and review of new legislation;
- Collection of information and data for planning requirements;
- Incorporating waste minimization and recycling in town council waste management activities;
- Promote the development of waste minimization and recycling partnerships with the private sector;
- Regulate waste management activities undertaken by the Waste Management utility (collection, disposal, composting initiatives, etc.);
- Establish public-private partnerships;
- Co-ordinate collection contracts for high-density low income areas (i.e. informal settlements);
- Review, evaluate and report on the performance of community waste collection services and programmes;
- Monitoring progress on implementing waste management plan initiatives;
- Developing communication strategies;
- Embark on the WIS education;
- Enhance education and awareness on recycling to promote extensive implementation of recycling and composting practices;
- Undertake waste minimization, recycling and waste management education, awareness and communication programmes; Commenting on environmental impact assessment within interacting areas, such as water, air, land-use and traffic;
- Revise and update general waste management plans;
- Establish and implement waste data collection systems;
- Setting up pilot projects;
- Implement the guidelines for health care waste and hazardous waste collection and transportation;

- Co-operation and exchange of experience among stakeholders such as National and service providers.

6.4 Town Council Goals and Targets

Summarised below are the Strategic Goals and Objectives as defined by the PPKTC, as well astargets that it has set out to achieve in each sector. Below each sector, progress made thus farin that area, as well as focus areas that need to be concentrated on are highlighted.

Table 22 showing PPKTC Goals, Objectives and Targets per Sector

	Goal	Objective	Target	Progress so far	Focus areas
	To have accurate waste information data available and an effective waste information management system.	To develop an information system to capture relevant data for current operation and future planning, in order to optimize waste management and budgeting. Establish a monitoring and information system to track waste generation, collection, reuse, recycling, reprocessing and disposal in terms of waste flow and facilitate waste exchange. Assist in delivery of information	To have a fully operational Waste Information system (WIS) in place, including extensive industry database and up-to-date waste management information by 2017.	Complete study of waste generation quantities and categories.	Complete and implement a fully functional, accurate and continuously updated WIS.

		on waste services and enforce the retrieval of information from the private sector.			
Waste Collection Information					
	Goal	**Objective**	**Target**	**Progress so far**	**Focus areas**
	To provide an appropriate, affordable and sustainable waste collection service to all people within the PPKTC and ensure that they live in a healthy and clean environment free of illegal dumping.	To extend access to quality and sustainable waste management services to all sectors/areas. Initiate and implement appropriate waste collection services to informal settlements, and high-density low income and informal trading areas especially taxi ranks. This should happen at all times during the day to create awareness about waste management issues within the community and thereby empower	100% of all households to receive a regular waste collection service by 2017. Illegal dumping to be eliminated by 2017/18.	Establishment of a community-based Refuse Collection Programme –in township areas.	Establishment of a community-based Refuse Collection Programme –in township areas.

		communities to take responsibility for the cleanliness of their surrounding environment. To minimise illegal dumping and littering through sustained clean-up programmes, education and by-law enforcement. Ensure that all private waste collection and transportation companies are registered on the municipal WIS.			
Waste Minimisation and Recycling Information					
	Goal	**Objective**	**Target**	**Progress so far**	**Focus areas**
	To implement sustainable recycling within the PPKTC giving due consideration to social, environmental	Encourage, educate and promote separation at source, waste minimisation and recycling. Promote cleaner production and reduced product	A target of 50% reduction of domestic and commercial waste streams disposed to landfill within the short term (2016/2017).	N/A	Currently all recycling initiatives are private enterprises, employing 6 people+ staff. The PPKTC's position needs to be

	and economic factors.	manufacturing by waste. Reduce waste quantities disposed of at landfill sites, by evaluating and implementing appropriate mechanisms to formalise salvaging at the landfill site. Ensure that waste minimisation and recycling procedures and practices are adopted by all sectors of society. Create sustainable employment through local entrepreneur development in waste recycling partnerships. Comply with- and enforce government and local policies, strategies and legislation related to waste minimization.			identified, defined and then expanded. Formalising landfill site salvaging. Implement a study of local industries to access progress in cleaner production and minimizing waste.
Waste Disposal Information					
	Goal	**Objective**	**Target**	**Progress so far**	**Focus areas**

	Ensure sufficient long term waste disposal capacity that is environmentally and publicly acceptable, also ensure that the landfills are progressively rehabilitated in such a manner so as to minimise the impact on the environment and nearby communities.	To ensure at least 25 years or more of licenced landfill airspace to serve the current and projected waste disposal needs of the Town Council. Develop a plan for the progressive rehabilitation of old dumpsite and the future upgrade of the Glen Township landfill sites to the approval of the regulatory authorities (SEA), and addresses long-term impacts such as water pollution and landfill gas emissions. Upgrade the operating landfill sites to meet SEA minimum requirements, ensure that all waste recyclers are registered. Consider the long-term approach for waste disposal beyond 25 years. Identify options to meet	Develop and commission a new landfill site to receive all waste by 2025. Complete closure and rehabilitation of old dump sites by 2016/17/18.		Completing new landfill site selection, licencing and commissioning. Develop strategies for future waste management planning and implementation.

		future waste disposal needs and develop an optimum strategy for timeous implementation.			
Garden Waste and Composting Information					
	Goal	**Objective**	**Target**	**Progress so far**	**Focus areas**
	To divert green and garden waste from the general waste stream to composting facilities.	To develop an incentive based integrated garden waste and composting strategy to achieve the proposed goal of 50% diversion of garden waste from landfill sites, develop partnerships with the private sector so as to optimise the management, quality, marketability of the garden waste sites and the final compost product. Investigate ways of sourcing and collecting green and	Divert 50% of green and garden waste currently being landfilled at old dumpsite to Glen Township Landfill or new garden waste composting sites by 2017.	None, however PPKTC must reviewing a business plan for establishment of a composting facility.	Complete review of the business plan, should plan not be deemed feasible, investigate alternative options.

		garden waste separately from the general waste stream. Encourage the participation of the public in achieving the goal and the key objectives, through education and awareness and also by creating an incentive based composting strategy. Investigate and determine the viability of enhancing the garden waste compost product.			
Organisational/ Institutional and Regulatory Information					
	Goal	**Objective**	**Target**	**Progress so far**	**Focus areas**
	Successful implementation and review of the waste management plan from an organisational and institutional perspective with all targets set up by	Establish an organisational structure in line with all waste management planning requirements and activities, to implement appropriate mechanisms for monitoring and	Establish effective monitoring and enforce waste by-laws. Employ required staff in order to build up capacity	Appointment of a Waste Management Officer (WMO) as required by the Waste Act , 2000	The PPKTC waste departments need to familiarize themselves with the Waste Act (2000), as well as the published SEA National Waste Management Strategy

	IWMP being realized.	enforcement of waste management by-laws, ensure that enforcement efforts are efficient, well-coordinated and effective. Ensure that activities of all relevant municipal staff and departments are well coordinated and aligned, to ensure that there is sufficient capacity and capability in the town council for planning, contract management, and monitoring or enforcement, review and incorporate additional by-laws required for the implementation of the IWM plan.			to ensure that newly adopted legislation is being met and enforced. Where required, additional municipal by-laws need to be written or abridged. Scrutinize budgetary requirements and approach external funders if required
Waste Management Education/ Awareness and Capacity Building					
	Goal	**Objective**	**Target**	**Progress so far**	**Focus areas**
	Ensure that the	Develop and implement a	80% of the PPKTC	Waste awareness	Broaden the

	populace of PPKTC are informed and made aware of waste management issues in general and of the integrated waste management system and that municipal staff involved with waste management and related issues are competent to implement the plan successfully	communication and public awareness programme. To build capacity and raise the skill profile of the municipal staff, ensure that the public and private sector understand their specific roles and cooperate and participate in the waste management issues. To have a relatively high level of commitment and understanding from the public and from industry to strive for a clean environment. To have a number of awareness campaigns established within the municipal area, change the historical mindset around illegal dumping and littering.	populace will have been exposed to information and been made aware of waste management and waste management planning issues by 2016/17/18.	campaigns are periodically run within the town council area, the promotion is run on smaller scale.	awareness campaigns into all previously un-serviced areas.

7. IWMP IMPLEMENTATION STRATEGIES

7.1 Policy/Legislative Relevant Framework

The first step into developing and implementing an effective IWMP is ensuring that there is clarity with the relevant legal policies / vision, mission and value/goals. Therefore it is crucial to first consider goals like:

- The waste management hierarchy
- Waste minimization aspects

Some of the above goals may be supportive of each other, while others may involve making trade-offs. Resolving such trade-offs involves making political decisions, which ideally should be taken in consultation with appropriate stakeholders, and guided by relevant legal legislation where possible. In terms of IWMP planning for Swaziland in particular for local authorities like town councils, the principle goals and priorities to guide the development and implementation of the plans are given by the requirements of the Waste Regulations Act, 2000 and the Environmental Management Act (*EMA*) (*No.5 of 2002*). The country's published National Waste Management Strategy (*Volume 1, 2003*) is a statutory requirement which builds on the previous Waste Regulations published in *2000*, as well as the extensive inputs from stakeholders made during the process of developing the National Waste Management Strategy *volume 1*.

The Environmental Management Act (*EMA, 2002*), Waste Regulations (*2000*) and the National Waste Management Strategy (NWMS, *volume1*) allocates the following responsibilities for IWMPs:

- The Swaziland Environment Authority (SEA) must draft and promulgate regulations and guideline documents for integrated waste management planning for all waste types.
- Local Authorities must develop and submit plans for integrated waste management to the SEA for approval. The approved IWMP must be included in the municipal/ town council Integrated Development Plan (IDP).
- Waste management plans for industrial waste that is disposed of at private and/or dedicated disposal facilities, must be prepared by the developers/owners and submitted to the SEA for review and approval.

7.2 Roles and responsibilities

For a successful and sustainable IWMP implementation, the roles of the departments of PPKTC and stakeholders; in relation to waste management are outlined below. These roles and responsibilities are directly based on the requirements of the Constitution of Swaziland and other relevant legislation such as the Waste Regulations, EMA Act as well as per the IWM Policy.

7.2.1 Board of councilors

The board of councilors has an overall responsibility to approve policies related to waste management and ensure good governance and efficiency and effectiveness of all services provided for waste management. The board is also responsible for ensuring the balance between policies/strategies and traditions/culture. This structure also makes sure that they bring a mutual relationship between all the relevant stakeholders and ensures public participation in waste management. Some issues although specific to waste management are best handled at this level due to the overlaps in disciplines and the integration required in dealing with such e.g. compliance and enforcement.

7.2.2 Municipal Manager/ Town Clerk

The Town Clerk is ultimately responsible for ensuring that waste within his/her areas of jurisdiction is managed in accordance with the legislative requirements of Swaziland.

7.2.3 Environmental Public Health Department

Environmental Public Health Department is primarily responsible for strategic planning and policy formulation making it the core directorate to play the coordination and integration role within the PPKTC. Their specific roles will thus include the following:

- Waste Information System (WIS);
- Auditing to ensure that all departments, Contractors and Agencies dealing with waste are incompliance with this plan and the IWM Plan.
- Accident and incident management and reporting.
- Ensure that the PPKTC adheres to all national and provincial legal obligations.

This section will work together with RSP and environmental health as the need arises, but will be the central point for all compliance monitoring and enforcement issues.

7.2.4 Waste Management Officer

The Waste Management Officer (WMO) is responsible for ensuring that the dedicated waste management staff services meet the requirements of the Policy and are compliant with the legislations of the country. The WMO is also responsible for the coordination of waste management activities to ensure integration. It is the responsibility of all staff to adhere to all relevant legislation, including the IWM Policy, and this Plan.

7.2.5 Engineering Department

This department is responsible for managing all utilities/facilities/agencies responsible for delivering waste management services on behalf of the PPKTC and ensuring that they perform accordingly with regards to waste collection and disposal.

7.2.6 Line Department Managers

Other line Departmental Managers within the PPKTC where relevant will be responsible for:

- Ensuring that staff under their control is aware of the IWM Plan and policies in correspondence thereto and that the mandatory training requirements of staff are fulfilled.
- Ensuring that where appropriate operational plans in relation to the implementation of the IWM Plan are developed and progress reporting in relation to same is undertaken.
- Assisting the Waste Management Department to make improvements to departmental waste management systems where accidents or incidents occur.

7.2.7 Stakeholder Responsibilities

Households and industry shall avoid negative impacts from waste on the environment and also play a role in terms of separation of waste at source, waste exchange and cleaner production. Changes in consumption patterns will reduce generation of waste and save our precious non-renewable natural resources.

- **The Ministry of Health:** PPKTC will work with the ministry in terms of the Public Health Act, this department's officers should undertake waste management duties especially compliance and enforcement monitoring.
- **Royal Swaziland Police:** As part of its mandate, the RSP has a section dedicated to the enforcement of the town's By-Laws. This includes the Waste By-Laws. Also this department should ensure that during public participation safety of the people is provided for.
- **Swaziland Environmental Authority:** The governing body's duties include enforcement of all requirements in relation to protection of the environment. This includes ensuring compliance to waste regulations and other legislations discussed earlier in this document. Through collaboration with local governing bodies (Town Councils, Municipalities, Umphakatsi, etc) SEA's other mandate is to ensure that the public and citizens of the country Swaziland are informed and educated on the requirements and strategies put in place in order to minimize the impacts of waste on the environment.
- **Ministry of Housing and Urban Development**: contributes in the development and construction structures in towns. During urbanization (extension of boundaries of a town) the Ministry of Housing and Urban Development is also responsible for this Ministry the development of strategies for towns.

7.3 Awareness Campaign and Public Participation

The study also takes notes that the town from time to time has embarked on an active awareness and clean-up campaigns in the street, schools of the town. The idea is to create a lasting impression of a clean city, its townships and other business areas.

Figure 12: The Town Council Councilors and residents involved in a clean-up campaign. Piggs Peak residents showing enthusiasm for the clean-up campaign.

But this has not proved sufficient in maintaining the general good appearance of the town. The old dumpsite is at present not a facility to be proud of. Litter is visible on and in the buffer zone of the site and some illegal waste dumping areas was observed around the town boundaries. It is absolutely imperative that the town council puts proper, effective systems in place to ensure that informative public awareness campaign achieve the desired results.

An Awareness Campaign is crucial to make people aware of the Integrated Waste Management plan for the PPKTC. This awareness campaign needs to have the full support of the entire town council department and other Government Departments; including the Swaziland Environment Authority, Ministry of Health, Ministry of Housing and Urban Development and the Ministry of Education. This campaign needs to look at an integrated approach to community awareness; this can include one or more of the following campaigns:

- Site visits by schools, community groups and businesses to the recycling centre.
- Awareness programs at schools, crèches, hostels etc.
- Town, community and school clean up campaigns, with prizes for the most waste collected awareness through plays, dances and song.
- Encouraging schools to establish recycling centres and use as much of the waste for arts, crafts, gardening and functional gadgets.
- Adopt a spot campaign.
- Environmental Clubs.

7.3 Public Information

The establishment/ use of a library with information on recycling, waste minimization and integrated waste management is recommended. In the event of the public looking for information, a central office should have a selection of books on the above subjects and numerous national and international publications on waste issues. This could either be located at the existing national library or the Public Health Environmental Department at the town council offices.

7.4 Public and Stakeholder Participation

Public participation in the development of the PPKTC IWMP will commence after completion of the final draft of the document, report approval by town council and implementation phase.

In order to enhance the public environmental awareness campaigns some recommendations are made below:

- The SEA / MOE, MHUD, MOHE should be engaged, as their contribution to the programme could be valuable.
- The establishment of environmental youth clubs is seen as an integral part of the programme that has a potential to draw youth involvement into implementing environmental outreach programmes.
- Community meetings, roadshows, interaction through local radio stations, newspapers and door-to-door distribution of information are tools that should be implemented to encourage recycling activities.

- Local schools should be encouraged to participate in recycling activities and environmental education should be encouraged / included in schools surrounding the town.
- Ward Councillors could be encouraged to set up environmental desks where street representatives could be allocated.
- Meeting with traditional leadership to encourage their ownership and communication of such initiatives into the rural areas.
- Publication of articles in local newspapers, printing of posters and information leaflets.

7.5 Implementation Program

7.5.1 Implementation Parameters and Policies

Relevant authorities that may need to be consulted when developing or planning and implementing some elements of the IWMP.

Table 23 showing the relevant authorities who have responsibilities in implementation of IWMP

LEVEL OF GOVERNANCE	RELEVANT AUTHORITIES
❖ National Government	• **MTEA/ SEA** • **MHUD** • **MOHE** • **RSP**
❖ Regional level	• **RA**
❖ Local level	• **Ward councilors/ ward committees** • **Waste Management Forums**

Each specific strategic priority needs a diverse set of resources and capabilities for effective implementation. The implementation instruments that are required to ensure successful implementation include:

- **Information:**

Bylaws need to be introduced to ensure the cooperation of the Private Sector in provision of waste related information. These bylaws could describe in detail the responsibility of the waste producers, the waste transportation organizations, and the recycling and/or disposal facilities. The local by-laws will have to be in line with national law and policy. The development and promulgation of National regulations is essential to act as a support to the implementation of by-laws relating to information gathering.

- **Recycling:**

If by-laws are implemented for recycling, it is necessary to provide a "level playing field" for all recyclable commodities to ensure the effectiveness of the objectives. The Town Council can regulate recovery of recyclable materials through legal contracts that would define the quantities and type of waste delivered and the charging systems to be applied. The licensing of a business could be linked to the requirement to separate and recycle specified waste materials. Industrial estates should be encouraged to form waste minimization and recycling groups within the area. This would require the preparation of instructions for waste minimization, separation at source, recycling and proper disposal.

- **Enforcement:**

Enforcement of the by-laws has always been an integral component of the success of the by-laws. However, insufficient capacity, uncertainty regarding enforcement jurisdiction, low fines and penalties, disinterest or low priority given to waste management offences, have all contributed to many offenders not complying with by-laws. Enforcement is critical to the success of the IWM plan.

- **Economic Instruments:**

Economic instruments can be used to ensure that the costs of providing waste management services are recovered, as well as to influence the behaviour of waste generators and to ensure the preferred direction of the waste stream, i.e. disposal or recycling. Economic instruments may therefore promote the optimal utilization of services and provide incentives to reduce waste production. It is generally thought that economic instruments for environmental protection can generate the same level of waste reduction at a lower cost than via the more conventional regulatory approach.

- **Communicative Instruments:**

Effective communication is vital to the ultimate success and sustainability of the plan. There are two types of communicative instruments:

- **Information:**

The presence of knowledge and understanding of the waste system is of vital importance in order to enable the parties involved in waste-management to co-operate and act as intended. The transfer of information has therefore become essential in modern waste management. Information generally has two purposes:

- An instructive purpose
- A motivating purpose;

The instructive purpose aims to inform people of what to do. It can be information about the correct sorting of waste or it can be information about where to deliver certain fraction of waste e.g. where to deliver used batteries. This type of instructive information will often be a combination of national campaigns and local information. The motivating information will often be national, provincial and local campaigns informing and motivating people to be "waste aware". It could include campaigns that explain why the public should actively participate in integrated waste management. To ensure maximum involvement by the generators as well as by the private waste companies, an education awareness programme will have to be set up by the town council. This will serve to highlight issues relating to legislative requirements, benefits to the private and the commercial sector, waste management requirements and the different waste information systems.

- **Capacity building:**

Implementing and controlling national legislation and governmental policies require a certain administrative capability at all administrative levels. This means that each administrative level should have a sufficient number of staff with the appropriate professional knowledge to administrate the regulation and supervise the public. The waste management planning process, which is a strategic process oriented and problem based, as well as the implementation process, may be more challenging for the officials then a more technical and goal oriented concept. Therefore, capacity building in this field is necessary within the town council (and utility) waste departments. With respect to the utility, responsibility will be upheld through the service delivery agreement. Capacity building will also have to be undertaken at political level and the structures which are currently in place could be used for this. The town council short-term action programme should include measures to improve the capability of the officials engaged in waste management planning. Education and training activities may comprise the following:

1. General environmental and waste management education;
2. Training in planning issues in general and waste management planning in particular;
3. Waste information systems;

4. Technological solutions for the waste sector, including collections systems, transfer and transport systems, recycling, recovery and treatment facilities(composting), and disposal facilities;
5. Issues regarding utility/private sector participation, including tender documents and procedures.

- **Institutional Capacity:**

For the successful implementation of the plan, appropriate institutional capacity for training and human resources development for waste management within the town council should be established at the central level. All staff should have appropriate training in waste management, and if this is currently not the case, skills and training will have to be provided. Private sector involvement in waste management implies a shift in the role of the municipal institutions from service provision to contract management and regulations. The PPKTC must encompass the following roles regarding the legal administration of waste management: a) Regulations and Planning, b) Public service, Monitoring and control. It is important that one department dedicated to waste management within the town council undertakes all or most of the main functions mentioned above.

The advantages of having a one stop department dealing with waste management include the following:

It establishes a single point of responsibility for waste management, where the manager has a level of authority which is corresponding to his/her responsibility;

- It facilitates long term planning and monitoring /control of performance;
- It aids in the development of a common approach to waste management (e.g. progress from a reactive to a proactive approach);
- It facilitates planning and co-ordination of service provision;
- It reduces overlap in activities and potential conflict of responsibility between different sections;
- It encourages personnel management and co-ordination;
- It facilitates personnel training, development and budgeting.

7.6 Implementation Requirements

Human Resources: A substantial increase in human resources and other corporate resources within the town council will be required to effectively implement the waste management plan. In terms of additional staff resources, the waste management departments shall be organized to fulfill its new functions to ensure compliance with relevant legislation. Implementation of this plan will require considerable efforts to plan and initiate projects; provide overall guidance and supervision of various projects and activities, and to coordinate the efforts of the town council

and other stakeholders. The IWMP cannot be effectively implemented if the planning process is not properly institutionalized, and if additional personnel resources are not mobilized.

7.6.1 Recurring budget costs

Table 24 showing the existing budget for waste management services

Environment Public Health Department	
Bill item	**Estimated costs**
Admin- Wages/ Salaries/ licence fees/ training/ awareness programs	E 180,000.00
Personnel- PPE	E 85,000.00
Heavy plant fuel	E 250,000.00
Transportation- service and maintenance	E 50,000.00
Waste collection hand tools- refuse bags and	E 50,000.00
Operations and maintenance including the Landfill	E 20,000.00
Waste receptacles furniture	E 20,000.00

7.6.2 Capital expenditure for IWMP

Table 25 showing the required short-medium to long-term capital expenditure is presented in the table below;

Item	**Indicator**	**Responsibility**	**Time frame**	**Cost of process per year**
Year 1				
• **Formulation of waste management objectives,**	-CEO/Board of councilors approved policies.	EPHO and Board of councilors	1 year 1 year	E35,000

• **Formulation of waste management policies** • **Formulation of implementation strategies** • **Development of a complaints register** • **Capacity building**	-SMART IWMP objectives and implementation strategies in place -Active complaints register -Positive attitude towards/ improved waste management practices		1 year 1 year 1 year	
• **Stakeholder participation**	Stakeholders buy in to the new waste management system	EPHO and CEO	10 years	E15,000
• **Public participation**	More vibrant and effective clean up campaigns	EPHO and Ward councilors	10 years	E25,000
Landfill fencing upgrade	-Upgraded and closed gaps on the landfill fencing	Landfill supervisor	1 year	E70,000
Landfill information plate	-Landfill information plate displayed at the landfill entrance	Landfill supervisor	1 year	E4,600
Landfill access control	-Sign prohibiting unauthorised entry to the landfill -Records registering access to the landfill	Landfill supervisor	1 year	E1,500
• **Disposal of clinical waste**	-An active MOU with PPK Government Hospital for the disposal of clinical waste by	EPHO	10 years	E4,000

	private clinics and pharmacies -Workshop with all pharmacies and private clinics on clinical waste management and new strategies in place for disposal. -advisory notices issued to clinics discouraging the disposal and or mixing of clinical and general waste.			
Year 2				
• **Waste Information System**	-Waste information system in place	EPHO	1 year	E40,000
• **Public Information**	-Availability of information for public use.	EPHO	1 year	E5,000
• **Public participation**	-More vibrant and effective clean up campaigns. -Improved waste management around town.	EPHO and ward councilors	9 years	E25,000
• **Public awareness on waste management in schools and private**	-Cooperation with other institutions in the management of	EPHO	9 years	E10,000

institutions	waste around town.			
• **Stakeholder participation**	Stakeholders buy in to the new waste management system	EPHO and CEO	9 years	E15,000
• **Formulation of by laws**	-Availability of waste management by-laws developed for PPK -By-laws approved by the board of Councillors or CEO	EPHO	1 year	E20,000
• **Enforcement of by laws**	-Public awareness on the enforcement of by-laws -Accessibility of By laws for public use. -Punishment of offenders	CEO and Board of councillors	9 years	E10,000
• **Identification of a recycler**	-Identified recycler/recyclers -Public awareness on recycling opportunities	EPHO	1 year	E5,000
• **Coordination of recycling opportunities**	-Active recycling schemes -The use of a different vehicle for collecting recyclables or recyclables collected by the identified recycler -Reduced waste	EPHO	9 years	E2,500

	disposed at the landfill. -Active recycling centre or space at the landfill set aside for recycling purposes.			
• **Disposal of clinical waste**	-An active MOU with PPK Government Hospital for the disposal of clinical waste by private clinics and pharmacies -Workshop with all pharmacies and private clinics on clinical waste management and new strategies in place for disposal. -advisory notices issued to clinics discouraging the disposal and or mixing of clinical and general waste.	EPHO	9 years	E4,000
Change of access road to the landfill	-A different access road to the landfill	Town Engineer and landfill supervisor	1 year	E55,000
Waste screens	-Erected waste screens -No waste scattered around the landfill	Landfill supervisor	1 year	E10,000

	cells			
Landfill gas management	-Landfill gas monitoring- borehole management, leachate management etc.	Landfill supervisor	9 years	E100,000
• **Waste receptacles (CBD) x 20 units**	-Fixed labelled waste receptacles in town -A map locating all the waste receptacles around town	EPHO	2 years	E 26,000.00
• **Waste skips (wards and institutions)**	-Availability of waste skips in all wards -Enough waste receptacles for the waste generated and period of collection	EPHO	2 years	E 34,000.00
Year 3				
• **Stakeholder participation**	Stakeholders buy in to the new waste management system	EPHO and CEO	8 years	E15,000
• **Public participation**	-More vibrant and effective clean up campaigns. -Improved waste management around town.	EPHO and ward councilors	8 years	E25,000
• **Public awareness on waste management in schools and**	-Cooperation with other institutions in the management of	EPHO	8 years	E10,000

private institutions	waste around town.			
• **Enforcement of by laws**	-Public awareness on the enforcement of by-laws -Accessibility of By laws for public use. -Punishment of offenders	CEO and Board of councillors	8 years	E10,000
• **Coordination of recycling opportunities**	-Active recycling schemes -The use of a different vehicle for collecting recyclables or recyclables collected by the identified recycler -Reduced waste disposed at the landfill. -Active recycling centre or space at the landfill set aside for recycling purposes.	EPHO	8 years	E1,500
• **Waste receptacles (CBD) x 20 units**	-Fixed labelled waste receptacles in town -A map locating all the waste receptacles around town	EPHO	1 year	E 26,000.00
• **Waste skips (wards and institutions)**	-Availability of waste skips in all wards -Enough waste	EPHO	1 year	E 34,000.00

	receptacles for the waste generated and period of collection			
• **TLB tractor x 1**	-Availability of a stand-by tractor for continuation of work in case of a break down.	EPHO	1 year	E 890,000.00
Landfill gas management	-Landfill gas monitoring- borehole management, leachate management etc.	Landfill supervisor	8 years	E9, 375
• **Weighbrige x 1**	-Quantification of waste before disposal -Improved record keeping (waste disposed) -Accurate charging/billing system	EPHO	2 years	E 205,500
• **Suspension, closure of dumpsite**	-No littering signs within the vicinity of the dumpsite -Waste recovered for disposal in the landfill -Fencing and security measures in place for prohibiting waste disposal	EPHO	2 years	E 65,000.00

• **Rehabilitation of old dumpsite**	'On-going Rehabilitation' sign erected -Rehabilitation process progressing		2 years	E150,000.00
Year 4-10				
• **Stakeholder participation**	Stakeholders buy in to the new waste management system	EPHO and CEO	7 years	E15,000
• **Public participation**	-More vibrant and effective clean up campaigns. -Improved waste management around town.	EPHO and ward councilors	7 years	E25,000
• **Public awareness on waste management in schools and private institutions**	-Cooperation with other institutions in the management of waste around town.	EPHO	7 years	E10,000
• **Enforcement of by laws**	-Public awareness on the enforcement of by-laws -Accessibility of By laws for public use. -Punishment of offenders	CEO and Board of councillors	7 years	E10,000
• **Coordination of recycling opportunities**	-Active recycling schemes -The use of a different vehicle for collecting recyclables	EPHO	7 years	E1,500

	or recyclables collected by the identified recycler -Reduced waste disposed at the landfill. -Active recycling centre or space at the landfill set aside for recycling purposes.			
Landfill gas management	-Landfill gas monitoring- borehole management, leachate management etc.	Landfill supervisor	7 years	E9, 375
• **Weighbrige x 1**	-Quantification of waste before disposal -Improved record keeping (waste disposed) -Accurate charging/billing system	EPHO	1 year	E 202,500
• **Establishment of a new landfill**	Full operation of the new landfill	Town Planner EPHO	7 years	E 8,100,000.00
• **Suspension, closure of dumpsite**	-No littering signs within the vicinity of the dumpsite -Waste recovered for disposal in the landfill -Fencing and security	EPHO	1 year	E 65,000.00

	measures in place for prohibiting waste disposal			
• **Rehabilitation of old dumpsite**	'On-going Rehabilitation' sign erected -Rehabilitation process progressing		1 year	E150,000.00

The capital expenditures presented in the above table are driven by the need to satisfy the following;

- service improvement, the provision of reliable wastes collection and disposal facilities
- replacements of assets to improve operating efficiencies
- waste growth due to population and economic growth

NB: The none allocation of capital budget to cater for the IWMP implementation will compromise service delivery of which the direct impact will be felt in the near future. The required capital expenditure as presented is for the IWMP implementation and any deviation will increase future operating costs and planned projects.

7.7 Financial Resources:

The IWMP implementation requires detailed financial planning and budgeting.

Types of Financial Sources

Financing sources for the town council to implement the IWMP could be found in a number of arenas, such as the National Government, and international funding, etc. Currently the PPKTC depends on subvention allocated by her line ministry (MHUD) for capital project, based on a process of priorisation of projects. The sources listed below are not exhaustive. Further, it must be recognised that some sources could provide financing for project planning, while others may be suited for project implementation.

7.7.1 Local Sources Financing

- The Municipal/ Town Council Infrastructure Grant (MHUD), a source of support for municipalities/ town councils which are committed to promotes infrastructure development and capacity building on waste management. MHUD is responsible for securing town council or municipal capital budget and for providing support to local authorities to improve waste collection coverage.

- Local registered financial banks

7.7.2 International Financing Sources

- The World Bank Group, which finances private sector projects in developing countries and helps promote sustainable private sector investment in developing countries as a way to reduce poverty and improve people's lives.

8. MONITORING AND REVIEW

8.1 Introduction

The monitoring and review of the waste management plan is an essential element of the plan process and serves to ensure that sustainable waste management is achieved in the PPKTC. Monitoring the plan's implementation is necessary to make sure it provides a relevant, cost effective, sustainable and flexible framework to guide waste management development and that if required, adjustments can be made to the plan. As the development of the plan in some cases has been based on certain assumptions, it would be best to verify these by monitoring so that the waste management plan and its various projects can be reviewed and refined with time.

8.2 Monitoring

A monitoring programme is essential to provide information against which the plan's performance is measured. For example, monitoring waste information over time can indicate the extent of change in the community's behaviour and this in turn will provide an indication of waste generation levels in the future.

The objectives of monitoring are to:

- Ensure that progress on the implementation of the waste management plan is on track;
- Programme adjustments and refinements can be made where required;
- Improvement in service provision;
- Fulfilling the monitoring requirements as may be imposed in terms of the provisions of the Local Government: Municipal System Act and other legislation
- To ensure that implementation of the IWMP runs smoothly and that the system is sustainable, regular monitoring is required. Improvements and alterations to an IWMP will enhance the plan and ultimately improve waste management in the PPKTC.

8.2.1 Monitoring process

Monitoring should focus on the short-term objectives of the waste management planning process to assess current problems and hurdles and to re-evaluate the implementation programme for the short, medium and long term. Monitoring of activities will therefore determine to what extent targets are being met. Overall monitoring activities could include:

- Verification of volumes of waste generated, recycled and disposed;
- Measuring the success of various collection services;

- Assessing recycling and composting initiatives;
- Investigate effectiveness of legislation, regulations, ordinances and/or bylaws;
- Follow-up complaints received regarding poor waste management;
- Management and control salvaging at landfill sites;

The guidelines on Integrated Waste Management Planning from the National Waste Management Strategy, lists the type of activities that should be considered for monitoring. These include:

Table 26 showing Strategic Monitoring Issues

Key Monitoring Issues	
Key issue	**Monitoring required**
General Issues:	• Resource situation; • Staff appointments, allocation of functions and training; • Payment for services; • Rates of generation of waste, verified by the waste information system; • Reporting to the waste information system; • Illegal dumping and littering; • Complaints regarding poor waste management.
Waste prevention and minimization:	• Annual reports of waste minimizing programmes and projects; • Annual environmental reports on emissions to air, water and land; • Achievements of targets for prioritizing waste streams and pollutants; • Information exchange and the establishment of

	waste minimization clubs.
Collection and Transportation:	• Annual reports on the implementation of collection and transportation services; • Payment received for waste collection and transportation services as against actual cost for provision of these services.
Recycling:	• Annual reports on waste recycling programmes and projects; • Information exchange between stakeholders; • Stakeholders forums coordinating new recycling activities; • Social and environmental impacts of the implementation of new recycling initiatives; • Registering and licensing of waste treatment facilities; • Auditing of waste incineration facilities by regulating authorities; • Environmental performance and impact; • Disposal; Auditing of general waste disposal facilities by EPH department; • Provision of adequate general waste disposal facilities; • Management and control of salvaging at landfill sites.

Performance indicators or monitoring indicators and feedback mechanisms are required so that the effectiveness of waste management projects can be assessed and corrective action may be taken if performance does not meet expectations.

The following are just some examples of performance indicators, which could be considered when monitoring the performance of the implementation of the waste management plan. In addition, the Waste Management Departments should formulate their own performance indicators based on the projects implemented as well as certain aspects of the waste management plan. Examples include:

- ✓ Amount of additional data obtained compared to baseline information (assumed percentage increases);
- ✓ Progress of waste management planning implementation in relation to programme schedule; number of educational surveys undertaken to determine level of understanding of waste management issued to the public;
- ✓ Number of private sector waste recycling companies registered with the Council; number of approved proposals for the recovery of waste as percentage of total proposals received
- ✓ Proportion of total waste going to landfill compared with target reductions. The Town council is expected to produce an Annual Monitoring Report on the implementation of the integrated waste management plan.

This should be forwarded to both the Council Board as well as relevant provincial structures for evaluation as part of their information requirements on the success of implementation and sustainability of the waste management plan. All aspects of the plan, which have been implemented, should be monitored and evaluated according to their success rate.

8.3 Evaluation and Review of IWMP

A performance review should be undertaken to determine the level of success of the implementation of the plan. The reason for reviewing the plan and its implementation on a regular basis is to ensure its practicality, suitability and usability. Only by monitoring and reviewing the plan can the level of performance be determined. It is here where the principle of continual improvement should be adhered to. It is proposed that the review of the plan be done annually.

9. RECOMMENDATIONS AND CONCLUSION

A Waste Information System should be the starting point for the town council. The aim of the WIS will be to provide all the necessary detailed information pertaining to waste management i.e. licence status of disposal facilities, volumes disposed of, condition of the landfills, number and type of equipment, date of purchase, operating and maintenance cost, replacement date, type of service, number of service points (domestic, commercial and industrial), the number of personnel involved, financial status and economics, etc and a waste information centre. Decisions concerning new equipment or services can then be made based on accurate information provided by the WIS. Some of the information in this document can serve as a basis or the future development of such a WIS. This is regarded to be of the utmost importance to the PPK town council. This IWMP should be re-evaluated and expanded to a detailed operational plan, once suitable information is available from the system so as to ensure that future planning is done correctly.

The above recommendations should ensure that the short term waste management requirements in the town council area are met. Once the Waste Information System is implemented, this Plan should be re-evaluated and adjusted. Long term planning can then be practiced in a more responsible manner. This will ensure that sound waste management is practiced within the PPKTC over the long term.

9.1 Financing Mechanism

A long term financing plan for the new services will therefore need to be considered. Subtitle 7.7 provides a sustainable basis for funding these services. If the proposed funding is received, any deviation of funds is discouraged, as this may result in increased future operating costs on planned projects. This may also compromise service delivery of which the direct impact will be felt in the near future.

9.2 Bylaws and Enforcement

The town council must compile comprehensive by-laws, addressing all solid waste management issues such as waste minimisation, industrial waste, and hazardous and medical waste. However, By-laws are useless without enforcement and the town council needs to coordinate with other law enforcers (SEA, DWA and RSP) to assist. The by-laws shall ensure that liability is addressed and that the generation, storage and disposal of industrial and domestic refuse is properly implemented. The town council must as a matter of urgency support recycling initiatives by implementing bylaws that facilitate the location, operation and use of such facilities.

9.3 Landfill Site Requirements

The basic landfill operations must be improved and the infrastructure upgraded to conform to both the permit conditions as well as the Minimum Requirements for Waste Disposal by

Landfill published by EMA, *2002* and WR, *2000*. Once the landfill is upgraded, it must be properly maintained. The landfill must be properly fenced and controlled access installed. Commercial waste; which is often cleaner than domestic waste, can be directed to a zoned off area. Once recycling systems are in place, the recycled material will also have to be sent to the recyclers. The scavenging area should be a proper concrete, roofed structure which will enable reclaimers to sort waste into dedicated bins safely and easily. The basic requirements for the landfill will include:

- Information board at entrance
- Access control complete with Weighbridge Fence (Min Req. all sites)
- Contaminated water control
- Leachate control
- Landfill Gas Management
- Storm water and uncontaminated water management
- Working face control
- Sufficiently qualified staff
- Suitable plant & equipment
- Change of access road to the site in order to mitigate the issue of slippery during rains and this will further have a positive impact on reducing waste that is dumped in the open dumpsite

9.4 Receptacles and Waste collection

- The municipality must provide suitable storage bins or facilities for different types of waste and people must be taught and shown how to use these facilities.
- The municipality must initiate and support the development of recycling centres and increase skips where needed.

- A sufficient number of skips must be provided, properly monitored and be emptied regularly by the town council. This will reduce illegal dumping within the town boundaries. The town council should promote recycling and/or waste minimisation. The informal salvaging operations at the landfill sites should be formalised to ensure that the reclaimers co-operate with the landfill supervisors.

- The PPKTC should identify potential and competent recyclers who will recycle waste and give incentives to people who will do the collection for them
- Recyclables should either be collected on a different vehicle by the PPKTC or collected by the identified recycler. This would avoid compacting and destroying the waste making its recovery for recycling very difficult or impossible.

- Schools should integrate waste management practices into the school's curriculum. Also the PPKTC may conduct waste management lessons and create school environmental clubs
- PPKTC should ensure that during the waiting period for implementation of the above, school children are educated on waste management paying attention to waste minimization. This could be in the form of pamphlets in schools, etc.
- Service levels should be work-shopped with the community to obtain their views and inputs on the proposed upgrading of their service and the cost implications involved.

NB: Plastics are recyclable and the percentage (55%); which was estimated by this study at the landfill can be improved (reduced) through implementation of the above recommendations

9.5 Clinical Waste Management

- Engage in an MOU with the government hospital for the clinical waste disposal for the benefit of private clinics and pharmacies around Piggs Peak.
- Educate/inform private pharmacies and clinics on new strategies for managing and disposing clinical waste.
- In order to mitigate the disposal of clinical waste in town council general waste receptacles by residents and businesses, the town council should issue out advisory notices to clinics (private/ government) businesses/ residents discouraging the disposal and or mixing medical waste with general household waste. All accumulated medical waste must be collected/ removed for incineration at an approved facility i.e. Piggs Peak Government Hospital
- The hospital should require empty medicine/pills containers and used syringes to be returned to the hospital for disposal before issuing new medication to the patient.

9.6 Community awareness, capacity building and public participation

- Community environmental awards, where schools and environmental forums are recognised for their role in environmental management issues.
- Clean-up campaigns where members of the community are encouraged to participate in cleaning up a particular identified area in the hope of cultivating a sense of responsibility for community members to clean their surroundings.
- Educational awareness programs for different target groups including hawkers, shop owners and schools.
- Partnerships with different stakeholders resulting in campaigns against littering and illegal dumping.
- The use of performance arts to communicate messages on waste management.

9.7 Illegal dumping

- The municipality should make by laws in relation to vacant plots where illegal dumping is prevalent which will ensure that the landlords develop their plots so that the possibility of illegal dumping on that site is eliminated. These requirements should state timeline for which development of plots should take place, penalties for failure to comply, etc.
- PPKTC should clear overgrown vegetation and collect waste on vacant plots and the landlord be held accountable for all the costs.
- The PPKTC should put/insert notice boards and warning signs on areas where illegal dumping is practiced in order to educate the public and warn them on the impacts and/or illegality of the action. Furthermore, the PPKTC should make sure that within a distance of 50m waste receptacles are provided and are enough for waste disposal.

10. REFERENCES

1. National Solid Waste Management for Swaziland volume 1/2 of 2003 (*National Solid Waste Management for Swaziland representing a long-term plan addressing key issues, needs and problems experienced with waste management in Swaziland)*

2. SEA Guidelines for The Development of IWM Plans for Town Councils (*These guidelines are intended to assist local governments develop and revise comprehensive solid waste management plans. The SEA believes: that using these guidelines will also result in improved plan quality and will expedite the Authority's review of the draft plans).*
3. SEA Technical Guidelines on Solid Waste Management, 2011 (*Municipalities/ Town Councils and Waste Control Areas*)
4. Compendium of Environmental Laws of Swaziland, 2005
   a. Environmental Management Act, 2002
   b. Environmental Audit Assessment and Review Regulations, 2000
   c. Waste Regulations, 2000
5. Piggs Peak Town Council IDP 2nd draft 2014 report
6. Danial,H. (1999). What a waste: Solid waste management in Asia. Washington DC.

7. Medina,M. (2002). Globalisation, development and municipal solid waste management
8. Swaziland Statistical Office, (1997). Swaziland Census Report. Volume 4
9. Swaziland Statistical Office, (2007). Swaziland Census Report. Volume 5
10. Wathern, P., 1988. An introductory guide to EIA. In: P. Walthern (ed.), Environmental Impact Assessment – Theory and Practise. Unwin Hyman, UK. World Bank, 1988. Environmental Guidelines. Environmental Department.
11. USAID 2009 publication on "Environmental Guidelines for Small-scale Activities in Africa"