



Government of Ghana

## Ministry of Works and Housing

GREATER ACCRA RESILIENT INTEGRATED DEVELOPMENT PROJECT (GARID)



### DRAFT FINAL REPORT

#### ENVIRONMENTAL AND SOCIAL AUDIT OF KPONE LANDFILL

By **Lukman Y. Salifu**



WasteCare Associates  
P. O. Box LG 486  
Legon-Accra  
Tel: 233-302-786072  
Fax: 233-302-786072  
E-mail: [info@wcghana.com](mailto:info@wcghana.com)  
Website: [www.wcghana.com](http://www.wcghana.com)

#### Client

Ministry of Works and Housing  
P. O. Box M 43  
Accra, Ghana.  
Attn: Ohene Sarfo  
PCU-GARID  
[Tel:+233](tel:+233302666860685547) 302 666860/685547

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## Table of Contents

ABBREVIATIONS AND ACRONYMS .....	1-3
EXECUTIVE SUMMARY .....	1-4
1.1 Background to Assignment .....	1-15
1.2 Objectives and Scope .....	1-16
1.2.1 Objectives of Study .....	1-16
1.2.2 Scope of Services .....	1-17
1.3 Approach and Methodology .....	1-17
1.3.1 Implementation Approach .....	1-17
1.3.2 Methodology .....	1-17
1. Policy, Legal and Institutional Framework .....	2-20
2.1 National Policy Framework .....	2-20
2.2 National Legal and Regulatory Framework .....	2-21
2.4 Institutional Framework .....	2-24
2.5 World Bank Requirements .....	2-25
2.6 Environmental Guidelines .....	2-27
2. Baseline Environmental and Social Information .....	3-31
3.1 Project Location .....	3-31
3.2 Biophysical Environment .....	3-31
3.2.1 Climate .....	3-31
3.2.2 Geology and Soils .....	3-32
3.2.3 Hydrology .....	3-32
3.3 Socio-Economic and Cultural Environment .....	3-33
3.3.1 Demographic Information .....	3-33
3.3.2 Household Size and Composition .....	3-33
3.3.3 Literacy and Education .....	3-33
3.3.4 Economic Activity Status .....	3-33
3.3.5 Waste Scavenging at Kpone Landfill .....	3-34
3. Review of Facility Design and Management Arrangements .....	4-36
4.1 Review of Landfill Engineering Design .....	4-36
4.1.1 Design Waste Volumes .....	4-36
4.1.2 Design Landfill Area .....	4-37
4.1.3 Comparison of Design and Actual Waste Placement .....	4-38
4.2 Topographical Survey and Void Space Filling Analysis .....	4-38

4.3 Review of Institutional/Management Arrangements (Planned & Actual) .....	4-44
4.3.1 Assessment of TMA's Oversight Structure.....	4-44
4.3.2 Review of Private Contractor's Oversight Arrangements.....	4-45
4. Assessment of O&M Management Procedures and Practices .....	5-47
5.1 Comparative review of optimal, design, and planned on-site practices.....	5-47
5.2 Audit of site operations and maintenance procedures.....	5-48
5. Stakeholder Consultations .....	6-1
6.1 Stakeholder Identification .....	6-1
6.2 Stakeholders Consulted .....	6-2
6.3 Key Issues from Consultations.....	6-4
7. Findings, Opinions and Recommendations .....	6-6
7.1 Proposed Measures for Kpone Landfill .....	6-6
7.2 Alternative Waste Disposal Options for GAMA .....	6-3
References .....	6-6
Annexes.....	6-7

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## ABBREVIATIONS AND ACRONYMS

BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
ESPA	Environmental Services Providers Association
GAEC	Ghana Atomic Energy Commission
GAMA	Greater Accra Metropolitan Area
GFZB	Ghana Free Zones Board
GOG	Government of Ghana
GRC	Grievance Redress Committee
HDPE	High Density Polyethylene
IDA	International Development Association
ISWA	International Solid Waste Association
JLMRC	Joint Landfill Management Review Committee
KKMA	Kpone Katamanso Municipal Assembly
LGPCU	Local Government Project Coordinating Unit
MDC	Municipal Development Collaborative
MSWR	Ministry of Sanitation and Water Resources
MOU	Memorandum of Understanding
TDC	Tema Development Corporation
TEPZ	Tema Export Processing Zone
TMA	Tema Metropolitan Assembly
TDC	Tema Development Company
UESP2	Second Urban Environmental Sanitation Project
WMD	Waste Management Department

## EXECUTIVE SUMMARY

### Background to Assignment

The Government of Ghana (GoG) has applied for an IBRD/IDA credit facility from the World Bank towards the cost of implementation of the Greater Accra Resilient and Integrated Development (GARID). Important interventions to be carried out under GARID will include infrastructure for improving drainage and solid waste management services in the Greater Accra Metropolitan Area (GAMA), with a focus on mitigating climate impacts in the Odaw catchment basin and its environments.

The Kpone engineered landfill was constructed under the IDA funded Second Urban Environmental Sanitation Project (UESP2) and has been in use since February 2013. GoG through the Ministry of Works and Housing (MWH) intends to apply part of GARID funds for the capping of placed waste and construction of additional cells at the existing Kpone Landfill facility.

In line with Ghana's Environmental Assessment Regulations LI 1652, 1999 and the Environmental Assessment Policy OP4.01 of the World Bank, an environmental and social audit is required for the assessment of the compliance of the operations of the Kpone engineered landfill with key performance indicators and benchmarks. An earlier assessment of the landfill carried out in 2015 serves as the background document for this assignment.

### Objectives and Scope

The objectives of this Environmental and Social Audit include the following:

- To undertake an assessment of the current operations of the Kpone landfill with respect to the operations and maintenance management, compliance with environmental and social safeguards in accordance with the operations and maintenance management plans and service contract for the landfill.
- Identify and propose remedial measures to improve the management of the landfill and how to mitigate environmental and social impacts, if any.

### Approach and Methodology

The methodology followed included desk reviews of documentation, site visits, interviewing of stakeholders, inspections and measurements. Figure ES1 provides a schematic overview of the Consultant's approach which was adapted from the 2015 Landfill Audit. The 2015 audit report had recommended the purchase abutting land (Parcel A of Figure ES3) for development of additional cells and the current consultations examined the status of ownership of adjacent lands to the site.

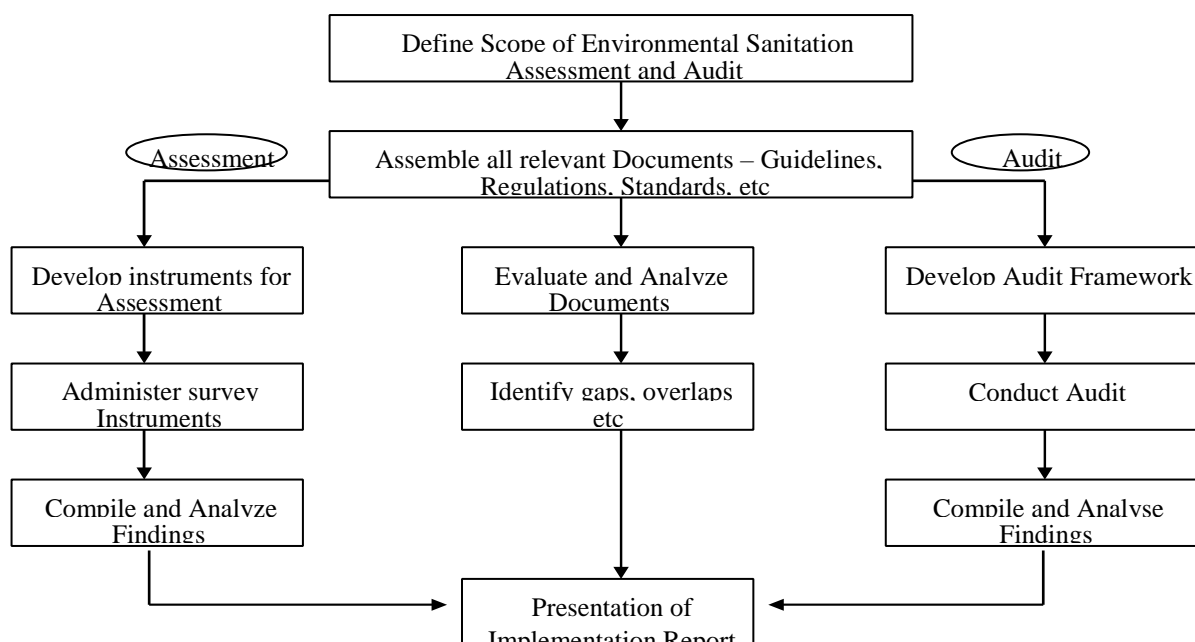


Figure ES1: Flowchart of implementation approach

### Project Location and Ownership of Site

The Kpone engineered landfill is located about 5 km northeast of the Tema city center at latitude 5.7041° N and longitude 0.0288° E. The site is located within the geographical boundaries of the Kpone Katamanso Municipal Area. The landfill is owned by the Tema Metropolitan Assembly. Figure ES2 presents a location map of the waste disposal facility.

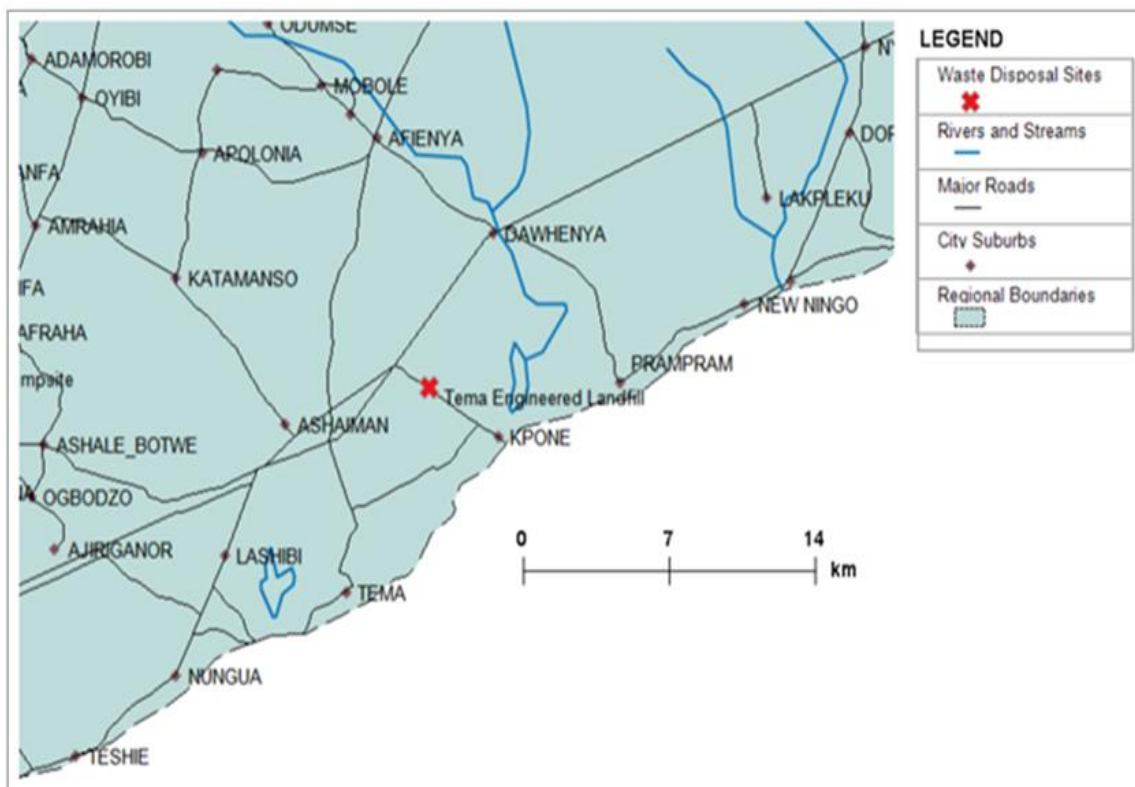


Figure ES2: Location map of Kpone landfill

## Design Landfill Area

The Kpone engineered landfill was originally planned to be developed in two phases.

- Phase 1 – An 18 ha land area that would have 4 cells and other facilities. Each of these cells would have a dimension of 175m by 145m. This initial phase was designed for available void and airspace of about 1.5 million m<sup>3</sup> and planned to be operational for between 8 to 10 years.
- Phase 2 – A 20 ha land area that would have 9 cells (Parcel B in Figure ES3). The Phase 2 could not be implemented as the land demarcated for that purpose has been re-zoned by the Tema Development Corporation (TDC) as an industrial area and has been consequently allocated to a private developer for the construction of a tile factory.



Figure ES3: Existing landfill site and proposed areas for additional cells

## Comparison of Design and Actual Waste Placement

Figure ES4 presents a comparison of the design and the actual waste volumes. The total waste placement in December 2018 after 6 years of operation was 1,771,493 tonnes. This corresponds to a projected design waste placement for a 13-year period and having a combined waste and soil volume of 2,417,952 m<sup>3</sup>. The increased volume was due to the use of the landfill site for waste from the whole of GAMA instead of Tema Metropolitan and Ashaiman Municipal areas as well as nearby environs.



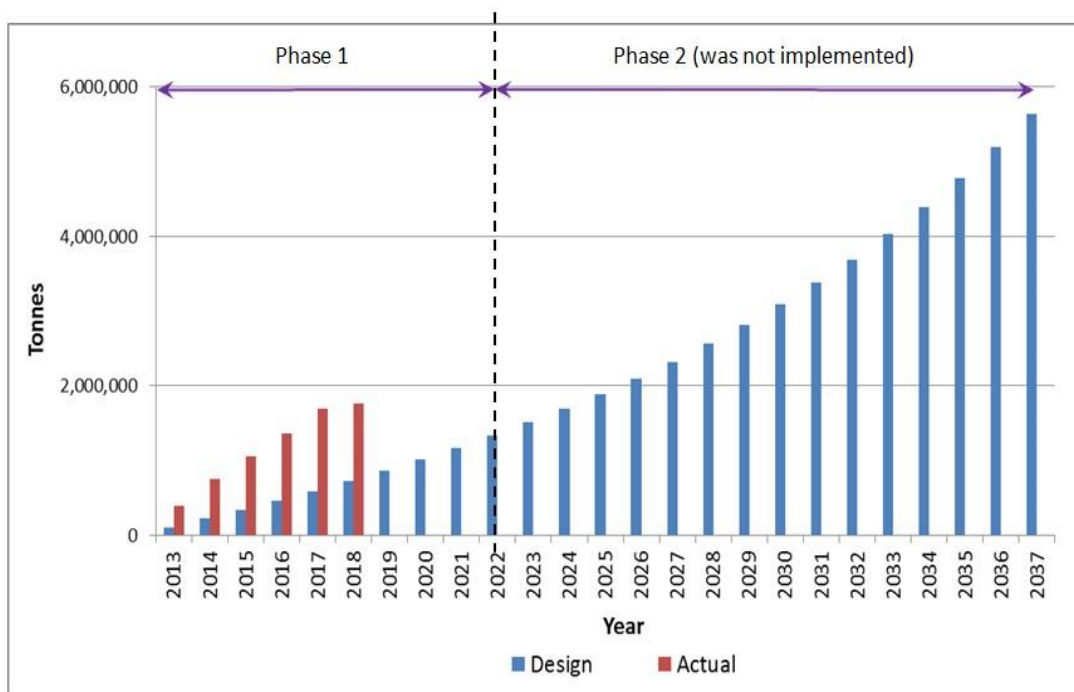


Figure ES4: Design and actual waste placement

### Key Findings: Assessment of Operations and Maintenance Management Procedures

An audit of the site operations and maintenance procedures as shown in Table ES1 was carried out using the planned procedures prescribed in the Operations and Maintenance (O&M) Plan and the specifications of the Service Contract as benchmarks. A compliance rating scheme adopted is described below:

- **Full compliance** – All the key performance indicators and industry benchmarks specified in the Operator's O&M Plan/Service Contract have been adhered to.
- **Partial compliance** – Only a few of the key performance indicators and industry benchmarks specified in the Operator's O&M Plan/Service Contract have been adhered to.
- **Non-compliance** - None of the key performance indicators and industry benchmarks specified in the Operator's O&M Plan/Service Contract have been adhered to.

Table ES1: Evaluation of prevailing conditions

Criteria	Evaluation of Status-Quo
Waste acceptance and registration.	There is partial compliance with this requirement.
Waste deposition and compaction	There is partial compliance with this requirement. The unavailability of a landfill compactor implies compromised density of placed waste.
Working face management	There is partial compliance with this requirement. Minimum requirements have been met. However, this could be further improved by controlling the activities of scavengers during unloading of wastes materials.



Leachate Management	Non-compliance with regards to this requirement. The lack of treatment means the uncontrolled leachate flows constitute a very serious surface water and groundwater pollution risk.
Special Wastes	Non-compliance with regards to this requirement. It was observed that the special waste cell has some structural defects and damage to the liner.
Cover material	There is non-compliance with this requirement. There is cover material stockpiled at the site and additional quantity can be buried near the site.
Environmental monitoring	There is non-compliance with this requirement.
Scavenging	Non-compliance with regards to the prohibition of scavenging activities could be due to the fact that the conveyor belt system for separation and recovery of materials was not procured. However, scavenging could be better organized especially with regards to interference with heavy equipment.
Nuisance control	There is partial compliance with this requirement. Litter control procedures are unsatisfactory. The inability to use daily cover means odour, vermin and bird control requirements are not fully being adhered to.
Record keeping	There is partial compliance with this requirement.
Staffing	There is full compliance with this requirement.
Health and safety for landfill staff	There is partial compliance with this requirement.

### Stakeholder Consultations

The identification of stakeholders/frontline actors involved in the operations and maintenance management, regulation and enforcement management at the Kpone landfill was an integral part of this study. Table ES2 presents a summary of the major issues and concerns discussed at each of these engagements.

**Table ES2: Key issues from stakeholder consultations**

Stakeholder	Issue	Response
MSWR	Status of landfill operations at Kpone from MSWR perspective	The possibility of building additional cells is being considered. Appeals have been made to the Office of the Chief of Staff with regards to acquiring adjoining parcel of land.
	Potential locations for waste disposal facilities to serve GAMA.	Ayidan (near ACARP) Otinbie (integrated waste treatment facility) Asutuare Junction (near monkey sanctuary) Tuba (owned by J. Stanley Owusu Co. Ltd)

TMA	Scope of Consultant's assignment	There is the need for PCUs of MSWR to keep beneficiary MMAs informed about all activities during all stages of the project life cycle within their administrative jurisdiction
	Ownership of engineered landfill and old dumpsite	There is an ongoing tussle with KKMA.
	Utilization of adjoining lands for additional cells (Parcel A)	TMA is considering the option of acquiring Parcel A from the new owners by payment of the appropriate compensation.
KKMA	Intended after use of Kpone engineered landfill	KKMA is seeking a partnership with German investors to commence a waste-to-synthetic diesel facility.
	Status of adjoining lands (Parcel A)	KKMA has not granted a permit to Coronation Real Estate Ltd. Its activities are therefore illegal.
	Status of lands near old Kpone dumpsite	KKMA intends to allocate the land for the construction of a composting facility
TDC	Status of adjoining lands (Parcel A)	The land has been sold to a private developer Coronation Real Estate Ltd due to inaction after the 2015 study.
	TDC's plans of allocating land for waste disposal	Portion of land near the old Kpone dumpsite has been earmarked as a future waste disposal site
MoE	Role in waste-to-catalytic diesel conversion at landfill	MoE led official delegation to explore project feasibility and associated matters
	Status of waste-to-catalytic diesel conversion at landfill	Project startup requirements have been concluded e.g. access-to-waste contracts and off-taker for products. Additional cells at Kpone landfill will be a boost to proposed project.

### Proposed Measures for Kpone Landfill

Based on the consultations and compliance assessment carried out a number of measures have been proposed for the consideration key ministries departments and agencies including MWH, Ministry of Sanitation and Water Resources (MSWR), KKMA and TMA.

Table ES2 summarizes proposed priority remedial actions from the compliance evaluation and consultations. Further details of the actions are discussed below and in Table ES3.

<b>Table ES2: Costed Priority Remedial Action Plan</b> <b>(based on E&amp;S compliance indicator evaluation and key Issues from Stakeholder Consultations)</b>					
Item	Description	Remedial Actions	Estimated Cost (\$)	Proposed Funding Source/Entity	Estimated Implementation/Completion Date
1	Leachate Management	Repair of Leachate Pumping Machine	Not Available	Waste Landfills Ltd	28/02/2019
		Sinking of Leachate wells	65,000.00	GoG/GARID	30/06/2019
2	Optimizing void space utilisation/Improved Waste placement and compaction	Repair of Landfill Compactor (Pump)	Not Available	Waste Landfills Ltd	15/03/2019
3	Improved Cover material usage	Excavator/Tipper Trucks to win laterite/transport stockpile for intermediate cover	Not Available	Waste Landfills Ltd	30/03/2019
4	Improving conditions of internal access roads	Construction of Perimeter Cut-off drains for conveyance of side-egress of leachate	30,000.00	TMA/MSWR	30/03/2019
5	A. Construction of Additonal (new) Cells (Parcel A)	General Earth Works, Access Roads, base lining and drainage, gas collection and venting and cut-off drains and leachate collection	3,695,000.00	GoG/GARID	31/10/2019
	B. Health & Safety of Landfill Staff/Improving Value-Waste Picking (Pickers)	Full Enforcement of PPE/Construction of Waiting Shed, Canteen, Changing rooms, Emergency Clinic			
6	Additional Cover material costs (excavation and haulage)	Residual dredge materials from Odaw lagoon	325,000.00	GoG/GARID	30/09/2019
7	Special wastes cell	Repair of liner	12,000.00	TMA/MSWR/Waste Landfills Ltd.	30/03/2019
8	Enforcement of Environmental monitoring	Measurement of environmental quality parameters	70,000.00	GoG/GARID	30/09/2019
9	Establishment grievance Mechanism	implementing grievance procedure	35,000.00	KKMA/TMA/MSWR	30/10/2019
10	Record keeping	Submission of Quarterly Verified Reports for External Validation Audit	Not applicable	Waste Landfills Ltd. TMA/MSWR	30/03/2019

### Improvement in Institutional Arrangements

It is recommended that a Joint Landfill Management Review Committee (JLMRC) be constituted to perform supervisory functions of the landfill operations.

The specific functions should include the following:

- Review of Operator's Quarterly Landfill Reports

- Review of TMA's Head, Waste Management Department's Quarterly Landfill Reports
- Review of tariffs, fees etc.
- Quarterly review of void space and remaining lifespan of the Landfill
- Half –yearly Report of External Auditor/Evaluator ( see below)
- Mandatory preparation and submission of Oversight Committee Reports to the Minister, MLGRD through the ESHD.

The appointment of an Independent Landfill Technical Auditor/Evaluator to undertake a half-yearly technical audit of the Landfill will also enhance the M&E functions of the TMA-WMD. This will ensure that the Operator's activities are evaluated for timely compliance of all performance indicators and industry benchmarks.

#### Improvement in Site O&M Management

Husbandry at the Kpone landfill generally leaves a lot to be desired thereby giving the facility an unkempt appearance. Table ES3 provides a range of specific recommendations that must be implemented by the various frontline actors as a matter of urgency.

**Table ES3: Key issues from stakeholder consultations**

<b>Description</b>	<b>Recommended Action</b>
Waste deposition and compaction	The exclusive use of a landfill compactor on the Cell 3 within a much smaller working face is strongly recommended. This will ensure that the density of placed waste meets is appropriate requirements thereby maximizing the use of the available airspace.
Internal access roads	Perimeter cut-off ditches should be constructed to minimize the formation leachate pools on the internal access roads that lead and from to the working phase.  The current phenomenon where dump trucks take a detour through Cell 1 to exit the working face via a steep descent should be prohibited immediately to avoid a potential disaster.  Landfill traffic to and from the working face should be either on the internal access roads or temporary engineered access paths.
Cover material	Intermediate cover material should be used to for sections of the landfill cells 1, 3 and 4 where dumping is no longer taking place.  This cover will help in slope stabilization and hence minimize the possibility of shear failure of the unconsolidated waste materials.  Residual dredge materials from dredging after sand recovery will be used as cover material for the Kpone landfill.

Scavenging	<p>Scavenging if it has to be tolerated must be only limited to Cell 3 where dumping is currently ongoing.</p> <p>Scavenging should be prohibited at sections of the landfill cells 1, 3 and 4 where dumping is no longer taking place in order to preventing the loosening of consolidated covered waste materials.</p> <p>The scavenging footprint should be gradually minimized and completely phased out within the next 6 months to facilitate the application of intermediate cover prior to the decommissioning of the Phase 1 cells.</p>
Leachate Management	The leachate collection system should be repaired by the sinking of wells to prevent the leachate seeps. The non-function treatment ponds have to be repaired as a matter of urgency before the start of the peak rainfall season. These actions will minimize the possibility of soil and groundwater contamination.
Working management face	The large presence of scavengers contributes to the inability to have a limited working phase during waste placement and compaction. The site manager must institute strict measures to limit their activities during unloading of wastes materials in order to improve aesthetic conditions.
Special wastes cell	The structural defects with specific reference to the liner should be repaired and put to use immediately.
Environmental monitoring	The requisite environmental monitoring regime should be enforced by the relevant regulatory agencies. The operator should be required to procure portable testing equipment for landfill gas and water quality testing.
Nuisance control	<p>The use of cover material to control odour, vermin and birds must be adhered to.</p> <p>Scavengers should be required to conform to litter control procedures with respect to recovered materials.</p>
Record keeping	The operator must be compelled to submit verified quarterly records especially of waste volumes accepted at the disposal site. The proposed oversight arrangement should ensure compliance and verification regarding this directive.
Health and safety of landfill staff	Full enforcement of PPEs, medical assistance, smoking restrictions, accident records.

#### Construction of Additional Landfill Cells

It is recommended that Parcel A, which could by conservative estimates provide additional airspace volume of 725,000 m<sup>3</sup>, should be legally acquired by the Government to facilitate

the construction of additional cells. A preliminary bulk cost of US\$3,695,000 has been estimated for the principal items for the expansion works as shown in Table ES4.

**Table ES4: Estimate of bulk works for additional cells**

<b>Item</b>	<b>Description</b>	<b>Cost (\$)</b>
1	Access Roads (Cell Perimeter and Internal Bunds)	250,000
2	General Earthworks ( Excavation, Filing, Embankments)	437,500
3	Base Lining and Drainage Layers (including Geotextiles)	1,100,000
4	Gas Collection and Venting	282,500
5	Surfacewater Interception/Groundwater cut-off drains and Leachate Conveyance	600000
6	Miscellaneous (including General Items, Site Fencing, Tree Buffering)	1,025,000
	<b><i>TOTAL COST</i></b>	<b>3,695,000</b>

#### Capping and Closure of Phase 1 Landfill Cells

The capping and closure of the Phase 1 of development of the Kpone landfill should commence once the construction of new cells on Parcel A has been completed. A preliminary bulk cost of US\$420,000 has been estimated for the principal items for the capping and closure works as shown in Table ES5.

**Table ES5: Estimate of bulk works for capping and closure**

<b>Item</b>	<b>Description</b>	<b>Cost (\$)</b>
1	Rehabilitation of access roads	30,000
2	Remedial works on leachate collection system	65,000
3	Cover material costs (excavation and haulage)	325,000
	<b><i>TOTAL COST</i></b>	<b>420,000</b>

#### Establishment of Grievance Redress Committee

It is recommended that a grievance redress mechanism should be established to address problems and concerns raised by individuals or groups affected by the landfill operations. The 3-tier grievance mechanism proposed would comprise of the following:

- KKMA Local Mediation Committee – Municipal Coordinating Director, Municipal Environmental Health Officer, landfill operator
- District CHRAJ Office

- Court of Law

It is anticipated that only the first tier may need to be activated. The use full spectrum of tiers can be resorted to and thus ensure that the grievance redress mechanism is compliant with both national and World Bank safeguard policy requirements.

Aggrieved parties shall report directly to the Local Mediation Committee through verbal narration, telephone calls, text messages and letters. The duration for resolving a grievance shall be a maximum of one week, except for special cases.



## 1. Introduction

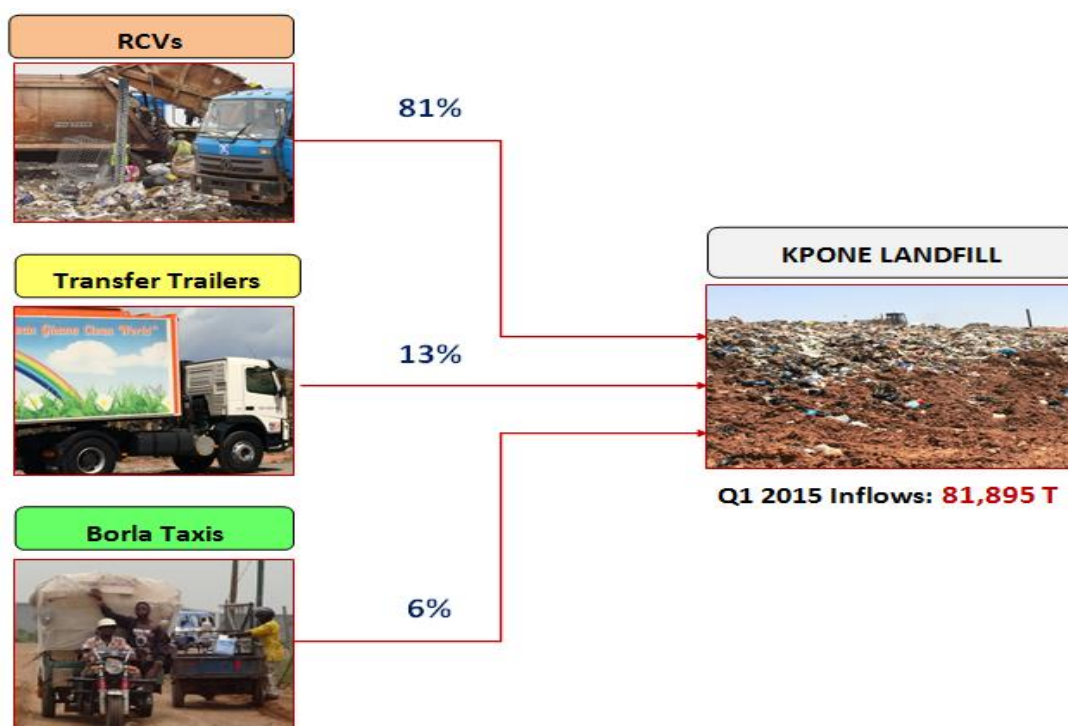
### 1.1 Background to Assignment

The Ministry of Works and Housing under the Greater Accra Resilient and Integrated Development Project (GARID) contracted an individual consultant in December 2018 to conduct an Environmental and Social Audit for the Kpone Landfill facility. Please refer to Annex 1.

The GARID Project seeks to address key drivers contributing to poor living conditions including high flood impacts in Odaw Basin of the Greater Accra Region. It will focus on improving drainage, solid waste management and the provision of services and infrastructure in priority flood-prone informal settlements. GARID is structured into the following four (4) main components:

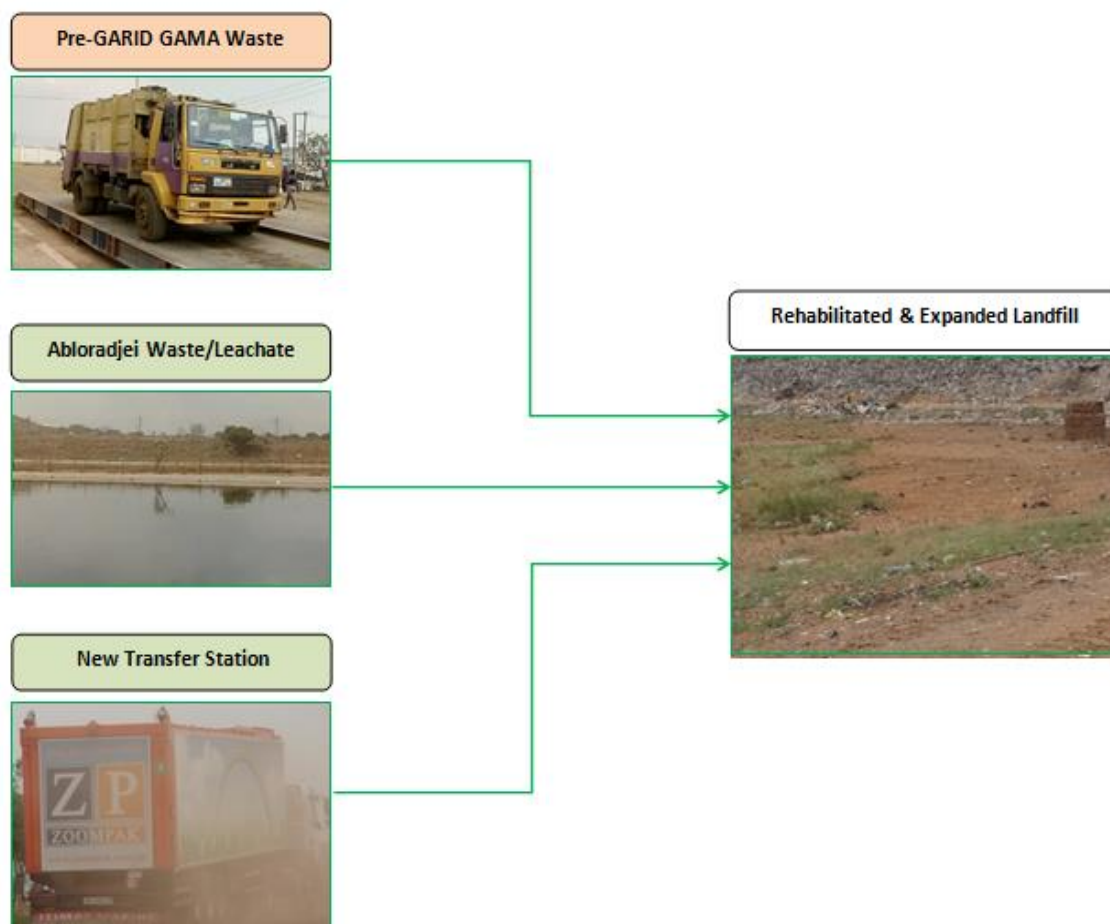
- **Component 1:** Drainage and flood management improvements within the Odaw Drainage Basin:
- **Component 2:** Improvements in solid waste management capacity including minimizing solid waste in waterways
- **Component 3:** Support to most vulnerable communities within the Odaw Drainage Basin to reduce their vulnerability and improve living conditions
- **Component 4:** Strengthening capacity for planning, coordination, monitoring and evaluation.

The Kpone Engineered Landfill was constructed under the IDA funded Second Urban Environmental Sanitation Project (UESP2) and has been in use since February 2013. Figure 1.1 depicts the pre-GARID Project waste haulage traffic to the Kpone waste facility.



**Fig. 1.1: RCV traffic mix to Kpone landfill, 2015**

The GARID project scenario depicted in Figure 1.2, envisages the construction of a new transfer station (at West Legon) and the capping of the Abloradjei dumpsite. These interventions will result in an increase in the proportion of bulk transfer trailers. The expected increase in waste volumes from the highly urbanized Odaw drainage catchment makes the engineered landfill of critical importance for optimizing waste management systems.

**Fig. 1.2: RCVs from Transfer Station(s) and leachate flows to Kpone landfill**

The environmental and social audit will update the assessment of the compliance of the operations of the Kpone Engineered Landfill with the operations and maintenance management plan and service contracts that were developed at inception to ensure sustainability. An earlier assessment of the facility in 2017 serves as an intermediate benchmark for this assignment. Please Refer to Annex A2.

## 1.2 Objectives and Scope

### 1.2.1 Objectives of Study

The objectives of this Environmental and Social Audit include the following:

- To undertake an assessment of the current operations of the Kpone landfill with respect to the operations and maintenance management, compliance with

environmental and social safeguards in accordance with the Operations and Maintenance Management plans and service contract for the landfill.

- Identify and propose remedial measures to improve the management of the landfill considering the stages and how to mitigate environmental and social impacts, if any.

### 1.2.2 Scope of Services

The main activities to be carried out in this Environmental and Social Audit are shown in Table 1.1.

**Table 1.1: Main tasks and activities**

Main Task	Activities
Site Reconnaissance and Geodetic Surveys	Initial site reconnaissance Topographic survey and void space analysis
Review of Facility Engineering Design (Planned & Actual)	Comparative assessment of design and actual waste placement Assessment of landfill operational life
Review of Institutional/ Management Arrangements (Planned & Actual)	Assessment of TMA's oversight structure Review of Operator's oversight arrangement
Assessment of O&M Management Procedures and Practices	Comparative assessment of optimal. design and on-site practices/records Audit of site operations and maintenance procedures Assessment of environmental monitoring practices Audit of health and safety practices
Stakeholder Consultations	Consultations of frontline actors and stakeholders

## 1.3 Approach and Methodology

### 1.3.1 Implementation Approach

The methodology followed included desk reviews of documentation, site visits, interviewing of stakeholders, inspections and measurements. Figure 1.3 provides a schematic overview of the Consultant's approach which was adapted from the 2015 Landfill Audit.

### 1.3.2 Methodology

#### 1.3.2.1 Interviews with frontline actors

During the assignment, introductory and follow-up meetings were held with the key stakeholders. Evidence of these interactions are provided in Annex C.

### 1.3.2.2 Desk Reviews of Landfill Site Documentation

Relevant documents were sourced from the key stakeholders and reviewed to obtain information/data covering;

- Site plans, ownership, lease agreements, measurements to confirm boundaries as per the site plans.
- Design, construction, operation and maintenance, and financial management of the Kpone engineered landfill site.

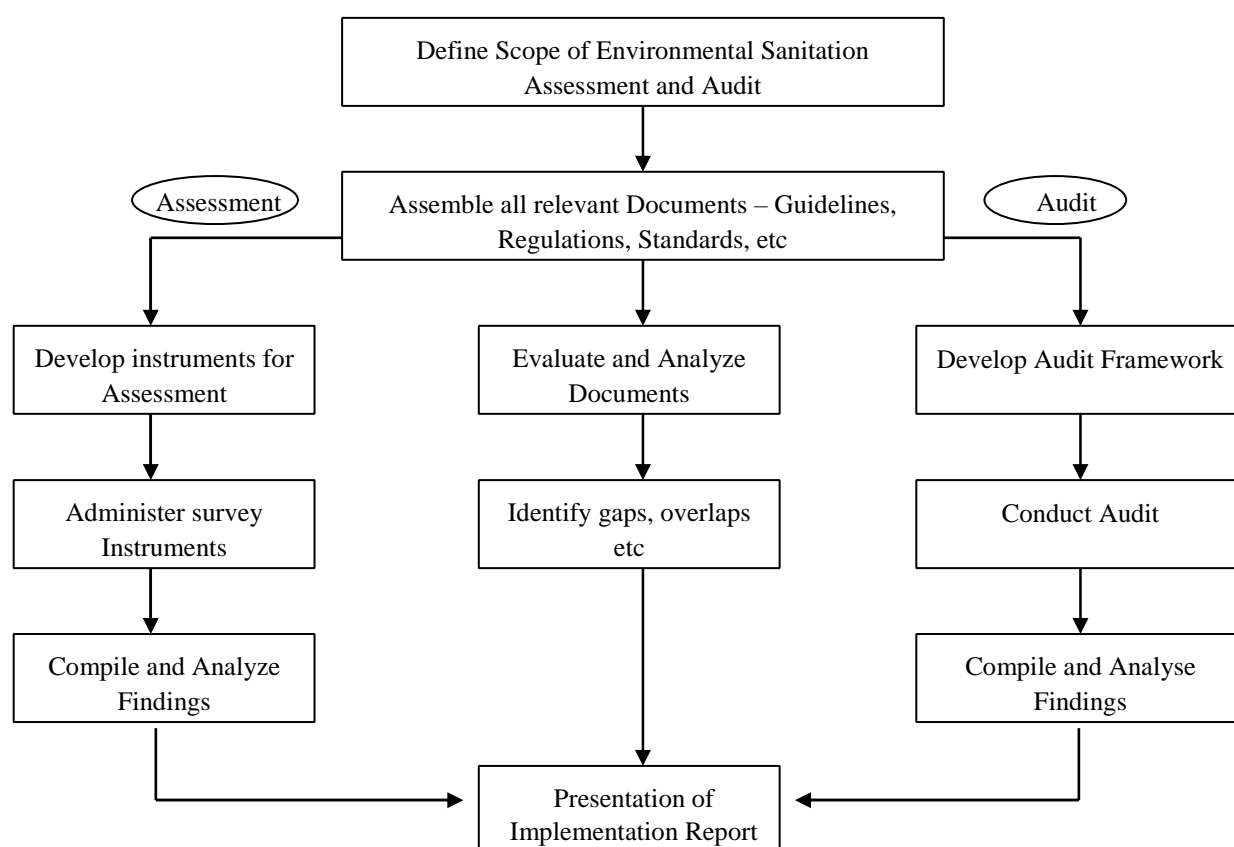


Fig 1.3: Flowchart of implementation approach

### 1.3.2.3 Field Visits, Inspections and Measurements

A number of site reconnaissance visits were undertaken by the Consultant to the Kpone engineered landfill. The observation and inspections conducted sought to obtain first-hand information on various activities at the project site including:

- **General Procedures** - operating hours, site control, waste receipt and registration.
- **Waste Placement** - working face management, spreading and compaction, use of cover material and disposal of special wastes.
- **Scavenging** – interference with waste handling activities, storage of recovered materials and use of protective equipment.

- **Technical Capacity of Operator** – equipment holding, equipment maintenance facilities as well as staffing.
- **Environmental Management** – leachate collection/treatment and landfill gas collection.
- **Health and Safety** – use of personal protective equipment (PPE) and site safety procedures.
- **Landfill Airspace Utilization** – landfill cell layout/configuration and usage of void space.

A topographical survey was also carried out in order to compare site design and as-built layout maps, landform contour maps and topographic (cross section) profiles of the landfill cells.

## **2. Policy, Legal and Institutional Framework**

The relevant national policies, legal and institutional frameworks, and the World Bank safeguards policies that will guide the implementation of waste disposal projects, i.e. planning, design, construction, closure and aftercare management, are briefly described.

### **2.1 National Policy Framework**

The relevant national policies to guide the implementation of the engineered landfill projects include the following:

- National Environment Policy (2013)
- National Environmental Sanitation Policy (2010)
- National Health Policy (2007)
- National Water Policy (2007)

#### **National Environment Policy (2013)**

The National Environmental Policy was formulated in 1995 and revised in 2013. The ultimate aim of this policy is to improve the surroundings, living conditions and the quality of life of the entire citizenry, both present and future. It seeks to promote sustainable development through ensuring a balance between economic development and natural resource conservation. The policy thus makes a high quality environment a key element supporting the country's economic and social development.

#### **National Environmental Sanitation Policy (2010)**

The revised environmental sanitation policy seeks to refocus the priorities of the sector, so it is forward looking and effectively embraces the challenges of changing life-styles associated with modernization and improving wealth status. The policy lays the basis for developing a systematic approach and framework for identifying and harnessing resources for value-for-money (economy, effectiveness and efficiency) services to all. Metropolitan, municipal and district assemblies as per the policy are required to carry out various functions with respect to environment sanitation including waste management. Specifically, the Assemblies shall ensure the availability of facilities for the safe handling and disposal of human excreta (nightsoil and sewage), industrial waste, animal manure, industrial sewage and domestic/commercial wastewaters. These include excreta disposal facilities and systems for the conveyance (sewerage, vehicular, manual), treatment and final disposal of liquid wastes.

#### **National Health Policy (2007)**

The National Health Policy which aims at creating wealth through health, among other things places emphasis on improvements in personal hygiene, immunisation of mothers and children. The National Health Policy also argues that a healthy population could only be achieved if there were

## 2.2 National Legal and Regulatory Framework

The national legislation and regulations particularly relevant to waste disposal projects include the following:

- The Constitution of Ghana
- Environmental Protection Agency Act 1994, Act 490
- Environmental Assessment Regulations 1999, LI 1652;
- Fees and Charges (Amendment) Instrument 2015 (LI 2228)
- Water Resources Commission Act 1996, Act 522
- Local Governance Act, 2016 Act 936
- Hazardous and Electronic Waste Control and Management Act, 2016 (Act 917)
- Public Health Act, 2012 (Act 851)
- Lands (Statutory Wayleaves) Act, 1963 (Act 186)
- The State Lands Act, 1963 (Act 125)
- The Labour Act, 2003 (Act 651)
- Workmen's Compensation Law, 1987, PNDCL 187

### **The Constitution of the Republic of Ghana (1992)**

The country is governed by a constitution which provides for a three tier system of governance: The Executive, the Legislature and the Judiciary acting independently and inter-dependently of each other. Chapter Six of the Constitution “The Directive Principles of State Policy” provides the broad

framework and guidance for all decisions regarding application of the constitution itself and actions of all citizens, Parliament, the President, the Judiciary, the Council of State, the Cabinet, political parties and other bodies.

It explicitly specifies obligations for the state as well as citizens with respect to the environment. In Article 36 (Clause 9) it is stated that “The State shall take appropriate measures needed to protect and safeguard the national environment for posterity; and shall seek co-operation with other states and bodies for purposes of protecting the wider international environment for mankind.” In Article 41 which covers the duties of a citizen it is stated that “The exercise and enjoyment of rights and freedoms is inseparable from the performance of duties and obligations, and accordingly, it shall be the duty of every citizen to protect and safeguard the environment.”

The Constitution also includes some provisions in Chapter 5 “Fundamental Human Rights and Freedoms” to protect the right of individuals to private property. In Article 20, the Constitution describes the circumstances under which compulsory acquisition of immovable properties in the public interest may be necessary. This may be required for the proposed project to ensure right of way for the sewer pipeline construction and buffer zones around the sewage treatment facility.



### **Environmental Protection Agency Act 1994, Act 490**

The Environmental Protection Agency Act 1994 (Act 490) provides the legal mandate to the Agency to ensure compliance of all investments and undertakings, such as the proposed ASHMA LIUC environmental sanitation project, with laid down Environmental Assessment (EA) procedures in the planning and execution of development projects, including compliance in respect of existing ones.

### **Environmental Assessment Regulations 1999, LI 1652**

The Environmental Assessment Regulations 1999 (LI 1652) enjoins any proponent or person to register an undertaking with the Agency and obtain an Environmental Permit prior to commencement of the project.

### **Fees and Charges (Amendment) Instrument 2015 (LI 2228)**

The Fees and Charges (Amendment) Instrument 2015 (L.I. 2228) gives regulation to the Fees and Charges (Miscellaneous Provision) Act 2009, Act 793. It provides comprehensive rates, fees and charges collectable by Ministries, Department and Agencies (MDAs) for goods and services delivered to the public. The permit fees applicable to the proposed project are listed in Section 4.1 Environmental Protection Agency.

### **Water Resources Commission Act 1996, Act 522**

The Water Resources Commission Act 1996 (Act 522) establishes and mandates the Water Resources Commission as the sole agent responsible for the regulation and management and the utilisation of water resources and for the co-ordination of any policy in relation to them. Section 13 prohibits the use of water (divert, dam, store, abstract or use water resources or construct or maintain any works for the use of water resources) without authority. The Act states under Section 24 that any person who pollutes or fouls a water resource beyond the level that the EPA may pre-scribe, commits an offence and is liable on conviction to a fine or a term of imprisonment or both.

### **Local Governance Act, 2016 Act 936**

The Local Governance Act, 2016, Act 936 empowers the Metropolitan/Municipal/District Assemblies to be responsible for the development, improvement and management of human settlements and the environment in the district. Section 91 (1) states that a person shall not carry out a physical development in a district except with the prior written approval in the form of a written permit issued by the District Planning Authority.

### **Hazardous and Electronic Waste Control and Management Act, 2016 (Act 917)**

This Act provides for the control, management and disposal of hazardous, electrical and electronic waste and related purposes. Under the Act, a person shall not deposit hazardous waste or other wastes on any land in the country or in the territorial waters of the country. The Act also states that a person involved in the management of hazardous wastes or other wastes shall:

- Take the steps that are necessary to prevent pollution from hazardous wastes and other wastes arising from the management; and
- Where pollution occurs, minimize the consequences of the pollution on human health and the environment

### **Public Health Act, 2012 (Act 851)**

The Public Health Act of Ghana was passed to prevent disease, promote safeguard, maintain and protect the health of humans and animals, and provide for related matters. The Act has various groupings that deal with the many aspects of Public Health. The groupings include communicable diseases, vaccination, quarantine, vector control, environmental sanitation, food and drugs, clinical trials and miscellaneous provisions such as international health regulations.

### **Lands (Statutory Wayleaves) Act, 1963 (Act 186)**

The Lands (Statutory Wayleaves) Act, 1963 (Act 186) details the process involved in the occupation of land for the purpose of the construction, installation and maintenance of works of public utility, and for the creation of rights of way for such works. Further to this act, the statutory wayleave registration 1964 provides procedural details and grievance redress mechanism. This legislation is applicable to issues relating to project affected persons (PAPs).

### **The State Lands Act, 1963 (Act 125)**

The Act 125 vests the authority to acquire land for the public interest in the President of the Republic. It also gives responsibility for registering a claim on the affected person or group of persons, and provides details of the procedure to do this. The State Lands Act, 1962 provides some details to be taken into consideration when calculating compensation such as definitions for (1) cost of disturbance, (2) market value, (3) replacement value, and so on. This legislation is applicable to issues relating to project affected persons (PAPs).

### **The Labour Act, 2003 (Act 651)**

The Labour Act stipulates the legal regime relating to labour, employers, trade unions and industrial relations. Act 651 contains a number of specific provisions relating to an employer's duty to its workers which include the following: protection of employment; general conditions of employment; employment of women; employment of young persons; fair and unfair termination of employment; special provisions relating to temporary and casual workers; trade unions and employers organizations; occupational health safety and environment; and strikes.

### **Workmen's Compensation Law, 1987, PNDCL 187**

It is to provide for the payment of compensation to workmen for personal injuries caused by accidents arising out and in the course of their employment. The tenets of the law places a large share of the burden of supporting workers injured at the workplace on the shoulders of the employers. The specific sections of the legislation which are of relevance to the skilled

and unskilled labour to be engaged during the pre-construction, construction, operational and decommissioning phases of the proposed project include: employer's liability for compensation; compensation in fatal cases; employer to pay medical expenses; and compensation for permanent total, partial and temporary incapacity.

## **2.4 Institutional Framework**

### **Ministry of Sanitation and Water Resources**

The Ministry of Sanitation and Water Resources (MSWR) is responsible for the implementation of the sanitation and water related policies and plans in the country. The MSRW has a mandate to provide safe drinking water, and sanitation services; ensure proper and timely collection and management of solid and liquid wastes; to set service standards and implement mechanisms for ensuring compliance and quality assurance; coordinate and harmonise strategies, technologies and approaches to ensure cost-effective delivery of WASH services; and leverage market mechanisms to create jobs to all segments of people living in Ghana through WASH service delivery. The Ministry has a Project Coordinating Unit (PCU) which is coordinating all the GAMA environmental sanitation projects.

### **Ministry of Local Government and Rural Development**

The Ministry of Local Government and Rural Development (MLGRD) exists to promote the establishment and development of a vibrant and well-resourced decentralized system of local government for the people of Ghana to ensure good governance and balanced rural based development. The Ministry is responsible for policy formulation, implementation, monitoring and overall oversight of the MMDAs.

### **Ministry of Works and Housing**

The Ministry of Works and Housing (MWH), is a Government of Ghana Central Management Agency responsible for formulating policies and programmes for the Housing and Works sub-sectors of the economy. In line with Sections 11 and 13 of the Civil Service Act 1993, (PNDCL 327), and by Executive Instrument (EI. 28, 2017), the Ministry of Works and Housing is mandated to initiate and formulate policies for the Works and Housing sector, as well as coordinate, monitor and evaluate the implementation of plans, programmes, and performance of the sector for national development.

### **Metropolitan, Municipal and District Municipal Assemblies**

The Metropolitan, Municipal and District Assemblies (MMDAs) in Ghana were each established by specific Legislative Instruments. The functions of the MMDAs are basically derived from the statute as mandated by the Local Government Act 1993 (Act 936) and the National Development Planning System Act 1994 (Act 480).

These functions, which are broadly aimed at attaining its objectives and fulfilling its mission of improving the quality of life of its people, are to:

- Formulate and execute plans, programmes and strategies for the effective mobilization of the resources necessary for the overall development of the municipality.
- Promote and support productive activity and social development in the municipality and remove any obstacles to initiative and development;
- Initiate programmes for the development of basic infrastructure and provide municipal works and services in the municipality.
- Be responsible for the development, improvement and management of human settlements and the environment in the municipality.
- In cooperation with the appropriate national and local security agencies be responsible for the maintenance of security and public safety in the municipality.
- Ensure ready access to courts in the municipality for the promotion of justice.
- Initiate, sponsor or carry out such studies as may be necessary for the discharge of any of the functions conferred by this Act or any other enactment.

### **Environmental Protection Agency**

The Environmental Protection Agency is the body responsible for regulating the environment and ensuring the implementation of government policies on the environment. The functions of the Agency include:

- Ensuring compliance with any laid down environmental impact assessment procedures in the planning and execution of development projects, including compliance in the respect of existing projects;
- Promoting effective planning in the management of the environment;
- Imposing and collecting environmental protection levies in accordance with the Environmental Protection Agency Act 1994, Act 490 or regulations made under the Act;
- Acting in liaison and co-operation with government agencies, District Assemblies and other bodies and institutions to control pollution and generally protect the environment.

## **2.5 World Bank Requirements**

The World Bank requirements of relevance to waste disposal projects include the following:

- World Bank Safeguards Policies
- World Bank Group General Environmental Health and Safety Guidelines
- World Bank Group Industry Sector Guidelines for Waste Management Facilities

### **Safeguards Policies**

The World Bank safeguards requirements applicable to this activity are provided in Table 2-1.

Table 2-1: World Bank safeguard policies

<b>World Bank Safeguard Policy</b>	<b>Summary of core requirements</b>
OP 4.01 Environmental Assessment	<p>Requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. The EA takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources); and trans boundary and global environmental aspects. It categorizes proposed projects into categories A, B, C or FI based on the extent of adverse impacts anticipated from the project.</p> <p>For Category A and B projects, an ESMP is to be prepared to guide the Implementation of mitigation measures for all identified environmental impacts from the proposed sanitation facility project.</p>
OP 4.12: Involuntary Resettlement	<p>Assist displaced persons in their effort to improve or at least restore their standards of living. Avoid resettlement where feasible or minimize. Displaced persons should share in project profits.</p> <p>The policy aims to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts.</p> <p>The policy prescribes compensation and other resettlement measures to achieve its objectives and requires that borrowers prepare adequate resettlement planning instruments prior to Bank appraisal of proposed projects.</p>

### **World Bank Group General Environmental Health and Safety Guidelines**

The World Bank Group (WBG) General Environmental Health and Safety (EHS) Guidelines is a technical reference document containing information on cross-cutting environmental, health and safety issues potentially applicable to all industry sectors. The General EHS guidelines, which prescribe performance levels and measures, are designed to be used together with the relevant Industry Sector EHS Guidelines. These documents are to be the reference for EHS measures implemented for WBG-funded projects. The General guidelines are in 4 main groups: Environmental; Occupational Health and Safety; Community Health and Safety; and Construction and Decommissioning.

### **World Bank Group Industry Sector Guidelines for Waste Management Facilities**

The EHS Guidelines for Waste Management cover projects dedicated to the management of municipal solid waste and industrial waste. The document provides guidelines for landfill management, closure and post-closure care. A complete list can be found at: [www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines](http://www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines)

## 2.6 Environmental Guidelines

The Ghana EPA environmental guidelines relevant to waste disposal projects include the following:

- Effluent Quality Discharge Guidelines
- Ambient Air Quality Guidelines
- Ambient Noise Level Guidelines.

The above listed guidelines are presented in Table 2-2, Table 2-3 and Table 2-4 respectively.

Table 2-2: Maximum Permissible Levels for Effluent Discharge into Natural Water Bodies

Parameter	EPA Recommended Guideline Value
pH	6 – 9
Temperature Increase	<3°C above ambient
Colour	200 TCU
Turbidity	75 NTU
Conductivity	1500 uS/cm
Total Suspended Solids	50 mg/l
Total Dissolved Solids	1000 mg/l
Oil/Grease	5.0 mg/l
Sulphide	1.5 mg/l
Total Phosphorus	2.0 mg/l
Biochemical Oxygen Demand (BOD <sub>5</sub> )	50 mg/l
Chemical Oxygen Demand (COD)	250 mg/l
Nitrate	50 mg/l
Ammonia as N	1.0 mg/l
Alkalinity as CaCO <sub>3</sub>	150 mg/l
Phenol	2.0 mg/l
Mercury	0.005 mg/
Total Arsenic	1.0 mg/l
Soluble Arsenic	0.1 mg/l

Parameter	EPA Recommended Guideline Value
Lead	0.1 mg/l
Total Pesticides	0.5 mg/l
Fluoride	10 mg/l
Chloride	250 mg/l
Sulphate	200 mg/l
Total Coliforms	400 MPN/100ml
E. coli	0 MPN/100ml
Cadmium	0.1 mg/l
Chromium (+6)	0.1 mg/l
Total Chromium	0.5 mg/l
Copper	5.0 mg/l
Nickel	0.5 mg/l
Selenium	1.0 mg/l
Zinc	10.0 mg/l
Silver	5.0 mg/l
Tin	5.0 mg/l
Aluminum	5.0 mg/l
Antimony	5.0 mg/l
Benzo (a) pyrene	2.05mg/l

Table 2-2: Maximum National Ambient Air Quality Guideline Values

Substance	Time Weighted Average (TWA)		Averaging Time
Sulphur Dioxide (SO <sub>2</sub> )	900 µg/m <sup>3</sup>	Industrial	1 hr
	700 µg/m <sup>3</sup>	Residential	1 hr
	150 µg/m <sup>3</sup>	Industrial	24 hr
	100 µg/m <sup>3</sup>	Residential	24 hr
	80 µg/m <sup>3</sup>	Industrial	1 yr
	50 µg/m <sup>3</sup>	Residential	1 yr
Nitrogen Oxides (measured as NO <sub>2</sub> )	400 µg/m <sup>3</sup>	Industrial	1 hr.
	200 µg/m <sup>3</sup>	Residential	1 hr.
	150 µg/m <sup>3</sup>	Industrial	24 hr



ENVIRONMENTAL AND SOCIAL AUDIT OF KPONE LANDFILL SITE

Substance	Time Weighted Average (TWA)		Averaging Time
	60 µg/m <sup>3</sup>	Residential	24 hr
Nitrogen Oxides (measured as NO <sub>2</sub> )	400 µg/m <sup>3</sup>	Industrial	1 hr.
	200 µg/m <sup>3</sup>	Residential	1 hr.
	150 µg/m <sup>3</sup>	Industrial	24 hr
	60 µg/m <sup>3</sup>	Residential	24 hr
Total Suspended Particulate	230 µg/m <sup>3</sup>	Industrial	24 hr
	150 µg/m <sup>3</sup>	Residential	24 hr
	75 µg/m <sup>3</sup>	Industrial	1 yr
	60 µg/m <sup>3</sup>	Residential	1 yr
PM <sub>10</sub>	70 µg/m <sup>3</sup>		24 hr
Smoke	150 µg/m <sup>3</sup>	Industrial	24 hr
	100 µg/m <sup>3</sup>	Residential	24 hr
	50 µg/m <sup>3</sup>	Industrial	1 yr
	30 mg/m <sup>3</sup>	Residential	1 yr
Carbon Monoxide	100 mg/m <sup>3</sup>		15 min
	60 mg/m <sup>3</sup>		30 min
	30 mg/m <sup>3</sup>		1 hr
	10 mg/m <sup>3</sup>		8 hr
Hydrogen Sulphide	150 µg/m <sup>3</sup>		24 hr
Mercury	1 µg/m <sup>3</sup>		1 yr
Lead	2.5 µg/m <sup>3</sup>		1 yr
Cadmium	10 - 20 ng/m <sup>3</sup>		1 yr
Manganese	1 µg/m <sup>3</sup>		24 hr
Dichloromethane (Methylene Chloride)	3 mg/m <sup>3</sup>		24 hr
1,2-Dichloroethane	0.7 mg/m <sup>3</sup>		24 hr
Trichloroethane	1 mg/m <sup>3</sup>		24 hr
Tetrachloroethene	5 mg/m <sup>3</sup>		24 hr
Toluene	8 mg/m <sup>3</sup>		24 hr

Substance	Time Weighted Average (TWA)		Averaging Time
Arsenic	30 ng/m <sup>3</sup>	Industrial	24 hr
	15 ng/m <sup>3</sup>	Residential	24 hr
Flouride	10 µg/l		24 hr

Table 2-3: National Ambient Noise Level Guideline (NANLG)

Zone	Description of Area of Noise Reception	Permissible Noise Level in Db(A)	
		Day (0600 – 2200)	Night (2200 – 0600)
A	Residential areas with low or infrequent transportation	55	48
B1	Educational (school) and health (hospital, clinic) facilities	55	50
B2	Areas with some commercial or light industry	60	55
C1	Areas with some light industry, places of entertainment or public assembly, and places of worship located in this zone	65	60
C2	Predominantly commercial areas	75	65
D	Light industrial areas	70	60
E	Predominantly heavy industrial areas	70	70

### 3. Baseline Environmental and Social Information

#### 3.1 Project Location

The Kpone Engineered Landfill is located about 5 km northeast of the Tema city center at latitude 5.7041° N and longitude 0.0288° E. The area in which the site is located is within the geographical boundaries of the Kpone Katamanso Municipal Area. However, the landfill is owned by the Tema Metropolitan Assembly and is operated by Waste Landfills Ltd. Fig. 3.1 presents a location map of the waste disposal facility.

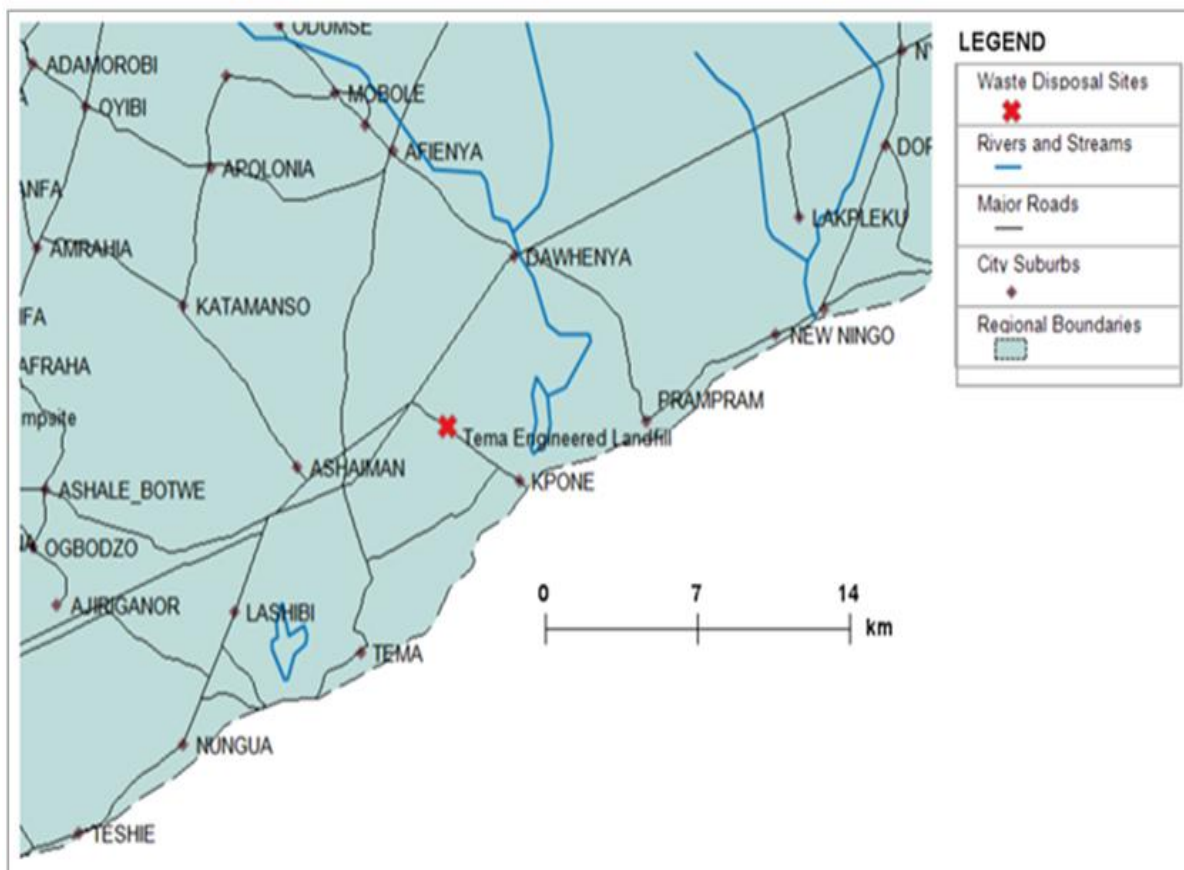


Fig. 3.1 Location map of Kpone engineered landfill

The major road in the area is the Aflao-Tema highway. An access road therefore links the site with the highway. The site is also connected to the main road leading to the Kpone township

#### 3.2 Biophysical Environment

##### 3.2.1 Climate

The Kpone Katamanso Municipal Area lies within the dry equatorial climatic zone which occurs along the middle to eastern coast of Ghana including the Greater Accra, Central and Volta regions. This climatic zone experiences a double maxima rainfall. Table 3.1 presents monthly climatic data for the geographical area ([www.ghanahydrodata.com](http://www.ghanahydrodata.com)).

Table 3.1 Monthly climate data

Month	Rain	Min Temp	Max Temp	Humidity	Wind
	mm	°C	°C	%	Km/day
January	11	22.7	30.5	86	147
February	22	23.8	31.1	86	190
March	56	24.3	31.1	87	190
April	100	24.3	31.1	88	173
May	132	23.8	30.5	88	147
June	215	23.2	28.8	90	147
July	67	22.7	27.2	89	173
August	28	21.7	26.7	91	207
September	72	22.7	27.2	89	216
October	62	23.2	29.3	89	173
November	28	23.8	30.5	87	147
December	18	23.8	31.1	88	147

### 3.2.2 Geology and Soils

The geology of the area can be categorized as Precambrian Dahomeyan schist, grandiorites, granites gneiss and amphibolites to late Precambrian Toga series of mainly quartzites, phyllites, phyllonites and quartz breccias. Other formations are the palaeozoic Accraian sediments sandstones, shales, and shales with gypsum lenses. All the units of the Accraian have been subjected to major faulting and jointing.

The soil types in the area are sandy, clayey, humus soils and suitable for farming activities. The underlying rocks are principally hard Togo quartzites and schists and hard Dahomean schists and genesis.

### 3.2.3 Hydrology

The landfill site is located within the catchment of the Gyrokorgyor stream which flows in a south eastern direction into the Gao lagoon. These water bodies are however situated more than 1 km from the disposal site. Unconfined aquifers in this lithology have good attenuation capacity due to clayey nature of the overburden. There are low infiltration rates and occurrence of groundwater at moderate depths. Groundwater vulnerability in the Dahomeyan formation is generally considered as low (GSD-BGR, 2005).

### **3.3 Socio-Economic and Cultural Environment**

#### **3.3.1 Demographic Information**

The population of Kpone-Katamanso Municipality, according to the 2010 Population and Housing Census, is 109,864 representing 2.7 percent of the region's total population. Males constitute 48.7 percent and females represent 51.3 percent. About 90.4 percent of the population live in urban localities. The district has a sex ratio of 88.9. The population of the district is youthful (under 15 years) (34.5%) depicting a broad base population pyramid which tapers off with a small number of elderly persons 60 years and above (3.4%). The total age dependency ratio for the District is 58.1, the dependency ratio in the rural localities is higher (58.7) than that of the dependency ratio in the urban areas (58.0)

#### **3.3.2 Household Size and Composition**

The municipality according to the 2010 census had a total number of 24,800 households. The average household size in the district is 4.0 persons per household. Children constitute the largest proportion of the household members accounting for 38.4 percent. Spouses form about 12.6 percent while other relatives constitute 9.2 percent. Nuclear (head, spouse(s), children) constitute 30.4 percent of the total number of households in the district and this is followed by Extended households (head, spouse(s), children and head's relative) (21.3%).

#### **3.3.3 Literacy and Education**

Of the population 11 years and above, 90.7 percent are literate and 9.3 percent are non-literate according to the 2010 Census. The proportion of literate males is higher (94.7 %) than that of females (87.0%). About five out of ten people (49.3%) indicated they could speak and write both English and Ghanaian languages. Of the population aged 3 years and above (100,670) in the district, 8.7 percent has never attended school, 36.6 percent are currently attending and 54.7 percent have attended in the past.

#### **3.3.4 Economic Activity Status**

About 75.1 percent of the population aged 15 years and older are economically active while 24.9 percent are economically not active according to the 2010 Census. Of the economically active population, 91.6 percent are employed while 8.4 percent are unemployed. For those who are economically not active, a larger percentage of them are students (53.3%) and 23.7 percent perform household duties. Again, about 51.9 percent of the unemployed are seeking work for the first and available for work.

Of the employed population, about 31.2 percent are engaged as service and sales workers, 23.2 percent in craft and related trade and 12.0 percent in Elementary occupations. About 15.9 percent are engaged as managers, professionals, and technicians. Of the employed population 15 years and older 46.0 percent are self-employed without employees, while 2.9 percent are contributing family workers. About 7.2 percent are self-employed with employees and 36.9 percent are employees. The private informal sector is the largest employer in the district, employing 70.5 percent of the population followed by the public sector with 7.4 percent.

### 3.3.5 Waste Scavenging at Kpone Landfill

There is a significant presence of scavengers at the Kpone engineered landfill. These scavengers belong to the Tema Landfill Recyclable Waste Pickers Association. Their activities to a large extent interfere with the site operations especially at the working face as depicted in Figure 3.2. The materials recovered from the waste dump are largely made up of plastics. These are stored near the landfill prior to conveyance to the end-use markets.



Fig. 3.2 Waste scavengers at working face



Fig. 3.3 Storage of recyclables near landfill



This year landfill managers with the assistance of an NGO organized an Occupational Health and Safety training for the waste pickers in Year 2018. Figure 3.4 presents photographs of the activity.



Fig. 3.4 TMA landfill officer addressing the waste pickers

Despite the cordial relationship between the landfill operators/managers there seems to be no formal grievance redress system to take into account any problems and concerns raised by individuals or groups affected by the landfill O&M activities.



## 4. Review of Facility Design and Management Arrangements

### 4.1 Review of Landfill Engineering Design

#### 4.1.1 Design Waste Volumes

The projected annual waste volumes that were used by the design consultants, Messrs Tahal/MDC, to determine the landfill area requirements for the 25-year design horizon are provided in Table 4.1.

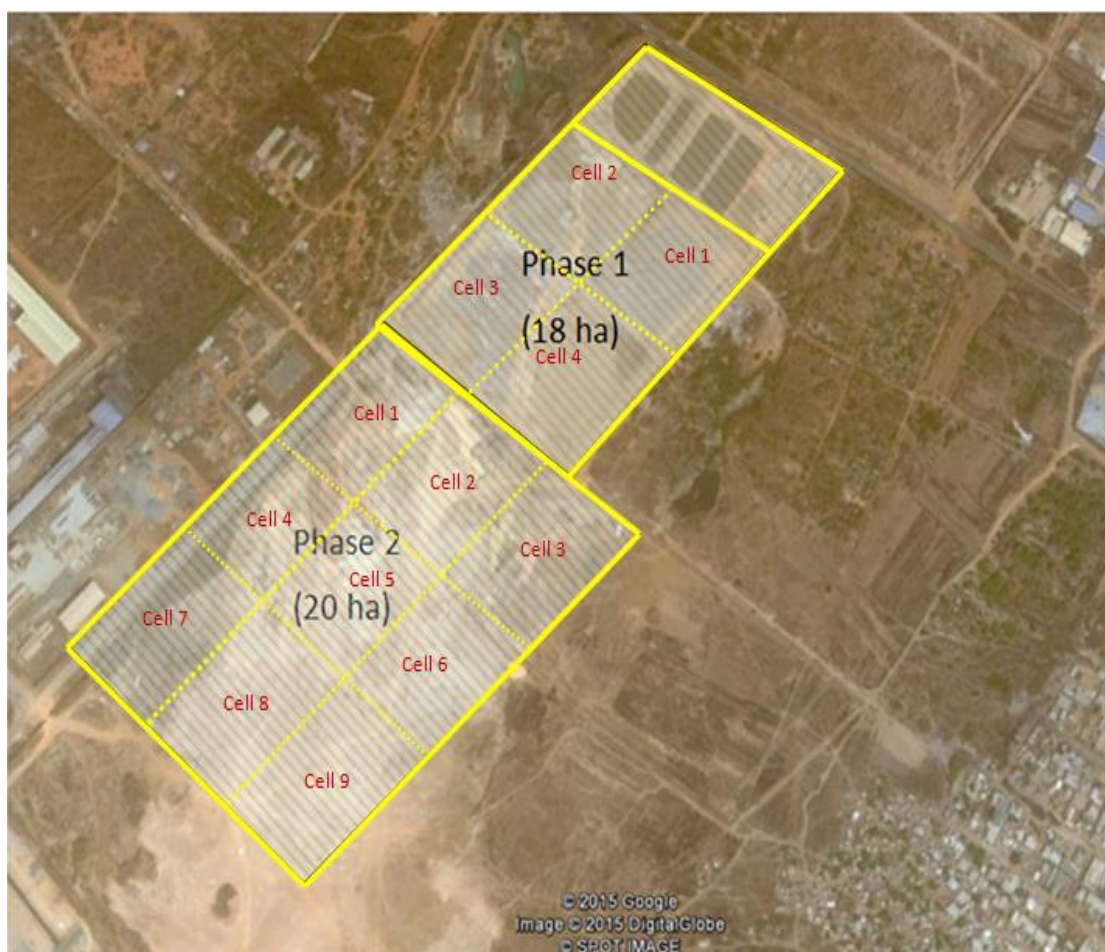
Table 4.1 Projected design waste volumes

Year	Annual Mass (tonne)	Accumulated Volume (m <sup>3</sup> )	Waste & Soil Volume (m <sup>3</sup> )
1	111,500	123,889	142,472
2	114,845	251,494	289,218
3	118,737	383,424	440,938
4	123,204	520,317	598,365
5	128,280	662,850	762,278
6	134,002	811,741	933,502
7	140,408	967,750	1,112,913
8	147,543	1,131,687	1,301,440
9	155,453	1,304,412	1,500,074
10	164,191	1,486,846	1,709,873
11	173,812	1,679,970	1,931,966
12	184,379	1,884,836	2,167,561
13	195,958	2,102,567	2,417,952
14	208,623	2,334,370	2,684,526
15	222,450	2,581,537	2,968,768
16	237,528	2,845,457	3,272,276
17	253,947	3,127,620	3,596,763
18	271,809	3,429,630	3,944,075
19	291,223	3,753,211	4,316,193

20	312,306	4,100,218	4,715,251
21	335,187	4,472,648	5,143,545
22	360,004	4,872,652	5,603,550
23	386,906	5,302,547	6,097,929
24	416,054	5,764,829	6,629,553
25	447,625	6,262,190	7,201,519

#### 4.1.2 Design Landfill Area

The total land area required to meet the waste and cover soil volume requirement of 7,205,519 m<sup>3</sup> for the 25-year design horizon was determined to be 38 ha at the design stage (Tahal/MDC, 2005).



**Fig 4.1: Land area footprint for Phases 1 and 2 (not drawn to scale)**

The Kpone engineered landfill was planned to be developed in two phases shown in Figure 4.1:

- Phase 1 – An 18 ha land area that would have 4 cells and other facilities. Each of these cells would have a dimension of 175m by 145m. This initial phase would have an available void and airspace of about 1.5 million m<sup>3</sup> and would be operational for between 8 and 10 years. This section is currently bounded by a temporary fence.
- Phase 2 – A 20 ha land area that would have 9 cells. This area was not fenced and no engineering works was done on this section on land during the construction stage.

It is imperative to note that Phase 2 could not be implemented as the land demarcated for that purpose has been re-zoned by the TDC as an industrial area and has been consequently allocated to a private developer for the construction of a tile factory.

#### 4.1.3 Comparison of Design and Actual Waste Placement

Figure 4.2 presents a comparison of the design and the actual waste volumes. The total waste placement in December 2018 after 6 years of operation was 1,771,493 tonnes. This corresponds to a projected design waste placement for a 13-year period and having a combined waste and soil volume of 2,417,952 m<sup>3</sup>.

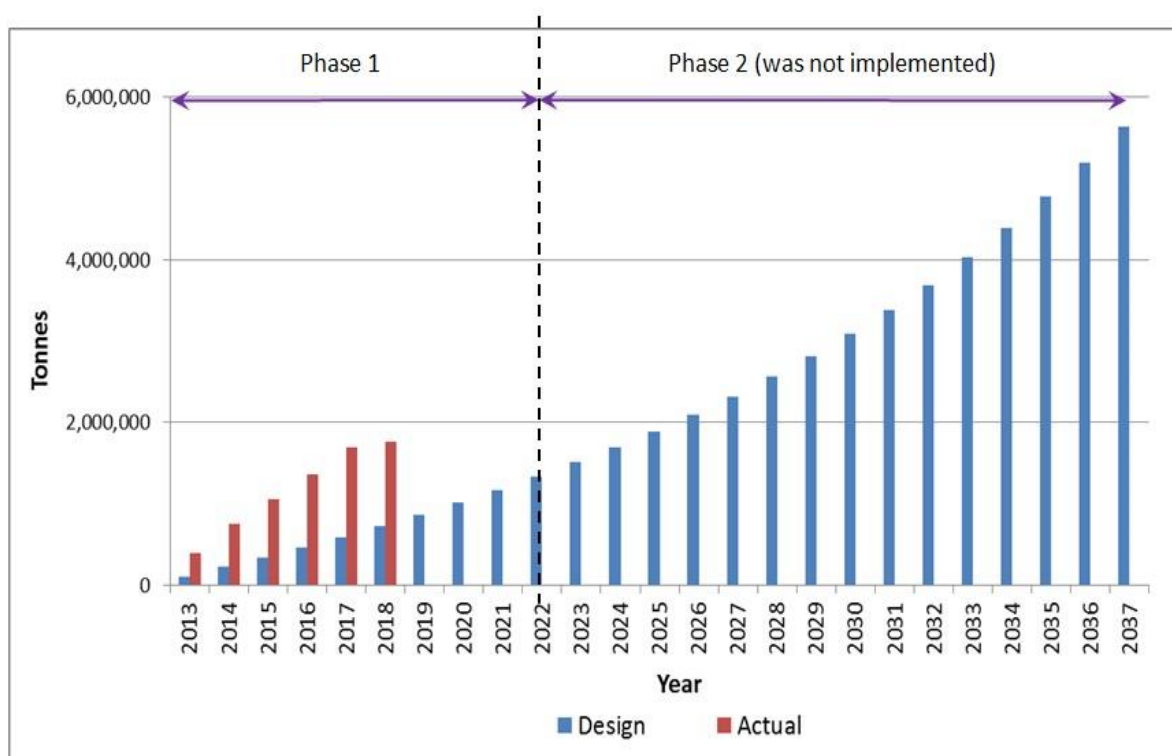
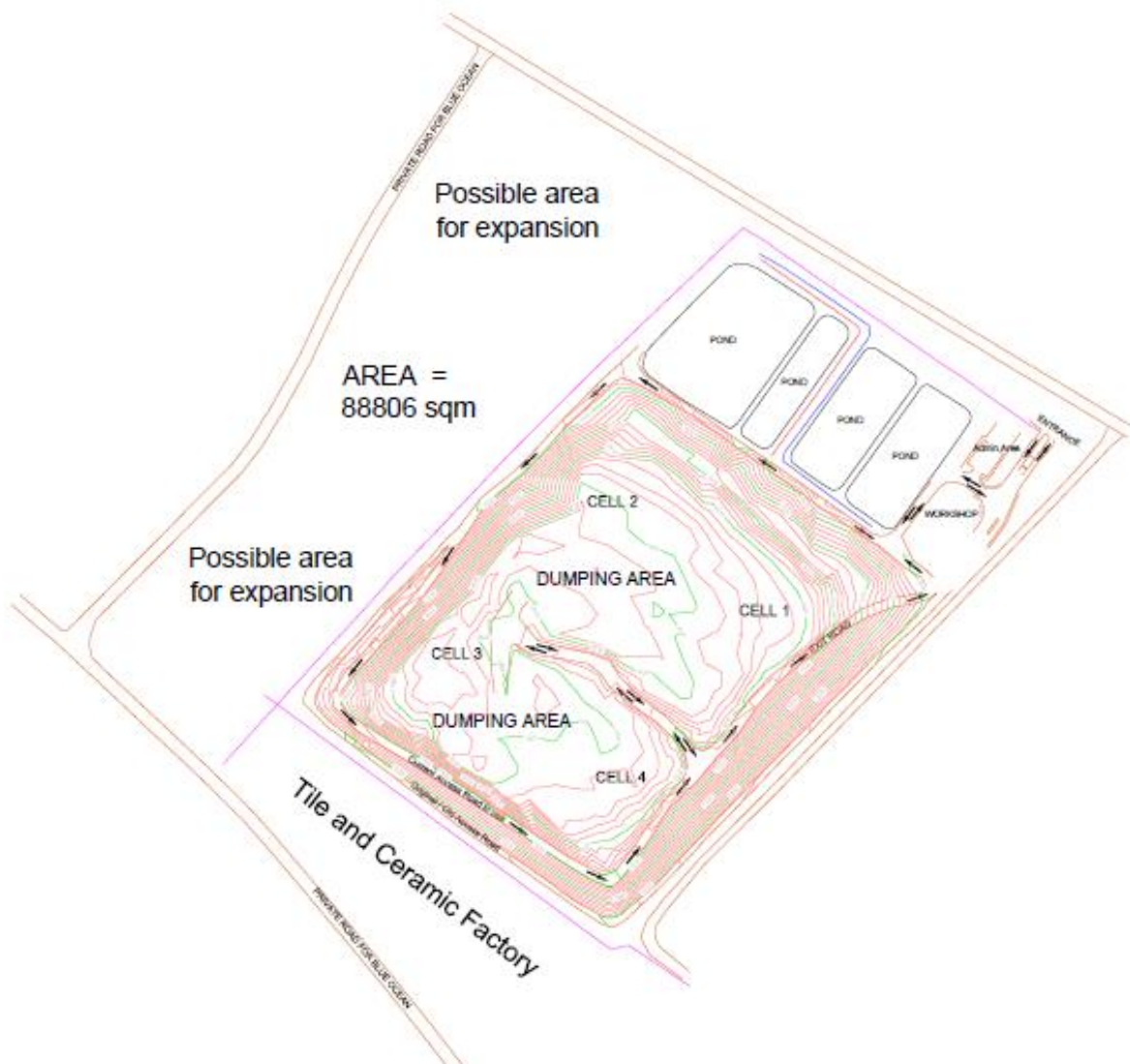


Fig. 4.2 Design and actual cumulative waste placement

#### 4.2 Topographical Survey and Void Space Filling Analysis

A topographic survey was undertaken at the Kpone landfill on 24th December 2018 in order to prepare landform contour maps, cross section profiles and determine the fill volumes of the landfill cells. A total of 330,953 sqm (81.8 acres) of land was surveyed. The survey covered the current operational land fill area and proposed area for expansion. A summary of the findings from the topographical survey are as indicated:

- Unlike in 2015 where individual cells could be clearly demarcated, all four cells have currently merged.
- The original access road has been abandoned and new one created running through cell 3 and exiting on cell 1.
- The floor area for the cumulative individual cells has increased from 2015 to 2018 by 6,254 sqm. (i.e. taking advantage of the areas in between cells).
- However, the top area has reduced from 2015 to 2018 by 26,510 sqm (i.e. landfill approaching the final conical shape with some flattening at the top).
- Due to merging of all four cells, individual fill volumes for each cell cannot be computed.
- However, an additional 1,025,501.94 cubic of waste has been added from 2015 to 2018.

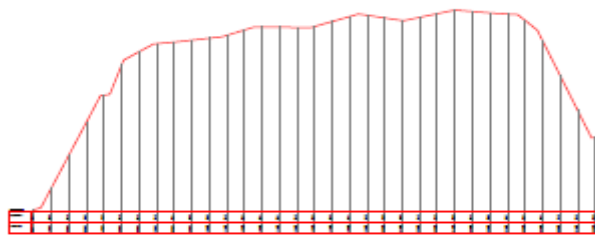


**Fig. 4.3: Contour map of landfill cells and adjoining areas**

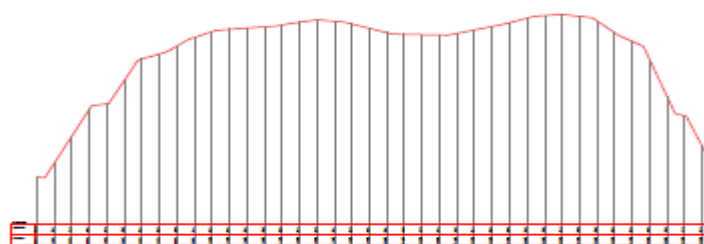
Figure 4.3 and Figure 4.4 show the contour map and cross section profiles respectively of the landfill site. Table 4.2 illustrates the fill levels and heights compared to the design fill heights.

(clear indication of land fill approaching its full design capacity). The detailed topographical survey drawings are provided in Annex B.

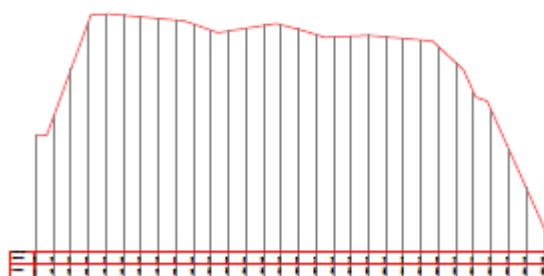
CELL1 - CELL2 Typical Section



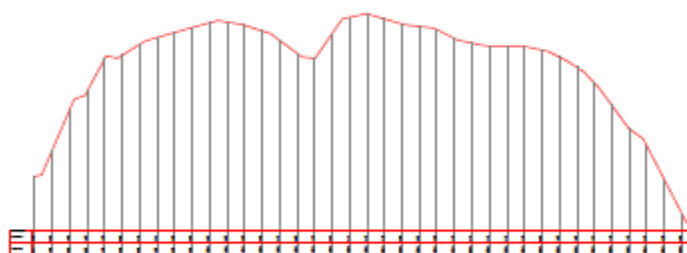
CELL2 - CELL3 Typical Section



CELL3 - CELL4 Typical Section



CELL4 - CELL1 Typical Section



NOTE - The dip between CELL4 and CELL1  
is the location of the current access road to  
the top

**Fig. 4.4: Cross-section profiles of landfill cells****Table 4.3: Formation, fill levels and heights for landfill cells**

Cell	Formation Level (m)	Current Fill Level (m)		Current Height	
		2015	2018	2015	2018
Cell 1	58	74	82	16	24
Cell 2	63	74	86	11	23
Cell 3	66	74	87	8	21
Cell 4	61	66	84	5	23

Cell	Formation Level (m)	Design Fill Height (m)	Variance (m) Available Airspace	
			2015	2018
Cell 1	58	24	8	0
Cell 2	63	24	13	1
Cell 3	66	24	16	3
Cell 4	61	24	19	1

Figure 4.5, Figure 4.6, Figure 4.7 and Figure 4.8 present photographs of the airspace utilization of the four cells respectively.





**Figure 4.5: Landform of Cell 1**



**Figure 4.6: Landform of Cell 2**



**Figure 4.7: Landform of Cell 3**

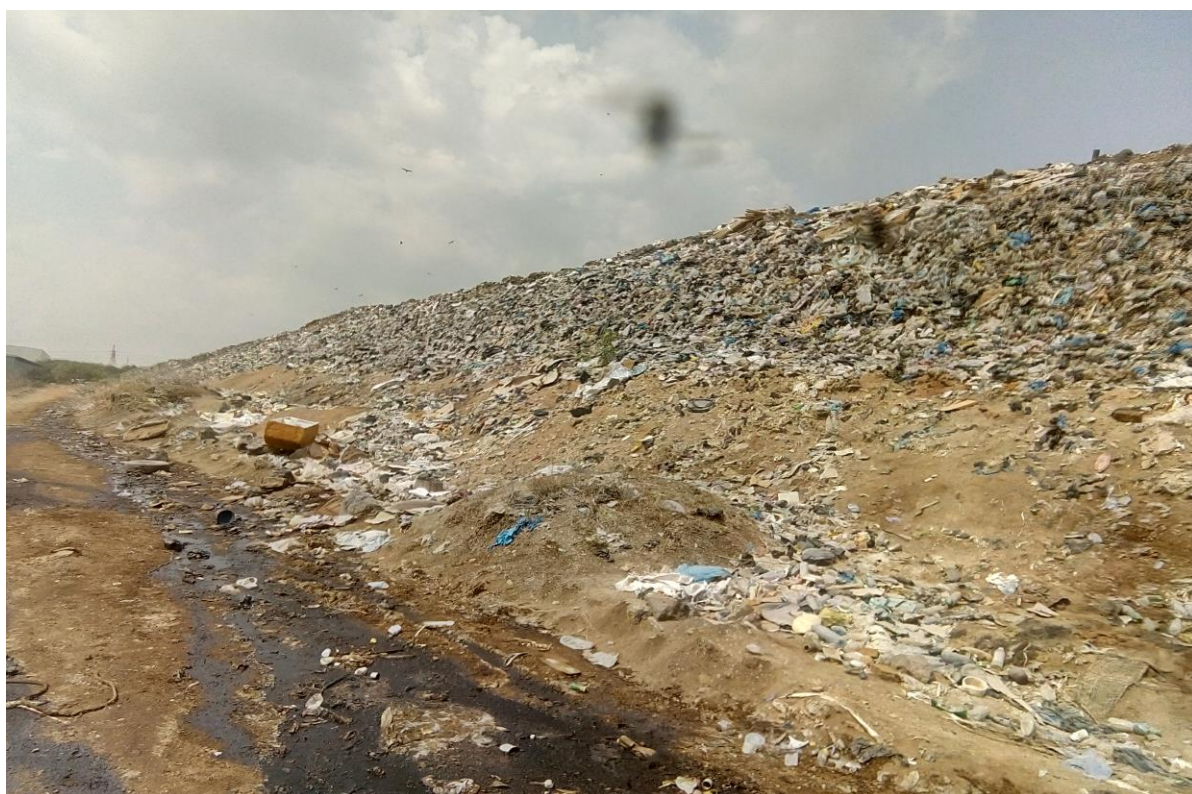




Figure 4.8: Landform of Cell 4

### 4.3 Review of Institutional/Management Arrangements (Planned & Actual)

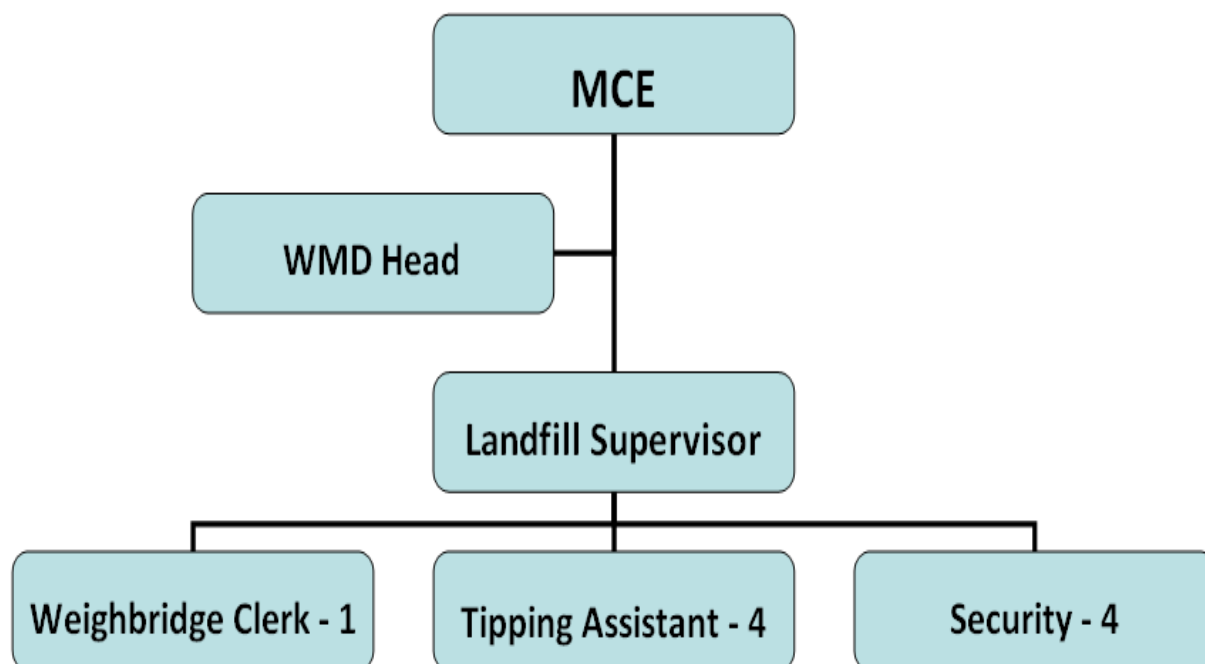


Fig. 4.9: TMA oversight structure

#### 4.3.1 Assessment of TMA's Oversight Structure

The TMA's oversight structure is presented in Figure 4.9. It consists of the following:

- Metropolitan Chief Executive - The Metropolitan Chief Executive as the political head of TMA has the final authority and responsibility for the proper management of the Landfill. All correspondences are addressed to his office.
- The Head of TMA Waste Management Department (WMD) - The Head of Waste Management Department is responsible for the day to day management of the Landfill. He is responsible for reviewing daily, weekly and monthly reports submitted on the Landfill. He is also responsible for authorizing TMA's Landfill expenditures for payment. He reports weekly on the Landfill operations at the Assembly's Heads of Department Weekly Management Meeting and prepares Quarterly Waste Management Department reports which incorporates the landfill activities.
- Landfill Supervisor - The Landfill Supervisor is responsible for supervising the activities of both TMA and the Operator at the landfill. He is responsible for ensuring the recording and compilation of daily reports on all activities on the Landfill. He technically supports the Operator in the performance of its operations and maintenance functions. The Supervisor is responsible for submitting all daily, weekly and monthly reports to the Head, Waste Management Department.
- Weighbridge Clerk - The Weighbridge Clerk is responsible for the complete, detailed and accurate recording of all waste discharged at the landfill. He also categorizes the waste for the purpose of charging user fees.

- Tipping Assistants - The Tipping Assistants assist and guide service providers to dump their waste in appropriate designated areas according to daily schedules of work on the Landfill.
- Security - TMA maintains twenty four (24) hours security on the landfill to ensure adequate security at all times. It operates day and night security availability in accordance with international landfill management security practices.

#### 4.3.2 Review of Private Contractor's Oversight Arrangements

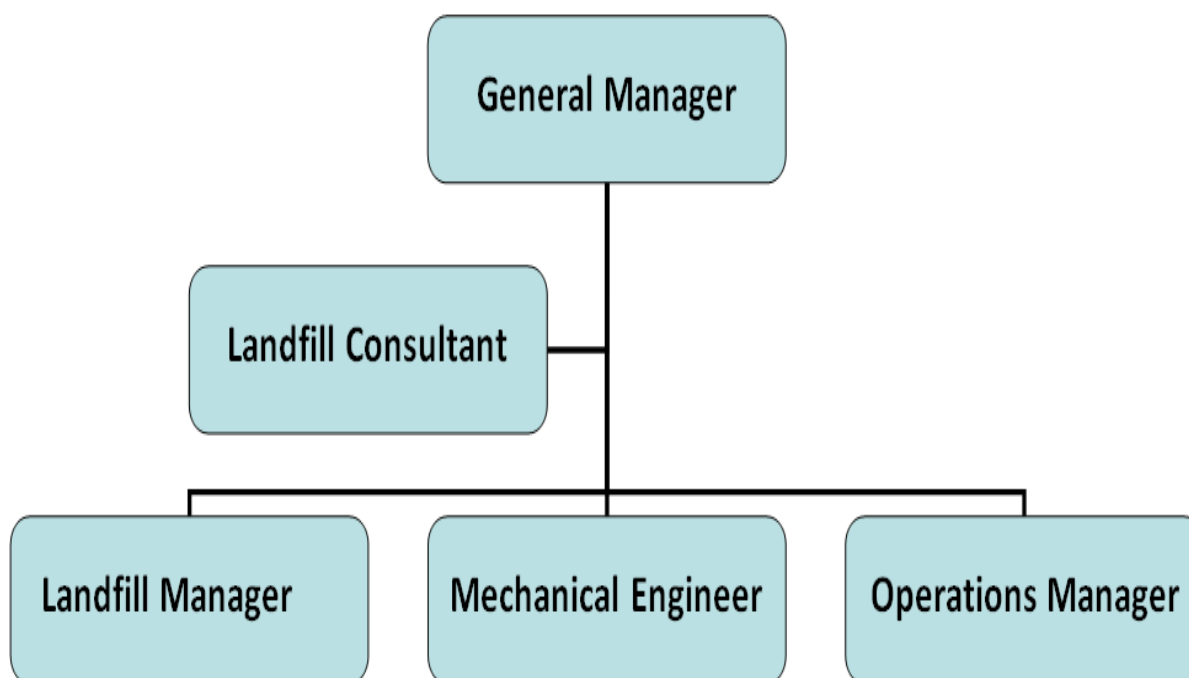


Fig. 4.10: Waste Landfills Ltd oversight structure

The oversight structure for the operator, Waste Landfills Ltd., is presented in Figure 4.10. It consists of the following:

- General Manager - The General Manager has overall responsibility for the operations of the Landfill. He is in charge of the direct supervision of the Landfill Manager and gives weekly directions of operations, authorizes expenditures and arranges for the provision of weekly logistics for operations. The General Manager reviews daily, weekly and monthly Landfill reports and advises on future actions. He is responsible for liaising with TMA for the resolution of operational and financial issues.
- Landfill Manager - The Landfill Manager is responsible for the day to day management of both technical and managerial operations of the Landfill and the compilation of all activity reports on the operations. He reports to the General Manager.
- Mechanical Engineer - The Mechanical Engineer is responsible for ensuring the availability of equipment at all times for the efficient handling of the waste discharged. He supervises the mechanics who carry out repairs and maintenance of equipment on site.

- Operations Manager - The Operations Manager is responsible directing and supervising the discharge, spreading, compacting, filling and covering of waste on the Landfill. He ensures the filling of cells to ensure optimum utilization of space on the landfill.

A review of the oversight structures for TMA and the Contractor show that each entity's structure is adequate for meeting its own set objectives. However, the parties do not have a common platform for periodic joint reviews, discussions and resolution of pressing issues for effective management of the site. The coordinating activities and resolution of pressing matters are poor and potentially affect the smooth operations of the Landfill.

## 5. Assessment of O&M Management Procedures and Practices

### 5.1 Comparative review of optimal, design, and planned on-site practices

The design consultants M/S TAHAL/MDC prepared an Operations and Maintenance (O&M) Plan for the Kpone landfill. Table 5.1 presents a comparison of these planned requirement procedures in the O&M Plan with the Ghana Landfill Guidelines and the Service Contract. The planned procedures were to a large extent compliant with the requirements in the Ghana Landfill Guidelines (2002).

**Table 5.1: Comparison of requirements for O&M activities**

<b>Description</b>	<b>Operators' Procedures</b>	<b>Planned Service Requirements</b>	<b>Contract Ghana Landfill Guidelines Requirements</b>
Waste acceptance and registration	The weight of the incoming waste as well as other characteristics such as the source and type of waste should be noted on a daily basis.	Inspection of wastes. The weight of the incoming waste as well as other characteristics such as the source and type of waste should be noted on a daily basis	Preliminary visual or random detailed inspection for unauthorized waste types. Registration of incoming waste loads.
Waste deposition and compaction	Waste shall be spread in layers with thickness between 30 – 40 cm. Compaction shall be done by 6 – 8 passes over waste material.	Waste should be built up to a compacted height of 2m. Waste shall be spread into thin layers up to 0.3 m.	Waste shall be deposited in thin layers no more than 0.6m in depth and compacted.
Working face management	Working face shall be sufficiently wide to all six vehicles to unload simultaneously. Foremen should control vehicle maneuvering.	Should be kept as small as possible compatible to a maximum height of 2 m in order to minimize the area of waste exposed during the operating day.	Daily working area shall be kept as small as possible in order to minimize the area of waste material exposed during the operating day.
Special Wastes	Specific measures prescribed for co-disposal of bulky items, dead animals and carcasses, mud, sludge and waste oils.	Separate cells shall be allocated at the landfill where hazardous waste, chemicals and carcasses of dead animals are disposed of.	Separate cells shall be allocated at the landfill where hazardous waste, chemicals and carcasses of dead animals are disposed of.
Cover material	Daily cover material of thickness 15 – 20 cm should be applied. Intermediate cover should be 30 cm thick.	Waste shall be covered with 15 cm thick top soil at intervals not more than one week. Intermediate cover of 25- 35 cm applied at areas unused for more than a month.	Daily cell cover should have a thickness of 0.1 - 0.15m. Intermediate cover should be applied to all areas of fill not expected to be used for 3 months or more.
Environmental monitoring	Groundwater quality, surface water quality, leachate quality and landfill gas monitoring required.	None	Groundwater quality, surface water quality, leachate quality and landfill gas monitoring required.

Nuisance control	Litter, odour, dust, fire, noise and vermin control measures required.	Litter, odour, dust, fire, noise and vermin control measures required.	Litter, odour, dust, fire, noise and vermin control measures required.
Scavenging	Scavenging is prohibited. Recovery and separation of materials should be done using special equipment and methods like mobile separating platforms.	Scavengers should operate only at times and places designated so that they do not interfere with normal operations. An area shall be designated for temporary storage of recovered materials.	Scavengers should operate only at times and places designated so that they do not interfere with normal operations. An area shall be designated for temporary storage of recovered materials.
Record keeping	Waste input, daily activity summary, environmental monitoring records, personnel and equipment	Waste acceptance, personnel records, equipment inventory, equipment maintenance	Waste acceptance, personnel records, accidents, equipment inventory, equipment maintenance, environmental monitoring and up-to-date site maps
Staffing	Site manager, site supervisor, secretary, accounts officer, weighbridge attendant, gate controller, drivers labourers, equipment operators, maintenance mechanics, labourers, night watchman	Manager, assistant manager, supervisor, equipment operators, mechanical maintenance staff, gatekeepers, labourers and security men.	Site supervisor. 1 labourer per 100 tonne waste/ day
Health and safety for landfill staff	No requirements stipulated	Provision of PPEs, emergency procedures, HSE training, medical examinations, medical assistance, smoking restrictions, accident records	Provision of PPEs, emergency procedures, HSE training, medical examinations, medical assistance, smoking restrictions, accident records

## 5.2 Audit of site operations and maintenance procedures

An audit of the site operations and maintenance procedures were carried out using the planned procedures prescribed in the Operations and Maintenance (O&M) Plan and the specifications of the Service Contract as benchmarks. A compliance rating scheme adopted is described below:

- **Full compliance** – All the key performance indicators and industry benchmarks specified in the Operator's O&M Plan/Service Contract have been adhered to.
- **Partial compliance** – Only a few of the key performance indicators and industry benchmarks specified in the Operator's O&M Plan/Service Contract have been adhered to.
- **Non-compliance** - None of the key performance indicators and industry benchmarks specified in the Operator's O&M Plan/Service Contract have been adhered to.

Table 5.2 presents an evaluation of the current conditions. A comparison of the status quo conditions which the 2015 Technical Audit reveals that the weighbridge is now fully functional. However the use of cover material seems to be limited in recent times giving the facility an unsightly appearance.

The health and safety standards practiced on the site were found to be unsatisfactory. A few operational controls exist at the waste disposal facility even though the operator has not prepared detailed (formal) site safety and emergency response plans. Most significant is the use of provision of protective equipment by personnel and a few scavengers.

Photographs of the prevailing site operations and maintenance procedures are provided in Appendix C.

ENVIRONMENTAL AND SOCIAL AUDIT OF KPONE LANDFILL SITE

**Table 5.2: Evaluation of prevailing site operations and maintenance procedures**

Criteria	Year 2015	Year 2018	Evaluation of Status-Quo
Waste acceptance and registration.	The weighbridge was out of service and refuse vehicles are therefore not weighed. Vehicles are also not inspected for unauthorized waste.	The weighbridge at the landfill is functional. However, vehicles are not inspected for unauthorized waste.	There is partial compliance with this requirement.
Waste deposition and compaction	The waste is spread out and compacted with a crawler tractor fitted a landfill-blade and occasionally with a landfill compactor.	The waste received on the working face is spread out and compacted with heavy landfill machinery including crawler tractor fitted a landfill-blade.	There is partial compliance with this requirement. The unavailability of a landfill compactor implies compromised density of placed waste.
Working face management	A large working face is operated on making the area for placement of refuse very unsightly. An orderly movement (entry to the landfill and exit from tipping face) of refuse collection vehicles was observed.	A large working face is operated on making the area for placement of refuse very unsightly. An orderly movement (entry to the landfill and exit from tipping face) of refuse collection vehicles was observed.	There is partial compliance with this requirement. Minimum requirements have been met. However this could be further improved by controlling the activities of scavengers during unloading of wastes materials.
Leachate Management	Leachate collected in a sump at the base of the landfill cell and pumped to the waste stabilization ponds for treatment.	Leachate seeping out of the waste mass. The pumping system to the waste stabilization ponds is non-functional.	Non-compliance with regards to this requirement. The lack of treatment means the uncontrolled leachate flows constitute a very serious surface water and groundwater pollution risk.
Special Wastes	Precautionary measures such as covering with lime which is required for co-disposal of special wastes were not being observed.	Precautionary measures such as covering with lime which is required for co-disposal of special wastes were not being observed.	Non-compliance with regards to this requirement. It was observed that the special waste cell has some structural defects and damage to the liner.
Cover material	Daily cover is not applied on the placed waste. However, periodic covering is adhered to and was on-going at the time of initial visits.	Neither daily nor periodic cover is applied on the placed waste. The cover material used is usually obtained from nearby borrow pit.	There is non-compliance with this requirement. There is cover material stockpiled at the site and additional quantity can be borrowed near the site.

# ENVIRONMENTAL AND SOCIAL AUDIT OF KPONE LANDFILL SITE

Environmental monitoring	Groundwater and leachate monitoring is done every 6 months by the GAEC	No records of groundwater and leachate monitoring available at the site office.	There is non-compliance with this requirement.
Scavenging	There are a large number of scavengers on the landfill site. The operation of the scavengers intruded on working face activities. The scavengers wore rudimentary protective clothing. The recovered materials were stored at designated locations near to the landfill site.	There are a large number of scavengers on the landfill site. The operation of the scavengers intruded on working face activities. The scavengers wore rudimentary protective clothing. The recovered materials were stored at designated locations near to the landfill site.	Non-compliance with regards to the prohibition of scavenging activities could due to the fact that the conveyor belt system for separation and recovery of materials was not procured. However, scavenging could be better organized especially with regards to interference with heavy equipment.
Nuisance control	Open burning of waste is not allowed. There are no mobile litter fences.	Open burning of waste is not allowed. There are no mobile litter fences.	There is partial compliance with this requirement. Litter control procedures are unsatisfactory. The inability to use daily cover means odour, vermin and bird control requirements are not fully being adhered to.
Record keeping	Records on daily waste inflows tonnage and equipment use and maintenance are kept.	Records on daily waste inflows tonnage and equipment use and maintenance are kept.	There is partial compliance with this requirement.
Staffing	2 site supervisors, 2 bulldozer operators, 2 compactor operators, I excavator operator, 2drivers, 2 mechanics, 1 electrician, 2 data clerks, 4 labourers, 3 flagmen and 5 security men	2 site supervisors, 2 bulldozer operators, 2 compactor operators, I excavator operator, 2drivers, 2 mechanics, 1 electrician, 2 data clerks, 4 labourers, 3 flagmen and 5 security men	There is full compliance with this requirement.
Health and safety for landfill staff	Provision of PPEs, medical assistance, smoking restrictions, accident records	Provision of PPEs, medical assistance, smoking restrictions, accident records	There is partial compliance with this requirement.



## 6. Stakeholder Consultations

### 6.1 Stakeholder Identification

The identification of stakeholders/frontline actors involved in the operations and maintenance management, regulation and enforcement management at the Kpone landfill was an integral part of this study. Table 6.1 lists these stakeholders and their specific interests or relationships with the operation of the waste disposal facility.

**Table 6.1 Stakeholder map**

Stakeholder	Interest/Relationship
Ministry of Sanitation and Water Resources (MSWR)	The MSWR is responsible for the implementation of the sanitation and water related policies and plans in the country.
Tema Development Corporation (TDC)	The TDC is the custodian of all lands in the Tema Metropolis. Its role has been the allocation of the land for the construction of the Kpone landfill.
Tema Metropolitan Assembly (TMA)	TMA is the owner of the landfill. The TMA Waste Management Department and has oversight responsibility for the operation and maintenance of the facility. TMA is responsible for fixing annual user fees for all categories of waste.
Kpone Katamanso Municipal Assembly (KKMA)	The Kpone landfill and adjoining areas which could potentially be utilized for expansion works are within the geographical boundaries of KKMA.
Zoomlion Ghana Ltd (ZGL)	ZGL was the operator of the landfill from January 2013 till May 2014.
Waste Landfill Ltd (WLL)	WLL has since November 2014 till date been responsible for managing the weighbridge, billing and collection of user fees. It is required to pay prescribed franchise fees to TMA.
Environmental Protection Agency (EPA)	The EPA has the statutory responsibility to ensure that all Landfill operations are carried in regulated manner which comply with environmental protection regulations and other discharge standards.
Environmental Service Providers Association (ESPA)	ESPA is the umbrella body of all service providers in Ghana with a current membership of more than 200 country-wide.
Ghana Free Zones Board (GFZB)	The GFZB currently has no direct responsibilities in the management of the landfill. However, the GFZB facilitated and had oversight responsibility for the initial Environmental Impact Assessment (EIA) studies for the Kpone Landfill as part of the Ghana Trade and Investment Gateway Project.
Kpone Landfill Waste Pickers Association	This is a cooperative association for the waste pickers on the landfill site.

## 6.2 Stakeholders Consulted

It was not possible to consult all the relevant stakeholders prior to the preparation of this interim report due to time constraints. The frontline actors consulted till date includes the Ministry of Sanitation and Water Resources and the Tema Metropolitan Assembly. A chronology of engagements undertaken is presented in Table 6.2.

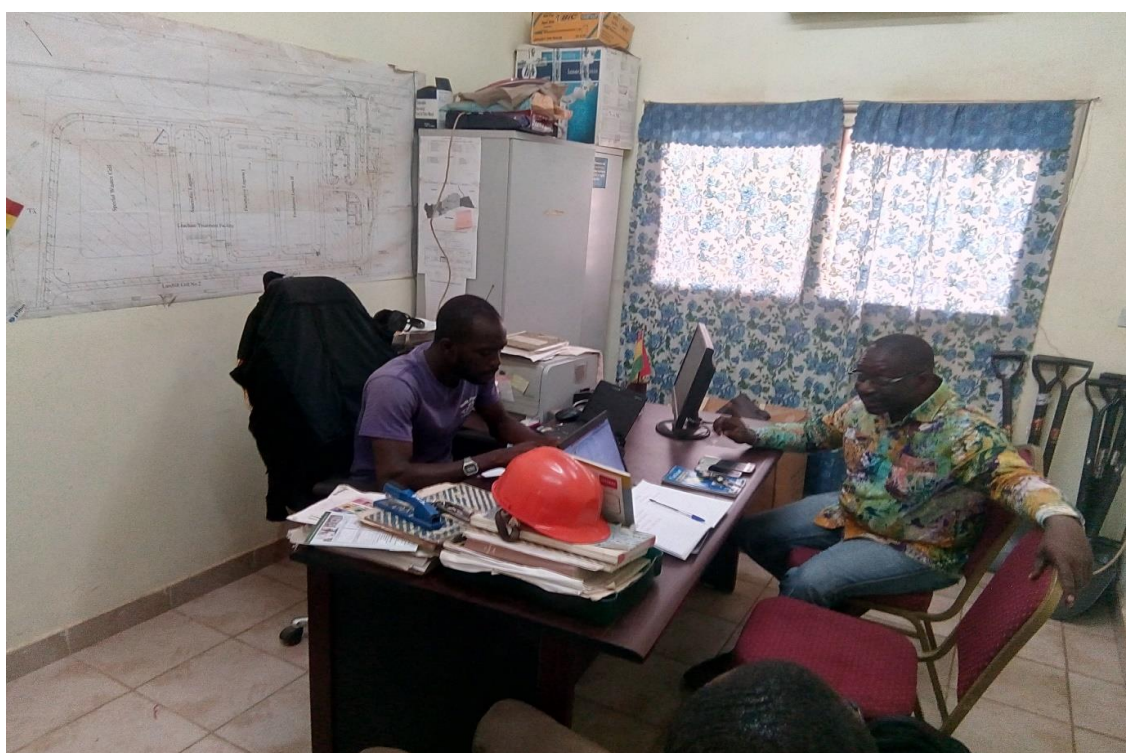
**Table 6.2 List of stakeholder engagements**

Meeting ID	Description of Public/Stakeholder Engagement	Date
Meeting 1	Meeting with TMA landfill site representative	20/12/2018
Meeting 2	Meeting with TMA WMD Director	20/12/2018
Meeting 3	Meeting with MSWR-EHSD Director	22/12/2018
Meeting 4	Meeting with TMA Coordinating Director	9/1/2019
Meeting 5	Meeting with TDC Planning Department	14/1/2019
Meeting 6	Meeting with TMA Chief Executive	14/1/2019
Meeting 7	Meeting with KKMA Coord. Director/EHD	14/1/2019
Meeting 8	Meeting with KKMA Chief Executive	17/1/2019
Meeting 9	Meeting with Deputy Minister for Energy	24/1/2019
Meeting 10	Meeting with Kpone Landfill Waste Pickers Association	22/02/2019

Figure 6.1 and 6.2 show interactions with technical staff at the MWSR and TMA respectively. Evidence of stakeholder interactions is provided in Annex D. A focus group discussion with members of the Kpone Landfill Waste Pickers Association was organized to solicit opinions on the challenges they face in their operations as well as those they anticipate in the event of closure of Kpone Landfill.



**Fig 6.1: Meeting at MSWR with Mr. Anthony Mensah**



**Fig 6.2: Meeting at Kpone landfill site with Mr. Ernest Nlasson and Mr. Anku**

### 6.3 Key Issues from Consultations

Table 6.2 below presents a summary of the major issues and concerns discussed at each of these engagements.

**Table 6.2 Summary of major issues from stakeholder engagements**

<b>Stakeholder</b>	<b>Issue</b>	<b>Response</b>
MSWR	Status of landfill operations at Kpone from MSWR perspective	The possibility of building additional cells is being considered.  Appeals have been made to the Office of the Chief of Staff with regards to acquiring adjoining parcel of land.
	Potential locations for waste disposal facilities to serve GAMA.	Ayidan (near ACARP) Otinbie (integrated waste treatment facility) Asutuare Junction (near monkey sanctuary) Tuba (owned by J. Stanley Owusu Co. Ltd)
TMA	Scope of Consultant's assignment	There is the need for PCUs of MSWR to keep beneficiary MMAs informed about all activities during all stages of the project life cycle within their administrative jurisdiction
	Ownership of engineered landfill and old dumpsite	There is an ongoing tussle with KKMA.
	Utilization of adjoining lands for additional cells (Parcel A)	TMA is considering the option of acquiring Parcel A from the new owners by payment of the appropriate compensation.
KKMA	Intended after use of Kpone engineered landfill	KKMA is seeking a partnership with German investors to commence a waste-to-synthetic diesel facility.
	Status of adjoining lands (Parcel A)	KKMA has not granted a permit to Coronation Real Estate Ltd. Its activities are therefore illegal.
	Status of lands near old Kpone dumpsite	KKMA intends to allocate the land for the construction of a composting facility
TDC	Status of adjoining lands (Parcel A)	The land has been sold to a private developer Coronation Real Estate Ltd due to inaction after the 2015 study.
	TDC's plans of allocating land for waste disposal	Portion of land near the old Kpone dumpsite has been earmarked as a future waste disposal site
MoE	Role in waste-to-catalytic diesel conversion at landfill	MoE led official delegation to explore project feasibility and associated matters
	Status of waste-to-catalytic diesel conversion at landfill	Project startup requirements have been concluded e.g. access-to-waste contracts and off-taker for products.
Kpone Landfill Waste Pickers	Role of Waste Pickers	Contributing to final waste placement reduction and recycling goals

ENVIRONMENTAL AND SOCIAL AUDIT OF KPONE LANDFILL SITE

Association	Health and Safety	Appropriate PPE clothing and equipment; need for site clinic for emergency treatment, waiting shed and washing/changing rooms
	Closure/Extension of Landfill	Extension of site to Parcel A will safeguard their livelihoods
	Site Operations	Lack of daily and intermediate cover is extending the working face as it is difficult for vehicles to tip within reasonable working space. Cover material available on site but no excavator/trucks for loading
	Recognition	Appeal for TMA to involve waste pickers in planning and decision making
	Access to credit	Government should be make available schemes for assisting waste pickers; existing small loans facility demand collateral that waste pickers do not have



## 7. Findings, Opinions and Recommendations

### 7.1 Proposed Measures for Kpone Landfill

#### 7.1.1 Improvements in Institutional Arrangements

##### Landfill Oversight Committee

It is recommended that a Joint Landfill Management Review Committee (JLMRC) be constituted to perform supervisory functions of the landfill operations. Table 7.1 the proposed composition of the oversight structure.

**Table 7.1 Composition of landfill oversight committee**

Entity	Representatives
Ministries, Departments and Agencies	Rep. MSWR/EHSD Rep MLGRD Rep. MESTI Rep. EPA Rep. TDC Rep. GFZB
Metropolitan, Municipal and District Assemblies	TMA Coordinating Director KKMA Coordinating Director Head, TMA Waste Management Department Head, KKMA Waste Management Department
Landfill Operator	General Manager Landfill Site Manager
ESPA	Executive Secretary

The specific functions should include the following:

- Review of Operator's Quarterly Landfill Reports
- Review of TMA's Head, Waste Management Department's Quarterly Landfill Reports
- Review of tariffs, fees etc.
- Quarterly review of void space and remaining lifespan of the Landfill
- Half –yearly Report of External Auditor/Evaluator ( see below)

- Mandatory preparation and submission of Oversight Committee Reports to the Minister, MLGRD through the ESHD.

### Independent Landfill Auditor

The appointment of an Independent Landfill Technical Auditor/Evaluator to undertake a half-yearly technical audit of the Landfill will enhance the M&E functions of the TMA-WMD. This will ensure that the Operator's activities are evaluated for timely compliance of all performance indicators and industry benchmarks. Figure 7.1 depicts the integration of the internal auditor in the existing institutional framework.

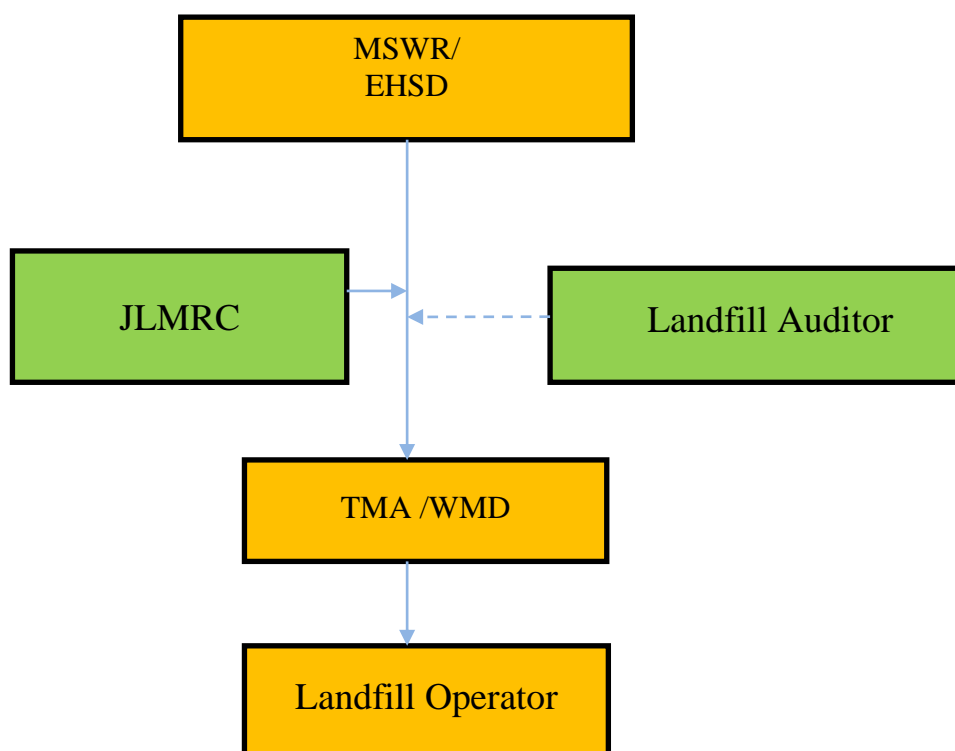


Figure 7.1 Proposed institutional arrangement for landfill management

#### 7.1.2 Improvement in Site O&M Management

Husbandry at the Kpone landfill generally leaves a lot to be desired thereby giving the facility an unkempt appearance. This is further aggravated by uncontrolled activities of the large number of scavengers and waste pickers at the waste disposal facility. Table 7.2 provides a range of specific recommendations that must be implemented by the various frontline actors as a matter of urgency.

**Table 7.2: Recommended Operation and Maintenance Activities**

<b>Description</b>	<b>Recommended Action</b>	<b>Responsibility</b>
Waste deposition and compaction	The exclusive use of a landfill compactor on the Cell 3 within a much smaller working face is strongly recommended. This will ensure that the density of placed waste meets is appropriate requirements thereby maximizing the use of the available airspace.	Waste Landfills Ltd TMA WMD
Internal access roads	<p>Perimeter cut-off ditches should be constructed to minimize the formation leachate pools on the internal access roads that lead and from to the working phase.</p> <p>The current phenomenon where dump trucks take a detour through Cell 1 to exit the working face via a steep descent should be prohibited immediately to avoid a potential disaster.</p> <p>Landfill traffic to and from the working face should be either on the internal access roads or temporary engineered access paths.</p>	Waste Landfills Ltd TMA WMD
Cover material	<p>Intermediate cover material should be used to for sections of the landfill cells 1, 3 and 4 where dumping is no longer taking place.</p> <p>This cover will help in slope stabilization and hence minimize the possibility of shear failure of the unconsolidated waste materials.</p> <p>Provision of machinery (Excavator/Tipper Truck) for scheduled excavation of lateritic material and transport of stockpiles for cover of placed waste</p> <p>Residual materials from dredging of the Odaw basin, i.e., after recovering sand from dredge materials, will be used as cover materials for the landfill.</p>	Waste Landfills Ltd TMA WMD
Scavenging	<p>Scavenging if it has to be tolerated must be only limited to Cell 3 where dumping is currently ongoing.</p> <p>Scavenging should be prohibited at sections of the landfill cells 1, 3 and 4</p>	Waste Landfills Ltd TMA WMD



ENVIRONMENTAL AND SOCIAL AUDIT OF KPONE LANDFILL SITE

	<p>where dumping is no longer taking place in order to preventing the loosening of consolidated covered waste materials.</p> <p>The scavenging footprint should be gradually minimized and completely phased out within the next 6 months to facilitate the application of intermediate cover prior to the decommissioning of the Phase 1 cells.</p>	
Leachate Management	<p>The leachate collection system should be repaired by the sinking of wells to prevent the leachate seeps. The non-functional treatment ponds have to be repaired as a matter of urgency before the start of the peak rainfall season. These actions will minimize the possibility of soil and groundwater contamination.</p>	<p>Waste Landfills Ltd TMA WMD EPA</p>
Working face management	<p>The large presence of scavengers contributes to the inability to have a limited working phase during waste placement and compaction. The site manager must institute strict measures to limit their activities during unloading of wastes materials in order to improve aesthetic conditions.</p>	<p>Waste Landfills Ltd TMA WMD</p>
Special wastes cell	<p>The structural defects with specific reference to the liner should be repaired and put to use immediately.</p>	<p>Waste Landfills Ltd TMA WMD</p>
Environmental monitoring	<p>The requisite environmental monitoring regime should be enforced by the relevant regulatory agencies. The operator should be required to procure portable testing equipment for landfill gas and water quality testing.</p> <p>Periodic performance audits by external experts should be incorporated in the Landfill Operator's contract. This measure should be adopted for all landfills.</p>	<p>EPA Waste Landfills Ltd TMA WMD</p>
Nuisance control	<p>The use of cover material to control odour, vermin and birds must be adhered to.</p> <p>Scavengers should be required to conform to litter control procedures with respect to recovered materials.</p>	<p>Waste Landfills Ltd TMA WMD</p>

ENVIRONMENTAL AND SOCIAL AUDIT OF KPONE LANDFILL SITE

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Record keeping	The operator must be compelled to submit verified quarterly records especially of waste volumes accepted at the disposal site. The proposed oversight arrangement should ensure compliance and verification regarding this directive.	Joint Review Committee Waste Landfills Ltd TMA WMD
Health and safety for landfill staff	Full provision of PPEs, medical assistance, smoking restrictions, accident records.	Waste Landfills Ltd TMA WMD

### 7.1.3 Construction of Additional Cells



The Phase 1 development of the Kpone landfill, now has limited airspace due to reception of increased waste volumes from the whole of Greater Accra Metropolitan Area, It is recommended that Parcel A shown in Figure 7.2 which could by conservative estimates provide additional airspace volume of 725,000 m<sup>3</sup>, should be legally acquired by the Government to facilitate the construction of additional cells. Please refer to Annex C for photographs. A preliminary bulk cost of US\$3,695,000 has been estimated for the principal items for the expansion works as shown in Table 7.3.

**Table 7.3: Estimate of Bulk Works for Additional Cells on Parcel A**

Item	Description	Cost (\$)
1	Access Roads (Cell Perimeter and Internal Bunds)	250,000
2	General Earthworks ( Excavation, Filing, Embankments)	437,500
3	Base Lining and Drainage Layers (including Geotextiles)	1,100,000
4	Gas Collection and Venting	282,500
5	Surfacewater Interception/Groundwater cut-off drains	600,000

	and Leachate Conveyance	
6	Miscellaneous (including General Items, Site Fencing, Tree Buffering)	1,025,000
	<b><i>TOTAL COST</i></b>	3,695,000

#### 7.1.4 Remediation and Closure of Phase 1 Landfill Cells

The capping and closure of the Phase 1 of development of the Kpone landfill should commence once the construction of new cells on Parcel A has been completed. A preliminary bulk cost of US\$420,000 has been estimated for the principal items for the capping and closure works as shown in Table 7.4.

**Table 7.4: Estimate of Bulk Cost for Remediation and Closure Works**

Item	Description	Cost (\$)
1	Rehabilitation of access roads	30,000
2	Remedial works on leachate collection system	65,000
3	Cover material costs (excavation and haulage)	325,000
	<b><i>TOTAL COST</i></b>	420,000

#### 7.1.5 Establishment of Grievance Redress Mechanism

It is recommended that a grievance redress mechanism should be established to address problems and concerns raised by individuals or groups affected by the landfill operations. The 3-tier grievance mechanism proposed would comprise of the following:

- KKMA Local Mediation Committee – Municipal Coordinating Director, Municipal Environmental Health Officer, landfill operator
- District CHRAJ Office
- Court of Law

It is anticipated that only the first tier may need to be activated. However, the opportunity to utilize the full spectrum of tiers also ensures that the grievance redress mechanism is compliant with both national and World Bank safeguard policy requirements.

The Local Mediation Committee shall follow these procedures in resolving grievances;

- Uptake-collection of grievances
- Sorting and Processing
- Acknowledgement and Follow-up
- Verification, Investigation and Action
- Monitoring and Evaluation

- Feedback

Aggrieved parties shall report directly to the Local Mediation Committee through verbal narration, telephone calls, text messages and letters. The duration for resolving a grievance shall be a maximum of one week, except for special cases.

Table 7.5 presents a priority remedial action plan for the proposed measures from the compliance audit of the environmental and social impact indicators specified in the operator's contract for managing the Kpone landfill site. The action plan has been augmented by key issues resulting from stakeholder consultations regarding the environmental and social monitoring indicators and related matters such as the rehabilitation and closure as well as the urgent need for additional cells at Kpone Landfill.

## 7.2 Alternative Waste Disposal Options for GAMA

From the consultations with stakeholders including the Environmental Health and Sanitation Directorate of the Ministry of Sanitation and Water Resources (MSWR-EHSD), the Tema Development Corporation (TDC), Kpone Katamanso Municipal Assembly (KKMA) and Tema Municipal Assembly (TMA) a number of alternative sites were mentioned for consideration in the event that Kpone Landfill is closed and decommissioned. These are discussed in the following sections.

### 7.2.1 Construction of New Landfill Cells at Old Kpone Dumpsite

The old Kpone dumpsite was decommissioned a prior to the construction of the engineered landfill. A site reconnaissance visit revealed that portions adjoining the fenced dumpsite can be utilized for the construction of a large cell. Figure ES10 presents Google satellite imagery of the location. The yellow polygon represents the old dumpsite whereas the white polygon represents the proposed location for a new cell which has an estimated area of 4.2 ha. Figure 7.3 presents photographs of this area.



Figure 7.3: Google Earth imagery of old Kpone dumpsite

<b>Table 7.5: Costed Priority Remedial Action Plan</b> <b>(based on E&amp;S compliance indicator evaluation and key Issues from Stakeholder Consultations)</b>					
Item	Description	Remedial Actions	Estimated Cost (\$)	Proposed Funding Source/Entity	Estimated Implementation/Completion Date
1	Leachate Management	Repair of Leachate Pumping Machine	Not Available	Waste Landfills Ltd	28/02/2019
		Sinking of Leachate wells	65,000.00	GoG/GARID	30/06/2019
2	Optimizing void space utilisation/Improved Waste placement and compaction	Repair of Landfill Compactor (Pump)	Not Available	Waste Landfills Ltd	15/03/2019
3	Improved Cover material usage	Excavator/Tipper Trucks to win laterite/transport stockpile for intermediate cover	Not Available	Waste Landfills Ltd	30/03/2019
4	Improving conditions of internal access roads	Construction of Perimeter Cut-off drains for conveyance of side-egress of leachate	30,000.00	TMA/MSWR	30/03/2019
5	A. Construction of Additonal (new) Cells (Parcel A)	General Earth Works, Access Roads, base lining and drainage, gas collection and venting and cut-off drains and leachate collection	3,695,000.00	GoG/GARID	31/10/2019
	B. Health & Safety of Landfill Staff/Improving Value-Waste Picking (Pickers)	Full Enforcement of PPE/Construction of Waiting Shed, Canteen, Changing rooms, Emergency Clinic			
6	Additional Cover material costs (excavation and haulage)	Residual dredge materials from Odaw lagoon	325,000.00	GoG/GARID	30/09/2019
7	Special wastes cell	Repair of liner	12,000.00	TMA/MSWR/Waste Landfills Ltd.	30/03/2019
8	Enforcement of Environmental monitoring	Measurement of environmental quality parameters	70,000.00	GoG/GARID	30/09/2019
9	Establishment grievance Mechanism	implementing grievance procedure	35,000.00	KKMA/TMA/MSWR	30/10/2019
10	Record keeping	Submission of Quarterly Verified Reports for External Validation Audit	Not applicable	Waste Landfills Ltd. TMA/MSWR	30/03/2019

### 7.2.2 Construction of New Regional Landfill outside Free Zone Enclave

The MSWR-EHSD is considering alternative locations for the construction of a new engineered landfill to serve GAMA. These include the following:

- Ayidan (near ACARP facility)
- Otinbie (integrated waste treatment facility)
- Asutuare Junction (near monkey sanctuary)



- Tuba (owned by J. Stanley Owusu Co. Ltd)

### 7.2.3 Development of a MINT Recovery Centre

The acquisition and development of the land area extending from the decommissioned Kpone dumpsite to the Kpone engineered landfill as depicted in Figure ES11 as a MINT resources recovery centre (MRRC) has also been given consideration.

The MRRC with an estimated land area of about 60 ha will be a one-stop location for re-use, recycling and recovery in line with the National Environmental and Sanitation Policy (1999) and meeting the objectives of KKMA. The centre is proposed for the co-location of various waste-to-resource facilities including composting, energy (e.g. gas extraction and catalytic conversion to diesel) and an engineered landfill. The MRRC would provide a medium to long term solution to the perennial challenge of finding adequate land for waste treatment and disposal.



**Figure 7.4: MINT resource recovery zone**

## References

1. ISWA (2010). Landfill Operations Guidelines, 2<sup>nd</sup> Edition. Prepared by ISWA Working Group on Landfills, International Solid Waste Association.
2. Tahal (2012). Operations & Maintenance Manual for Kpone Landfill (this document can be obtained from TMA-WMD)
3. Tahal/MDC (2007). Environmental Impact Assessment and Preliminary Designs of an Engineered Solid Waste Disposal Facility for the Tema Export Processing Zone. Ghana Trade and Investment Gateway Project. Prepared by Tahal Consulting Engineers Ltd and Municipal Development Collaborative.
4. BGR-GSD (2006.) Environmental and Engineering Geology for Urban Planning in the Accra-Tema Area. Technical Reports and Maps, CDROM, Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) and Ghana Survey Department (GSD).
5. Ghana EPA (2002). Ghana Landfill Guidelines, Environmental Protection Agency, Ghana.
6. IFC (2007) Environmental, Health, and Safety Guidelines for Waste Management Facilities. Available at A complete list can be found at: [www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines](http://www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines)
7. Ireland EPA (2000). Landfill Site Design, Landfill Manuals, Ireland Environmental Protection Agency, Wrexford, Ireland. Available online, <http://www.epa.ie> [Accessed 7<sup>th</sup> July, 2012]
8. Rushbrook, P. and Pugh, M. (1999). Solid Waste Landfills in Low and Middle Income Countries – A Technical Guide to Planning, Design and Operation, World Bank Technical Publication 426, Washington, USA.
9. WsteCare (2015). Technical Audit Report for Kpone Engineered Landfill.



## **Annexes**

- A. Project Terms of Reference and Correspondence
- B. Topographic Survey Drawings
- C. Photo Gallery of Site Conditions
- D. Stakeholder Consultation Records