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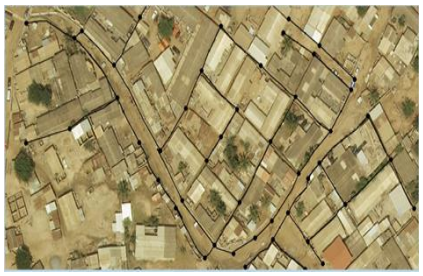
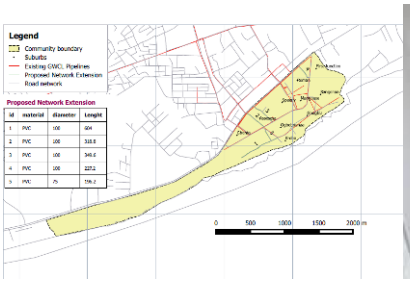
LEDZOKUKU-KROWOR MUNICIPAL ASSEMBLY

GREATER ACCRA METROPOLITAN AREA (GAMA) SANITATION AND WATER PROJECT

CONSULTING SERVICES FOR COMMUNITY ENGAGEMENT/MOBILIZATION, DESIGN AND IMPLEMENTATION SUPERVISION FOR THE PROVISION OF IMPROVED SANITATION AND WATER SUPPLY IN TESHIE OLD TOWN COMMUNITY - LEDZOKUKU-KROWOR MUNICIPAL ASSEMBLY

FINAL WASH INFRASTRUCTURE AND SERVICES OPTIONS REPORT





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Contents

List of Tables

LIST OF FIGURES

LIST OF ABBREVIATIONS

ARAP	-	Abbreviated Resettlement Action Plan
BCC	-	Behavioral Change Communication
BOQ	-	Bill of Quantities
CAD	-	Computer Aided Design
CBO	-	Community-Based Organisations
CBT	-	Capacity Building Team
CL4D	-	Collaboration for Leadership Development
CSC	-	Community WASH Score Card
EHSD	-	Environmental Health and Sanitation Directorate
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
EPA	-	Environmental Protection Agency
ESMF	-	Environmental and Social Management Framework
FOM-H	-	Facilities Operation and Maintenance Handbooks (FOM-H)
FOMP	-	Facility Operation and Management Plans
GAMA	-	Greater Accra Metropolitan Area
GIS	-	Geographic Information System
GSS	-	Ghana Statistical Service
GWCL	-	Ghana Water Company Limited
IA	-	Implementing Agencies
ITB	-	Invitation to Bid
KAPB	-	Knowledge, Attitudes, Practices and Behaviour
LEKMA	-	Ledzokuku-Krowor Municipal Assembly
LGPCU	-	Local Government Policy Coordination Unit
LICSU	-	Low Income Community Support Unit
LIUC	-	Low-Income Urban Community
MA	-	Municipal Assembly
MLGRD	-	Ministry of Local Government and Rural Development
MMA	-	Metropolitan and Municipal Assemblies
MMDA	-	Metropolitan, Municipal and District Assemblies
NGO	-	Non-Governmental Organisations
NHPC	-	National Population and Housing Census
O&M	-	Operation and Maintenance
OBA	-	Output Based Aid
PCU	-	Project Coordinating Unit
PLWH/A	-	Persons Living With HIV/AIDS
PPP	-	Public-Private-Partnership
RAP	-	Resettlement Action Plan
R-B M&E	-	Results-Based Monitoring and Evaluation
RPF	-	Resettlement Policy Framework
RRI	-	Rapid Results Initiative
SIFT	-	Sanitation Improvement Facilitation Team
SWP	-	Sanitation and Water Project
TOR	-	Terms of Reference
UNICEF	-	United Nations Children's Fund
WASH	-	Water, Sanitation and Hygiene
WSUA	-	Water and Sanitation Users Association

EXECUTIVE SUMMARY

This report is the final version of the report on WASH facilities, services and financial options proposed for upgrading environmental sanitation and water supply services in Teshie Old Town. The recommended technical options and the related costs in this document are based on outcome of literature reviews, assessment of baseline field data, physical assessments of existing WASH facilities, focus group discussions; and community & stakeholder negotiations.

Design considerations made in the selection and recommendations of the technical options were based on technical feasibility, local knowledge on functionality and care of use, space demand/constraints, resilience, durability; costs (i.e. capital and O&M), ease of operation and maintenance, ease of construction with local materials and availability of skilled artisans, socio-cultural acceptance and inclusiveness; gender preferences; community involvement, feasibility of implementation, financial sustainability, environmental and social impact and benefits.

Based on the above, the following recommendations on WASH services and infrastructure improvements are made:

A. Household Sanitation Technology Options

Based on the consensus reached during the community and key stakeholder negotiation meetings on proposed WASH facility and service options for Teshie Old Town, the agreed facility preference is the communal-based/network sanitation technology option. This option consists of flush toilets (either WC/cistern or pour flush) connected to simplified (condominium) sewer network linked to centralised/communal treatment system (e.g. centralised/communal septic tank, bio-digester plant, etc.).

Unit Costs for Recommended Individual Household Sanitation Options

Table ES1 below provides estimate unit costs for each of the proposed options.

Table ES1: Unit Cost for recommended individual household sanitation technologies

Facility Type	Estimated Superstructure + sanitary fixtures cost (USD)	Estimated Household connection cost (USD)[1]	Total Cost (USD)
Pour flush toilet connected to sewer	440.73	100	540.73
Water closet (WC)/cistern flush toilet connect to sewer	490.85	100	590.85

Faecal Sludge Treatment Options

Faecal sludge collected from Old Teshie is disposed directly into the sea at Lavender hill. Based on the faecal sludge (shit)-flow analysis, (see Figure 2.5 of this document) list of applicable treatment options were assessed.

Based on the assessments and community/stakeholder negotiations, as well as an objective of resource re-use and recovery, a centralised bio-digester/reactor treatment system (see Figure 3.4) is proposed.

[1] Includes cost for household connection pipes, grease trap and household inspection chambers

A biogas reactor or anaerobic digester is an anaerobic treatment technology that produces (a) a digested slurry (digestate) that can be used as a fertilizer and (b) biogas that can be used for energy. Biogas is a mix of methane, carbon dioxide and other trace gases which can be converted to heat for cooking or electricity (for lighting).

B. Household Latrine Promotion Models

Training of Sanitation Activists/Canvassers: in order to ensure that household latrine promotion improves in the community, a number of community activists/canvassers for home latrine promotion have been trained as part of the GAMA SWP. The activists/canvassers have been trained on the recommended sanitation technology options and are expected to share information and deepen community members' understanding of the project benefits.

Artisan Driven Model: this model aims at creating a sustainable artisanal delivery of household toilets with the artisan carrying out both marketing and construction of toilets for households. In this model the artisan procures the materials and carries out all the construction works. Previous experiences show that if the artisans' businesses are project-driven then the demand from households for artisans' services often decline at the end of the project. This model can be sustained if the artisan is self-motivated and engaged in a sanitation business which is demand-driven (see Figure ES 1 below).

The artisan driven model is enhanced by the extension of credits to households by microfinance institutions and other financial intermediaries for home improvement including acquisition of household toilets. Existing groups like the Artisans Association of Ghana with offices in Accra and Ashaiman, and community savings groups will be engaged in the promotion of home improvement. This has the potential of increasing the construction of toilets by households.

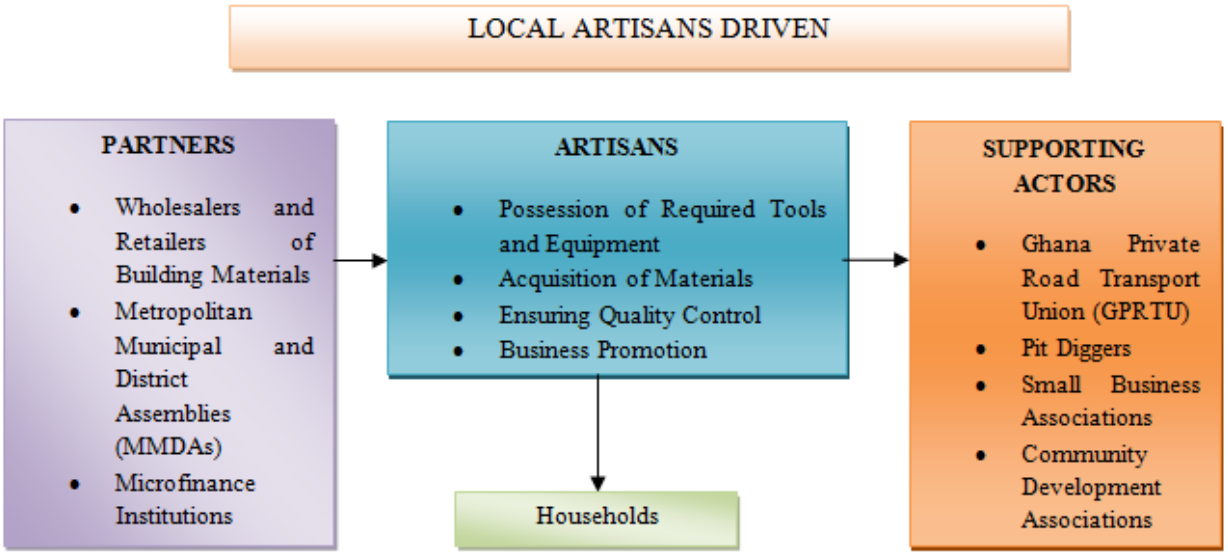


Figure ES1: Key actors and roles of the local artisan driven household latrine promotion model

Enterprise-Solutions: this proposed model involves a network of existing registered enterprises that engage trained artisans and/or agents to promote market and/or construct the recommended household toilet options. The artisans are paid direct labour costs for constructing a facility.

The trained agents are either paid-employees of the enterprises or are engaged on retainer basis often paid a percentage of the total cost of an installed facility. The operations of enterprises are not limited to the jurisdiction of any particular MA and may operate GAMA-wide.

The Ghana Federation of the Urban Poor Toilet Makers Company is an example of a registered Sanitation Enterprise operating at GAMA- wide level. Enterprises registered (or Licensed) by MAs may provide training to community members of the Sanitation Improvement Facilitation Team (SIFT) to promote the construction of household toilets in the community. The inclusion of various financial institutions (commercial banks and microfinance institutions) with the ability to advance credits to households to finance home improvements, including household toilets, has the potential for sustaining latrine promotion. The key features of the model are detailed in Table 3.8 of this document.

C. Water Supply Improvement

Water supply improvement in Teshie Old Town entails extension of distribution lines from existing mains into sections of the community that have no water supply lines. The improvement costs is estimated at **248,129.01 USD**

D. Solid Waste Management Upgrade

The following are the list of interventions proposed for the improvement/upgrading of solid waste management in Teshie Old Town.

- Provision and supply of 1,958 litre bins to households by the MA
- Construction of 1no. tollbooth, 7.29m^2 floor area (at the beach dump site)
- Construction of 3no. solid waste holding bays (SWHB), 105m^2 floor area
- Provision 950m of U450 and U600 access road side ditches and communal collection site drains
- Construction of plastic buyback center equipment inclusive, 207m^2

The total cost for provision of the above improvement interventions is **408,716.58 USD**

E. Sullage Drainage and Disposal

It is proposed that all houses in the area should be provided technical support in laying simple uPVC pipes to connect to the existing drains to discharge grey water from kitchens and bathhouses. Alternatively, where applicable, soakage pits may be constructed to dispose of household sullage. Grease traps wil be installed to separate solids from kitchen waste. The soakage pits will be sized to adequately handle the estimated amount of wastewater (including both bathroom sullage and greywater from kitchens).

The estimated cost of constructing soakage pits in 327 houses within the project area is **50,148.72 USD**

F. Total Cost of Interventions

Estimated cost of interventions

S/No.	Project Intervention	Amount in USD
1	Promotion of household sanitation facilities	2,185,930.26
2	Construction of sewage network	2,454,805.50
3	Construction of sewage treatment plant	1,526,500.00
4	Water supply improvements	248,129.01
5	Provision of solid waste bins	137,066.58
6	Construction of 3No. communal refuse collection/holding bays	271,650.00
7	Promotion of HH sullage drainage and disposal measures	50,148.72
8	Subtotal	6,874,230.07
9	Add 10% of Subtotal as contingency	687,423.01
10	**Total**	**7,561,653.08**

G. Financing Options

The proposed financing options for consideration by individual households include:

- Use of Own/Family/Friend Income
- Use of Free Materials and Labour
- Loans and Micro Credit
- Self Help/Savings Groups
- Micro Credit with Insurance System

H. Proposed Financing Mechanism – G-Fund Example

People's dialogue has set up a G-Fund (a saving scheme) with Ghana Federation of the Urban Poor (GHAFUP). The G-Fund consists of the savings of the urban poor and some contributions received from third parties. The aim of the G-Fund is to provide the peri-urban poor with micro financing for a broad variety of needs that the urban poor of GHAFUP select themselves. Due to the high cost of using WASH facilities, WASH hardware has been the least of improvement options selected most households. Loans have been provided to water vendors, public/private bath houses etc. from the G-Fund. The G-Fund currently amounts to 400,000 GHS and the default rates are below 10%. . This level of default is made possible because the G fund is a Community Social Development Fund and GHAFUP employs a system of accounting principle that calculates default only on principal unlike other financial institutions where loans and defaults are calculated on Loan plus Interest amount. Members of GHAFUP determine the interest levels, acceptable default rates and recoverable percentages. G Fund belongs to a global Community of funds operating within the Slum Dweller International (SDI) networks in over 34 countries that focuses not exclusively on Financial sustainability but equally on delivery of service to beneficiaries with tolerable recovery rates of seventy percent (70%) on the principal component of loans and hence extremely low default rates (10%) making it six (6) percentage lower than prevailing default rates of microfinance institutions in Ghana.

The experiences of People's Dialogue in implementing the G-Fund shall be critically examined for implementation in Teshie Old Town. The process involved in obtaining loan from G-Fund to finance WASH needs is described in Figure 8.1 of this document.

1. PROJECT BACKGROUND

1.1 Introduction

The Government of Ghana, acting through the Ministry of Local Government and Rural Development, is implementing the Greater Accra Metropolitan Area Sanitation and Water Project (GAMASWP) funded through a grant from the International Development Agency (IDA)/World Bank. The project seeks to increase access to improved sanitation and improved water supply in the Greater Accra Metropolitan Area (GAMA), targeting low income urban communities (LIUCs), and to strengthen management of environmental sanitation services across GAMA.

An important component of this project is the upgrading of access to WASH services for a total of 250,000 people in LIUCs selected from the 11 Metropolitan and Municipal Assemblies (MMAs) in GAMA. For the purposes of this project, LIUCs have been defined as those in which at least 75% of households live in a single room, and at least 75% of households use public toilets or other unacceptable toilet facilities.

In the case of the Ledzokuku Krowor Municipal Assembly (LEKMA), Teshie Old Town was selected as the LIUC by the Municipal Assembly (MA).

Project interventions will include:

- Partially subsidized sanitation facilities for compound housing meeting project criteria;
- Establishment of public toilets under sustainable Public Private Partnership (PPP) management arrangements, where compound level facilities are not possible;
- Technical assistance and facilitation of micro-finance for single households to build improved sanitation facilities;
- Development, if necessary, of fecal sludge management services so as to enable the servicing of all facilities in the selected community;
- Improved water supply arrangements;
- Implementation of a program to promote improved hygiene-related behavior;
- Where appropriate, development of sustainable improved local-level management of drainage systems;
- Improvement of local-level solid waste management in order to ensure effective drainage and reduce solid waste accumulation in latrine pits.
- An action learning initiative to generate empirical evidence on the gender dimensions, impacts and implications of sustainable urban sanitation for poor men and women, girls and boys. The action learning will assess and gather evidence on the gendered implications of the intervention regarding policy, financing, design, operation, maintenance, use and sustainability.

1.2 Objectives

The objectives of the assignment are to:

a. Support LEKMA in engaging community members of Teshie Old Town to establish a baseline of existing and end-line situations for sanitation, water supply, and hygiene conditions and practices, as well as socio-economic and demographic characteristics of the low income community;

b. Support the design and construction supervision of sanitation and environmental infrastructure to improve services in Teshie Old Town;
c. Support the design implementation of hygiene promotion and behavioral change campaigns, including due consideration of gender aspects; and
d. Establish a simple, sustainable community-based monitoring and feedback system.

The above is to be achieved in close collaboration with the communities, local and central agencies concerned, and with the formal and informal private sector service providers where appropriate.

1.3 Scope of Services

The scope of services for the assignment includes:

a. Prepare a base map of the target community by defining the geographic area/mapping in consultation with the MA
b. Carry out a baseline study and inventory of water, sanitation and hygiene (WASH) infrastructure and services, habits, preferences, water and sanitation related health data/characteristics
c. Conduct gender informed needs and preference assessment to identify technically, socially, financially, and environmentally appropriate solutions
d. Recruit and train local community activists to support the work of a dedicated Sanitation Improvement Facilitation Team (SIFT)-comprise community members, Consultant and other relevant stakeholder and facilitate communication with the community, including hygiene promotion
e. Hold public consultations to validate the baseline assessment and discuss possible interventions and future management arrangements with clear roles for the community and all other stakeholders
f. Develop a list of feasible sanitation and water supply service options in discussion with MA, Capacity Building Team/Environmental Health and Sanitation Directorate (CBT/EHSD), Ghana Water Company Limited (GWCL), and project staff
g. Prepare designs for the sanitation infrastructure in accordance with appropriate local standards
h. Identify and negotiate preferred sanitation solutions with the community
i. Identify and agree on a body to represent the community
j. Prepare a budgeted plan for infrastructure investment and development of services and service providers (if relevant)
k. Mobilize resources, with the support of the CBT, submitting plans through the MA to the Local Government and Policy Coordination Unit (LGPCU), and in discussion with microfinance partners where household or compound level infrastructure (toilets, bathrooms, water connections) is involved
l. Assist the MA to select and supervise contractors for community infrastructure with the support of the CBT
m. Support the formative research on hygiene promotion, and the delivery of the resulting campaign messages, with the support of the CBT and the EHSD.

n. Establish community-based monitoring and feedback system for all the services provided under the project, and facilitate the production of the first three 6-monthly reports to the MMA, EHSD and GWCL.
o. Undertake an end line study, update the inventory of WASH infrastructure and services and create an updated community WASH scorecard

1.4 Expected Outputs

The expected outputs of the assignment include the following:

a. Community base maps
b. An inception report including an updated work programme and selection of communities for survey
c. WASH inventory, Gender Needs Assessment and community scorecard
d. WASH Service and Infrastructure Options
e. Environmental and Social Screening Report
f. Environmental Impact Assessment (EIA) scoping report (if EIA is required); Resettlement Action Plan (RAP) report (if required)
g. EIA, Environmental Management Plan (EMP) and RAP/ARAP reports
h. Detail Design, Tender Documents and Financing Plan
i. Design of a community-based monitoring and feedback system
j. Post Intervention WASH Inventory and Community Scorecard
k. 3 No. Bi-annual Monitoring Report
l. 11 No. Quarterly Monitoring Report
m. Final/Completion Report

1.5 Structure of Report

This report is the fourth in series to be submitted to the client (LEKMA) and focuses on recommended household and communal WASH infrastructure and service upgrade options for Teshie Old Town in fulfilment of "Output d". The report also indicates unit costs of the proposed household WASH interventions as well as preliminary estimates for bulk/communal interventions.

The report is structured as follows:

Executive Summary	This section summarises the key issues presented in this report.
Chapter One	***Introduction:*** This section presents the general project background information and expected deliverables.
Chapter Two	***Existing Sanitation and Water Situation in Teshie Old Town:*** the existing environmental sanitation and water situation in Teshie Old Town are discussed in this chapter. An abridged form of the detailed baseline report.
Chapter Three	***Sanitation Facility and Service Improvement Options:*** proposes household, communal sanitation, faecal sludge collection, treatment and disposal options, service delivery models and costs.
Chapter Four	***Water Supply Improvement Options:*** presents options for improved water supply to the community.
Chapter Five	***Solid Waste Management Improvement Options:*** describes options for improved household and communal solid waste collection and disposal.
Chapter Six	***Sullage Disposal and Drainage Improvement Scheme:*** presents options for conveyance and disposal of grey water and stormwater from households/premises.
Chapter Seven	***Institutional Arrangement:*** *presents the expected roles and responsibilities of relevant institutions in operation and maintenance management of proposed WASH infrastructure and service interventions*
Chapter Eight	***Technical and Financing Options***: this section describes the Implementation Packages, Cost involved, Proposed Financing Options and Adaptation of WASH Infrastructure Financing Mechanism - G-Fund
Chapter Nine	***Appendices:*** this section summarizes the description of sanitation facilities, Cost estimates of proposed household sanitation options, Summary of technical and financial options for Teshie Old Town, Knowledge of Community Members on Proposed Household Sanitation Technology Options Estimated cost of proposed simplified sewerage system and Advantages of HDPE pipes over other brands in the local market.

2. ENVIRONMENTAL SANITATION AND WATER SUPPLY SITUATION

2.1 Community Profile

The Teshie Old Town community is located in the Ledzokuku-Krowor Municipal Assembly (LEKMA). The community is bounded to north and south by the Accra-Tema Beach Road and the Sea (Gulf of Guinea) respectively. It stretches from the Kpeshie Lagoon (West) to First Junction Area (East). The community is made up of the Akro East and Akro West electoral Areas. Figure 2.1 below present the location map and some of the suburbs in the community. The community has an estimated population of 20,145 and an average household size of 5. The total number of households is estimated at 4,029. The population and housing densities are estimated at 193.7 persons/ha and 14.42 houses/ha respectively.

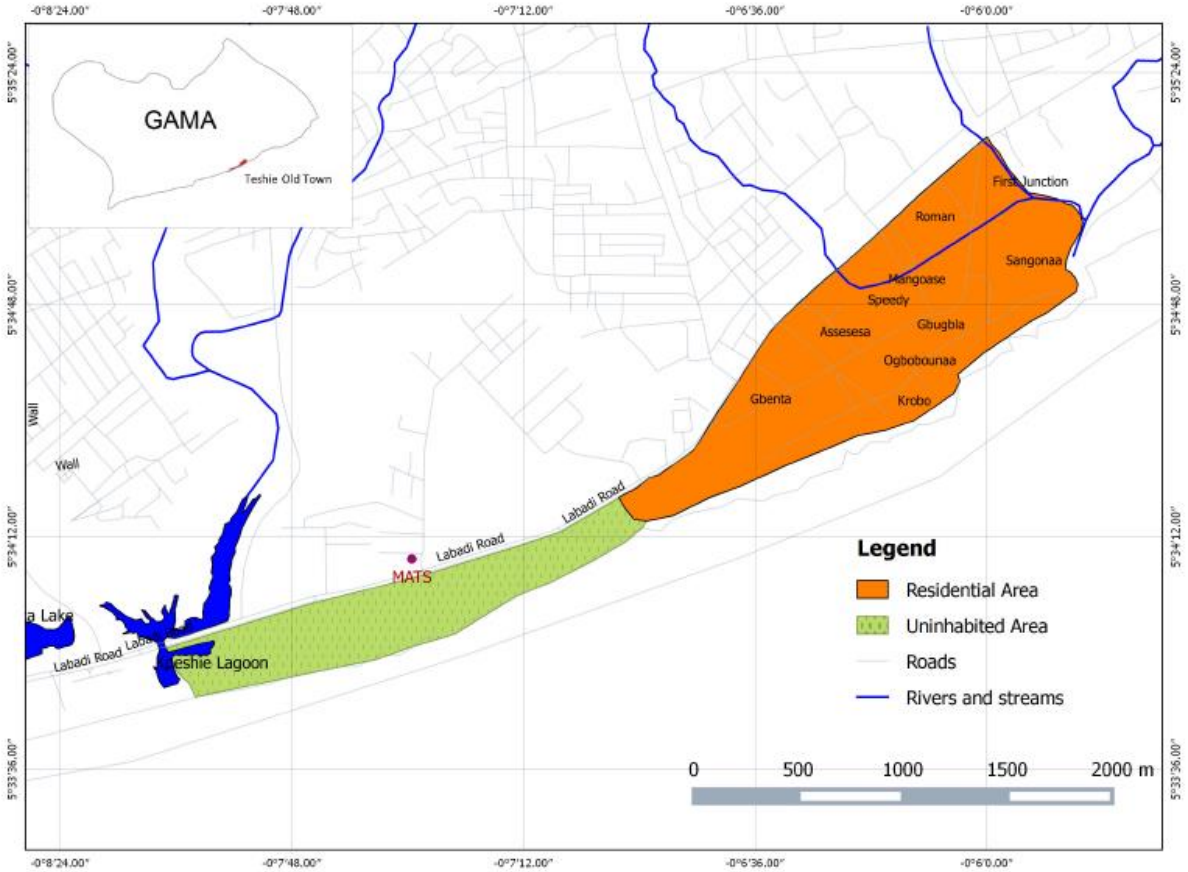


Figure 2-1: Location Map of Teshie Old Town

2.2 Sanitation Situation at Household Level

The existing situation on the availability and usage of household toilets in the study community are provided below.

2.2.1 Availability of In-House Toilet Facilities

Majority (95.13%) of households in Teshie Old Town do not have home (in-house) toilets. The remaining (4.87%) of households have from one (1) to five (5) units of household toilet type inside house (dwelling). Figure 2.2 below shows the number of toilets per house for the remaining 4.87% households that have toilet facilities in-house.

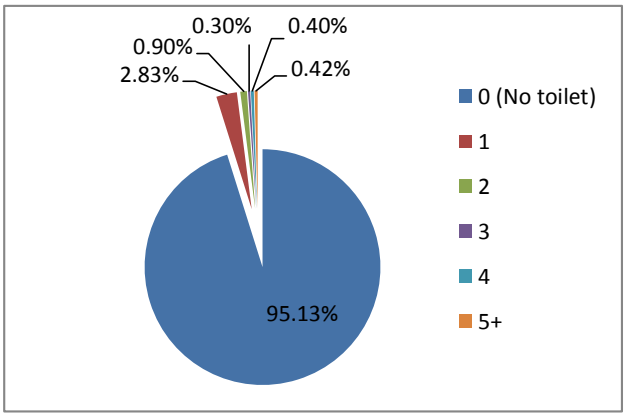


Figure 2-2: Distribution of Household by No. of Toilets in-House.

2.2.2 Household Toilet Types

Pour flush is the most common toilet facility type in the community (i.e. about 44.8% of household toilets are pour flush) (See Plate 2.1). Less than 20% rely on WC flush to septic tank. Unimproved pit latrines account for 8.7% of the household toilets (see Figure 2.3 below).

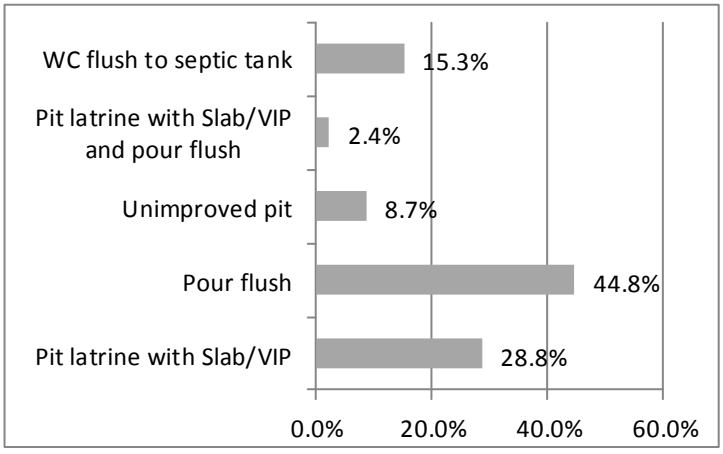


Figure 2-3: Household toilet facility types

Plate 2-1: Commonly used pour flush toilet in the community

2.2.3 Household Toilet Ownership

1.93% of the households have toilets exclusively used by single households see Figure 2.4 below. Out of the 1.93% (58) of households with toilets; 1.73% are found within compound houses; 9.47% are in detached structures 1.67% are in semi-detached structures and none in Temporary Structures (see Table 2:1 below).

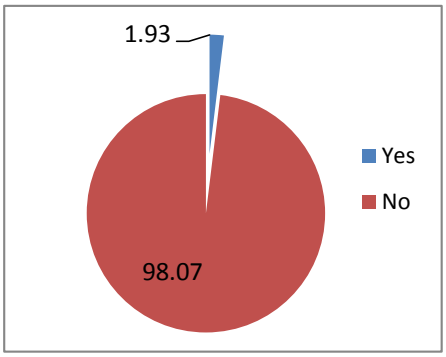


Figure 2-4: Households with dedicated toilets

Table 2.1: Households with dedicated toilets by house types

Type of House	HH have its own Dedicated Toilet		
	No	Yes	Total
Compound house	98.27%	1.73%	100.00%
Detached	90.53%	9.47%	100.00%
Semi detached	98.33%	1.67%	100.00%
Temporary structure	100.00%	0.00%	100.00%

2.2.4 Public Toilet Usage

62.7% of the households use public toilets (either exclusively or in combination with other means of disposing of human faeces). Public toilet usage is mainly by residents who live in temporary structures (see Table 2.2 below).

Table 2.2: Public toilet usage by house type

	Use of public toilet		
Type of House	**No**	**Yes**	**Total**
Compound house	38.71%	61.29%	100.00%
Detached	30.53%	69.47%	100.00%
Semi detached	26.25%	73.75%	100.00%
Temporary structure	31.34%	68.66%	100.00%

2.2.5 Physical Conditions of Shared Block/Public Toilets and O&M Procedures

Majority of the public toilets in the community are owned by the MA (LEKMA). The eight (8) public toilets are not evenly distributed with two (2) yet to be opened (as at time of assessment). Residents in less served areas especially along the beaches, resort to open defecation (32%). Table 2.3 below presents the list of public toilets in Teshie Old Town. The Table indicates the location, ownership, technical features and operation and maintenance procedures.

Table 2.3: List of public toilets in Teshie Old Town

LOCATION	TECHNICAL FEATURES	OPERATIONAL & MAINTENANCE PROCEDURES
Adedenkpo public toilet Latitude N $5^0$34'35" Longitude W $0^0$6'32" 47m above sea level.	• 24-seater pour flush • Buy water from tanker drivers. • Segregated evenly (12 male and 12 Female) • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• The floor of facility has lots of cracks in it. • Toilet cubicles have no doors. • The slabs on the septic tank are broken posing a threat to the children who play around the area and also emitting a foul smell to the inhabitants close by. • User fee per visit is 30p. • Residents nearby are encroaching premises.
Adoemli public toilets Latitude N 5034'48" Longitude W 006'26" 37m above sea level.	• Fairly new 24-seater • Old 20-seater • Facility has access to tap water. A drum is placed at the tap and facility users wash their hands into this drum, the water collected from washing of hands is fetched with small buckets and used to flush the toilet. • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• Most of the cubicle doors have broken down. • Used anal cleansing materials are stored in plastic receptacles. • User fees per visit are 50p and 30p dependent on the type of facility to visit
Bukoeshie public toilet. Latitude N $5^0$34'43" Longitude W $0^0$6'12" 29m above sea level	• Newly constructed two-storey 40 seater water closet • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• Facility is yet to be opened • Caretakers raise concern that the septic tank is too small for facility
Teshie Kponkpa public toilet Latitude N $5^0$34'54" Longitude W $0^0$6'11" 45m above sea level	• This is 20 seater pour flush toilet facility which is currently in a deplorable state. • There is no water supply from GWCL and facility relies on a water tanker for water. • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• Both walls and floors are filled with cracks • There is a refuse dumping site to the right of the toilet facility and this happens to be the entrance to the female side. The rubbish dump is rapidly closing up to the entrance. • There are no doors to the cubicles.
Akotobu toilet facility Latitude N $5^0$35'3" Longitude W $0^0$5'58" 38m above sea level	• 16-seater pour flush toilet. • The facility has no water supply and relies on rain harvested water • Evenly segregated for both male and female • There is no hand washing facility	• Fence walls have broken down. • Septic tank is filled with cracks.

LOCATION	TECHNICAL FEATURES	OPERATIONAL & MAINTENANCE PROCEDURES
Gbugbla Latitude N $5^0$34'31" Longitude W $0^0$6'15" 46m above sea level	• Fairly new 20-seater WC facility. • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• There is a soakaway with an exposed pipe flowing directly into the sea. • The septic tank currently in use is very small and has to be desludged twice every month at a fee of GHC100 per desludge. • The site where this facility sits now used to hold an old toilet facility. The septic tank which served the old facility has not been broken down. The septic tank is full and according to the attendant at the facility, there is no money and nobody to work on the tank.
Mangoase Latitude N $5^0$34'52" Longitude W $0^0$5'55" 44m above sea level	• 20-seater pour flush toilet on the same premise with a bath facility. • The facility has access to GWCL water supply • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• Facility is quite old and needs renovation
Kruo Latitude N $5^0$34'45" Longitude W $0^0$5'58" 37m above sea level	• 20-seater pour flush with two cubicles for the disabled. • Evenly segregated for both male and female • Toilet had no facilities for physically challenged persons • There is no hand washing facility	• According to residents, the facility was completed some months ago but has not been commissioned yet. Residents living close to this facility have therefore resorted to open defecation along the beach with only a small percentage moving to public toilets in other suburbs.

2.2.6 Faecal Sludge Generation and Management Practices

The flow of faecal sludge from the point of generation to the final destination for Teshie Old Town is presented in Figure 2.5 below. Table 2.4 below gives the volume of faecal sludge generated in a day.

Table 2.4: Estimated volume of faecal sludge in a day

Per Capita Faecal Sludge Generation		**Population**	**Estimated Volume of faecal sludge (l/day)**
WC/flush	1.0l/cap/day	2,095.8	2,095.8
Unimproved Pit latrine	0.2l/cap/day	238.4	238.4
VIP	0.2l/cap/day	789.0	789.0
VIP & Pit Latrine	0.2l/cap/day	65.9	65.9
Pour flush	0.65/cap/day	3,988.9	3,988.9
Open defecation	0.2l/cap/day	1,289.2	1,289.2
Total		**20,145**	**8,467.2**

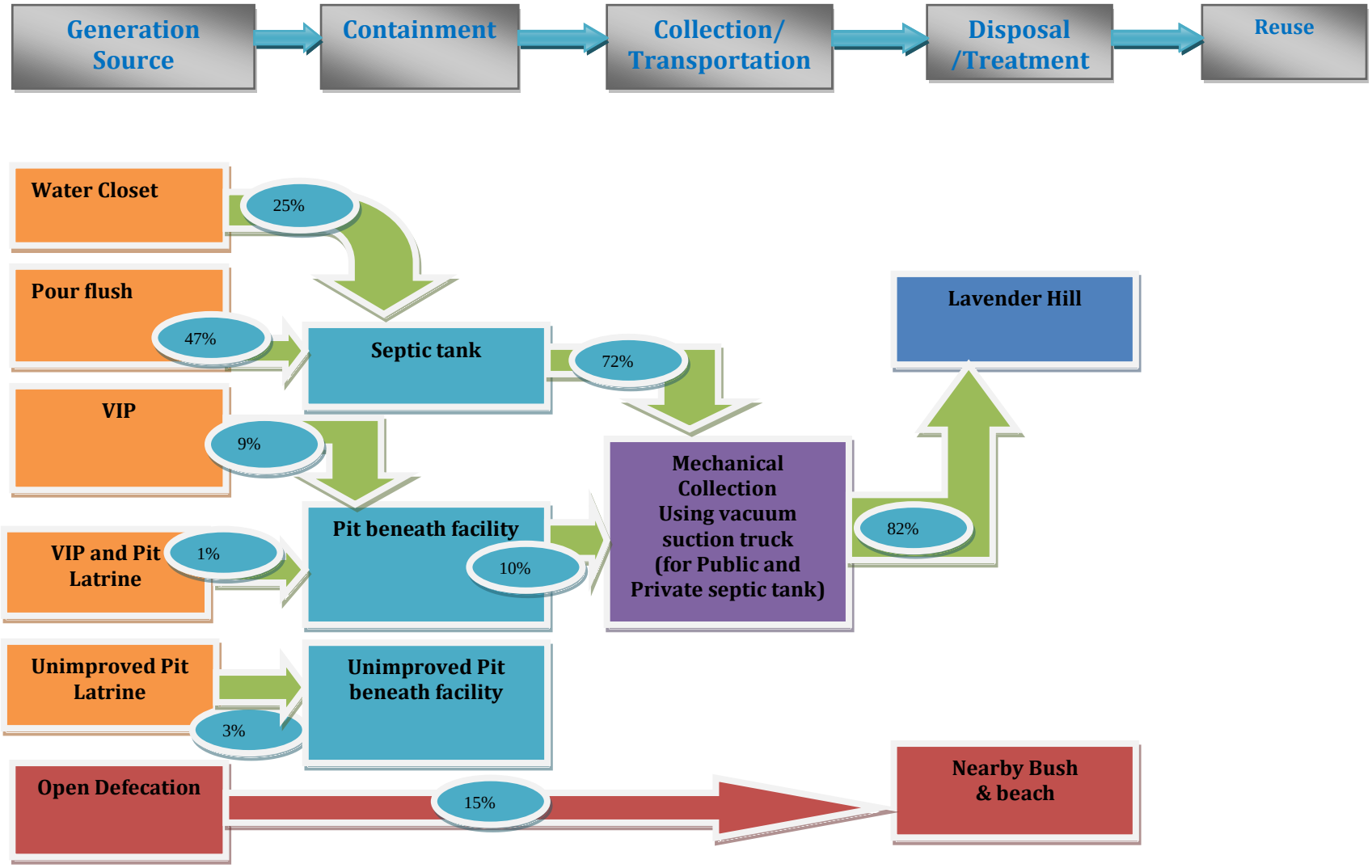


Figure 2-5: Shit Flow Diagram for Teshie Old Town

2.3 Solid Waste Management

2.3.1 Classification of Households Solid Waste Containers

Sacks and polythene bags are the predominantly used household solid waste storage receptacles. Together they account for 76.6% of storage receptacles used by households. 17.4% of the households indicated using standard waste bins.

Households that use multiple receptacles for waste collection accounted for 14.4% of the households (see Figure 2.7 below).

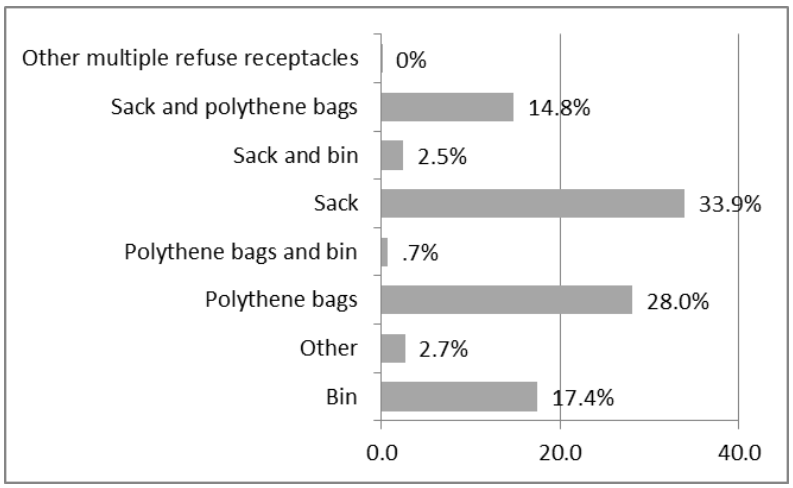


Figure 2-6: Household Waste Storage Receptacles

2.3.2 Household Waste Collection Methods

About half (52.9%) of households, dispose of their refuse at open/crude dump sites as shown in Figure 2.8 below. Another Thirty-four percent (34.2%) of the households indicated the use of communal containers which are often sited at sanitary sites (public toilets) - see Plates 2.2 - 2.4. Households that rely on door-to-door waste collection services alone accounted for only 2.2% (133 households). The service in most cases is provided by private individuals using tricycles ('Borla Taxis'). About three percent (2.6%) of residents indicated the use of dug-pits (trenches) for disposing of domestic refuse The refuse disposed in the trenches are often burnt after some days of pile-up. . Communal containers, which are a more preferred waste collection method compared to open/crude dump sites, are few and unevenly distributed in Old Teshie. Women and children who are usually responsible for gathering, storage and disposal of solid waste in the household therefore resort to the use of the open/crude dump sites.

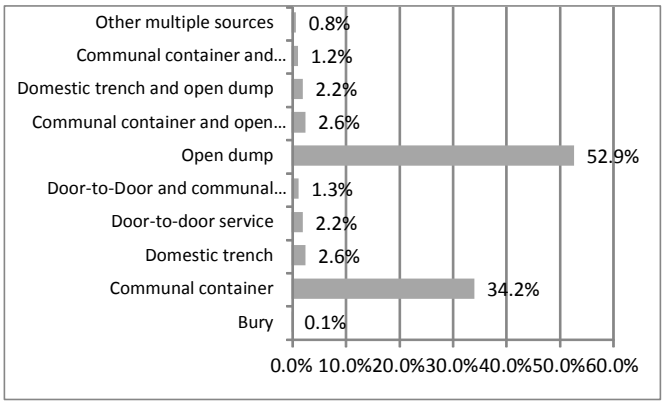


Figure 2-7: Household waste disposal methods

Plate 2-2: Littering around the communal waste collection container at Kponkpa sanitary site

Plate 2-3: Communal waste collection container at Akotobu sanitary site with 'Borla Taxi' in view

Plate 2-4: Crude dumping and open burning of solid waste along the beach

2.4 Sullage Disposal and Stormwater Conveyance

Majority of the households in the community dispose of sullage, kitchen and bathroom wastewater into nearby earth drains or concrete drains (see Plate 2.5 below). Most households dispose of sullage directly via pipes or earth channels while others use receptacles such gallons to collect sullage (from bathhouse) prior to disposal.

Plate 2-5: Drains in community silted with solid waste

2.5 Existing Water Supply Situation

Sachet water is the main source of drinking water (85%) while 8.7% of households rely on public stand pipes (provided by GWCL); 4.3% of households source their drinking water from GWCL in-house connections which is significantly lower than the Greater Accra regional average of 64.4%. Women with assistance from their children are responsible for fetching and storing water for household use including cooking, cleaning, and bathing. The availability of water in close proximity to households is an important factor of quality of service.

Table 2.5 provides the list of water supply outlets/service providers in Teshie Old Town

Table 2.5: List of water supply points in suburbs of Teshie Old Town

Name/Location	Technical Features	Operational & Maintenance Procedures
Gbugbla Anteh-we	• Storage tank capacity is 10,000 L (2 in number) • The tanks are filled once a week by a tanker and the service is paid for with the money made from the sale of water.	• Donated to the community by CiDA and managed by the representatives of the Teshie Concerned Citizens Association • A gallon cost 50 pesewas • The facility makes an average sale of GHC50 per week
Bukoeshie	• Storage tank capacity is 1,000 L (2 in number) • The facility relies on a water tanker for supply	• Facility was donated by GWCL/PURC/WaterAid/Water Board through the Water Pro Poor Pilot Project • The facility is managed by a Teshie community club known as the Big 16 Fun Club. • The facility records an average of 30 consumers per day.
Krobo-Bukoemli	• These are 3 Rambo 450 tanks. • The tanks rely on desalination plant for supply	• Facility is managed by 69 Boys Fan Club in Teshie • Patronage of the facility has reduced drastically as more inhabitants are supplied with water by GWCL

3. SANITATION IMPROVEMENT OPTIONS

Consistent with the main objective of the GAMA-SWP project of achieving universal sanitation coverage in the community, an estimated 3,951 sanitation facility units will have to be provided in the community by the close of the project in 2017. Table 3.1 below provides an estimated breakdown of the household (HH) sanitation facilities required.

Table 3.1: Statistics on Households without Sanitation Facilities

Item	Description	Input Data
1	Total number of persons in households	20,145
2	Total number of houses	576
3	Total number of households	4,029
4	Average household size	5
5	Average number of households per house	7
6	Number of persons per house (using seven (7) households per house)	35
7	Households with dedicated toilets in-house	78
8	Households living in compound houses without toilets	1,003
9	Households living in detached[2] houses without toilets	924
10	Households living in semi-detached[3] houses without toilets	1,004
11	Households living in temporary structures without toilets	1,020
12	**Households without dedicated (single-household-use) toilets**	**3,951**
13	**Percentage of Household without dedicated (single-household-use)toilets**	**98.07%**

3.1 Factors Considered for Sanitation Technology Options

The following factors were considered as key in determining specific sanitation technologies/options to be recommended and marketed to HHs without dedicated toilets in Teshie Old Town.

Table 3.2: Key Factors Considered in Selection of Household Sanitation Technology Options

Factor	Key Indicators
Technical	• Space demand/constraints in compounds/houses for provision of the requisite types and quantities • Population density • Availability of water • Availability of local materials for construction and O&M • Availability of skilled or semi-skilled manpower for construction and O&M • Ease of operation and maintenance
Financial	• Affordability- capital and operation and maintenance management costs • Attractiveness/appropriateness of marketing and financial/franchise arrangements available to households (beneficiaries)
Environmental	• Geographical conditions - soil/water table etc. for design underground sanitation facilities • Enhancement and improvement in environmental conditions • Reduction of incidence of diarrhoeal diseases • Minimal or no impact on immediate environment
Socio-cultural	• Existing socio cultural habits, norms and preferences • Suitability for men, women, children, the physically challenged and the aged. • Enhances beneficiaries income status (reduction in costs of other services) • Involvement of community
Institutional	• Existing institutional arrangements and support for marketing facility models

[2] Not exactly a detached house but share similar features as a detached house
[3] Not exactly a semi-detached house but share similar features as a semi-detached house

3.2 Household Sanitation Technology Options

This section of the report presents a brief report on WASH facilities, services and financial options proposed for upgrading environmental sanitation and water supply services in Teshie Old Town. The recommended technical options and the related costs proposed in this document are based on outcome of literature reviews, assessment of baseline field data, physical assessments of WASH facilities, focus group discussions and community & stakeholder negotiations.

Design considerations made in the selection and recommendations of the technical options were based on technical feasibility, local knowledge on functionality and care of use, space demand/constraints, resilience, durability; costs (i.e. capital and O&M), ease of operation and maintenance, ease of construction with local materials and availability of skilled artisans, social and cultural acceptance and inclusiveness; gender preferences; community involvement, feasibility of implementation, financial sustainability, environmental and social impact and benefits.

The sanitation ladder shown in Figure 3.1 gives the possible incremental improvement options for households latrines focusing on re-use of by-products. Figure 3.2 also shows a typical layout of compound houses in Teshie Old Town and alternative configurations for retrofitting household toilets

The key advantages and disadvantages of the options considered are provided in Appendix 1 of this document. As part of assessment of the technology options, existing knowledge of community members on the proposed options were solicited (see Appendix 2 of this document).

1. **Category 1: Individual household level sanitation technology options**:

a) Pour flush with septic tank
b) WC/cistern flush with septic tank (single/double)
c) Urine Diversion Toilet (UDT)
d) Biofil toilet
e) Biogas toilet
f) Van's biological toilet
g) Enviro Loo toilet

In areas of high population and housing density, issues of tenancy and availability of space are very critical elements for installing facilities especially individual household (stand-alone) facilities. Options for shared-block facilities were therefore also proposed for discussion.

2. **Category 2: Households shared-block sanitation technology options**:

a) Shared-block VIP
b) Shared block KVIP
c) Shared block pour flush with shared septic tank
d) Shared block WC with shared septic tank
e) Shared block Urine Diversion Toilet (UDT)
f) Shared block Biofil toilet
g) Shared block Biogas toilet with shared digester
h) Shared block Van's biological toilet
i) Shared block Enviro Loo toilet

3. **Communal based/network sanitation technology options**:

a) WC/cistern/pour flush connected to simplified (condominium) sewer network linked to decentralised/centralised communal treatment system (e.g. decentralised communal septic tank, centralised bio-digester plant or Janicki Omni processor etc.)

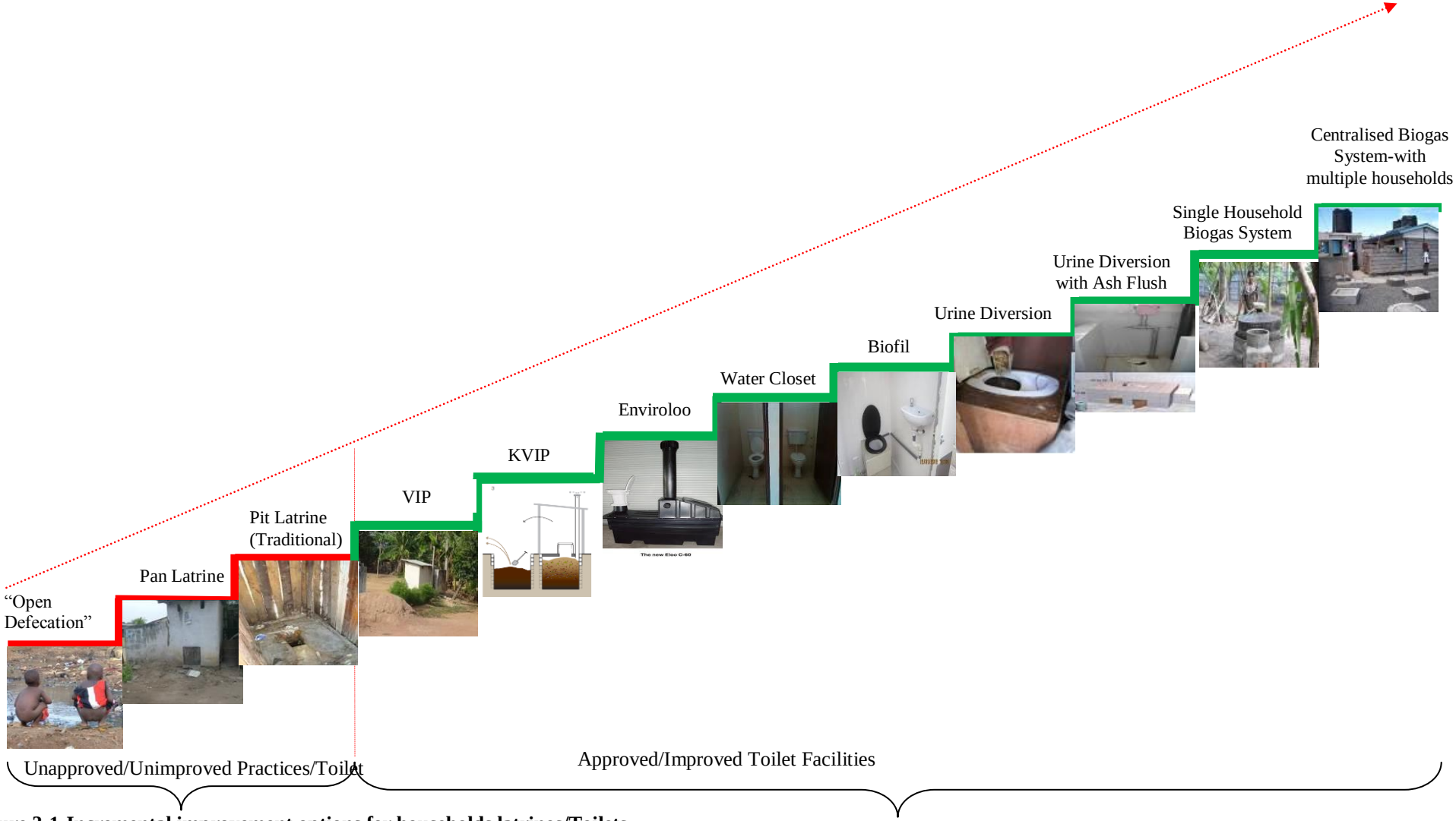


Figure 3-1-Incremental improvement options for households latrines/Toilets

Figure 3-2: A typical layout of compound house in Teshie Old Town (with proposed locations of one-family in-door toilet facilities)

3.3 Unit Costs for Household Sanitation Options Considered

Table 3.3 below provides estimate unit costs for each of the considered options.

Table 3.3: Unit Cost for proposed household sanitation technologies

Facility Type	Estimate Capital Cost (USD)		Total Cost (USD)
	sub-structure/digester	superstructure + Sanitary Fixtures cost	
VIP	302.05	130.19	432.24
KVIP	302.05	136.70	438.75
Pour flush with septic tank			1,725.00
Water Closet with septic tank	615.38	410.26	1,025.64
Pour flush connected to Condominial Sewerage	100[4]	440.73	540.73
WC connected to Condominial Sewerage	100	490.85	590.85
Pour flush with leach pit	252.95	620.77	873.72
Water closet with leach pit			1,550.00
Biofil standard digester	384.62	179.49	564.10
Biofil standard digester with sand	384.62	307.69	692.31
Biofil Microflush Standalone	384.62	641.03	1,025.64
Enviro loo toilet			630.00

Table 3.5 below sets out quantities of household sanitation technology options proposed for households in compound, semi-detached and detached houses without toilets taking into consideration pattern of existing sanitation facility types in the community. The quantities were determined based on the following data inputs (from household and field surveys) and the assumptions in Table 3.4. The proposed options were discussed with the key stakeholders during the negotiation meeting (see Appendix 3 for photo shots of the meeting).

Table 3.4: Data Inputs used in calculating quantities of facilities

Data Inputs
Total number of toilets required in compound, semi-detached and detached houses = (149 + 138 + 150) = **437**
Total number of toilets required as shared block facilities for HHs in temporary structures= **152**
40% of the total number of toilets shall be provided as VIPs and KVIPs toilets to HHs living in compounds, semi-detached and detached houses without their own toilets, 8% as HHs-pour flush toilets with septic tanks, 12% as HHs-WC toilets with septic tanks, 4% as HHs-pour flush toilets with leachate pits, 4% as HHs-WC toilets with leachate pits, 15% as HHs-Biofil/Biogas toilets and remaining 13% as HHs-Enviro-loo/ECOSAN toilets.
It is estimated that **90%** of HHs leaving in temporary structures will rely on facilities provided as shared-block toilets; this brings the total number of shared-block toilets to **137.** This is in addition to the **138** single-household (dedicated) facilities indicated above. The remaining **10%** of HHs will still rely on existing shared-block toilet facilities (i.e. **15** toilets already existing). Fifty-two **(52%)** of the **137 shared-block toilets** shall be provided as VIP and KVIP toilets, **24%** as pour flush toilets with septic tanks, remaining **24%** as WC toilets with septic tanks in compound, semi-detached and detached houses for HHs leaving in temporary structures.

[4] Includes costs for household connection pipes, grease trap and household inspection chambers

Table 3.5: Calculation of quantities for proposed household sanitation technology options (Shared-block)

Toilet Code	Compound/House Type	Type of Sanitation Technology Option	Unit	Quantity
VIP, (CSD/H-01)	Compound or House with (5-10) permanent inhabitants	2-vaults VIP Latrine	No.	25
VIP, (CSD/H-02)	Compound or House with (11-15) permanent inhabitants	3-vaults VIP Latrine	No.	25
VIP, (CSD/H-03)	Compound or House with (16-20) permanent inhabitants	4-vaults VIP Latrine	No.	25
VIP, (CSD/H-04)	Compound or House with (21-25) permanent inhabitants	5-vaults VIP Latrine	No.	25
VIP, (CSD/H-05)	Compound or House with (26-30) permanent inhabitants	6-vaults VIP Latrine	No.	24
Subtotal Households In-House VIP Toilets				**124**
KVIP, (CSD/H-01)	Compound or House with (5-10) permanent inhabitants	2-privy rooms KVIP toilet	No.	25
KVIP, (CSD/H-02)	Compound or House with (11-15) permanent inhabitants	3-privy rooms KVIP toilet	No.	25
KVIP, (CSD/H-03)	Compound or House with (16-20) permanent inhabitants	4-privy rooms KVIP toilet	No.	25
KVIP, (CSD/H-04)	Compound or House with (21-25) permanent inhabitants	5-privy rooms KVIP toilet	No.	25
KVIP, (CSD/H-05)	Compound or House with (26-30) permanent inhabitants	6-privy rooms KVIP toilet	No.	24
Subtotal Households In-House KVIP Toilets				**124**
PFST, (CSD/H-01)	Compound or House with (5-10) permanent inhabitants	2-privy room pour flush with septic tank	No.	14
PFST, (CSD/H-02)	Compound or House with (11-15) permanent inhabitants	3- privy room flush with septic tank	No.	14
PFST, (CSD/H-03)	Compound or House with (16-20) permanent inhabitants	4- privy room pour flush with septic tank	No.	14
PFST, (CSD/H-04)	Compound or House with (21-25) permanent inhabitants	5-privy room pour flush with septic tank	No.	14
PFST, (CSD/H-05)	Compound or House with (26-30) permanent inhabitants	6-privy room pour flush with septic tank	No.	14
Subtotal Households Pour Flush Toilets with Septic Tanks				**70**
WCST,(CSD/H-01)	Compound or House with (5-10) permanent inhabitants	2-privy room water closet with septic tank	No.	17
WCST, (CSD/H-02)	Compound or House with (11-15) permanent inhabitants	3-privy room water closet with septic tank	No.	17
WCST, (CSD/H-03)	Compound or House with (16-20) permanent inhabitants	4-privy room closet with septic tank	No.	17
WCST, (CSD/H-04)	Compound or House with (21-25) permanent inhabitants	5- privy room water closet with septic tank	No.	17
WCST, (CSD/H-05)	Compound or House with (26-30) permanent inhabitants	6- privy room water closet with septic tank	No.	17
Subtotal Households WC Toilets with Septic Tanks				**85**
PFLP, (CSD/H-01)	Compound or House with (5-10) permanent inhabitants	2- privy room pour flush with leachate pit	No.	4
PFLP, (CSD/H-02)	Compound or House with (11-15) permanent inhabitants	3- privy room pour flush with leachate pit	No.	4
PFLP, (CSD/H-03)	Compound or House with (16-20) permanent inhabitants	4- privy room pour flush with leachate pit	No.	4
PFLP, (CSD/H-04)	Compound or House with (21-25) permanent inhabitants	5- privy room pour flush with leachate pit	No.	4
PFLP, (CSD/H-	Compound or House with (26-30)	6- privy room pour flush with leachate pit	No.	2

Toilet Code	Compound/House Type	Type of Sanitation Technology Option	Unit	Quantity
05)	permanent inhabitants			
Subtotal Households Pour Flush Toilets with Leachate Pits				**18**
WCLP, (CSD/H-01)	Compound or House with (5-10) permanent inhabitants	2- privy room water closet with leachate pit	No.	4
WCLP, (CSD/H-02)	Compound or House with (11-15) permanent inhabitants	3- privy room water closet with leachate pit	No.	4
WCLP, (CSD/H-03)	Compound or House with (16-20) permanent inhabitants	4- privy room water closet with leachate pit	No.	4
WCLP, (CSD/H-04)	Compound or House with (21-25) permanent inhabitants	5- privy room water closet with leachate pit	No.	4
WCLP, (CSD/H-05)	Compound or House with (26-30) permanent inhabitants	6- privy room water closet with leachate pit	No.	2
Subtotal Households WC Toilets with Leachate Pits				**18**
BFG, (CSD/H-01)	Compound or House with (5-10) permanent inhabitants	2- privy room Biofil/Biogas toilet	No.	13
BFG, (CSD/H-02)	Compound or House with (11-15) permanent inhabitants	3- privy room Biofil/Biogas toilet	No.	13
BFG, (CSD/H-03)	Compound or House with (16-20) permanent inhabitants	4- privy room Biofil/Biogas toilet	No.	13
BFG, (CSD/H-04)	Compound or House with (21-25) permanent inhabitants	5- privy room Biofil/Biogas toilet	No.	13
BFG, (CSD/H-05)	Compound or House with (26-30) permanent inhabitants	6- privy room Biofil/Biogas toilet	No.	13
Subtotal Households Biofil/Biogas toilet				**65**
EVL, (CSD/H-01)	Compound or House with (5-10) permanent inhabitants	2- privy room Enviro-Loo Toilet	No.	12
EVL, (CSD/H-02)	Compound or House with (11-15) permanent inhabitants	3- privy room Enviro-Loo Toilet	No.	12
EVL, (CSD/H-03)	Compound or House with (16-20) permanent inhabitants	4- privy room Enviro-Loo Toilet	No.	12
EVL, (CSD/H-04)	Compound or House with (21-25) permanent inhabitants	5- privy room Enviro-Loo Toilet	No.	12
EVL, (CSD/H-05)	Compound or House with (26-30) permanent inhabitants	6- privy room Enviro-Loo Toilet	No.	12
Subtotal Households Enviro Loo Toilets				**60**

The provisional cost estimates for providing household toilets in Teshie Old Town is **USD 2,532,166.02.** Details of the proposed estimates for these options are provided in Appendix 4.

Based on agreement from stakeholders' negotiation meeting, cistern-flush water closets and/or pour flush toilets connected to condominium sewer network was the preferred option of the community members. As indicated in Table 3.6 below, the total cost estimate for the provision of WC/pour flush toilet for households without dedicated toilets is estimated at **USD 2,185,930.26.**

Table 3.6: Cost Estimate for Provision of Household Toilets

Facility Type	Unit Cost	% of HH likely to opt for facility type[5]	No. of HH without toilets likely to prefer option	Estimated Cost (USD)
Pour flush toilet	540.73	75	2,963	1,602,318.17
WC toilet	590.85	25	988	583,612.09
Total			**3,951**	**2,185,930.26**

[5] Based on baseline study finding on household toilet type / use pattern

3.4 Faecal Sludge Collection and Desludging Options

The existing method for collection of faecal sludge involves the use of vacuum suction trucks mainly operated by private operators. The service providers are directly engaged by households and operators of public toilets according to prevailing service charges. From the baseline survey, twelve (12%) of households indicated that desludging services are either poor or very poor. It is therefore recommended that the current service delivery option be maintained with LEKMA instituting regulation for improving services including a sanction regime for poor services. Wastewater from households will be conveyed to the proposed new sewage treatment plant. Allowance will be made for the treatment of up to 50m^3 faecal sludge per day which hauled by cesspit emptiers to the treatment plant. Figure 3.3 below shows the modified shit-flow diagram for Teshie Old Town to reflect the existing mode of collection and desludging of faecal sludge.

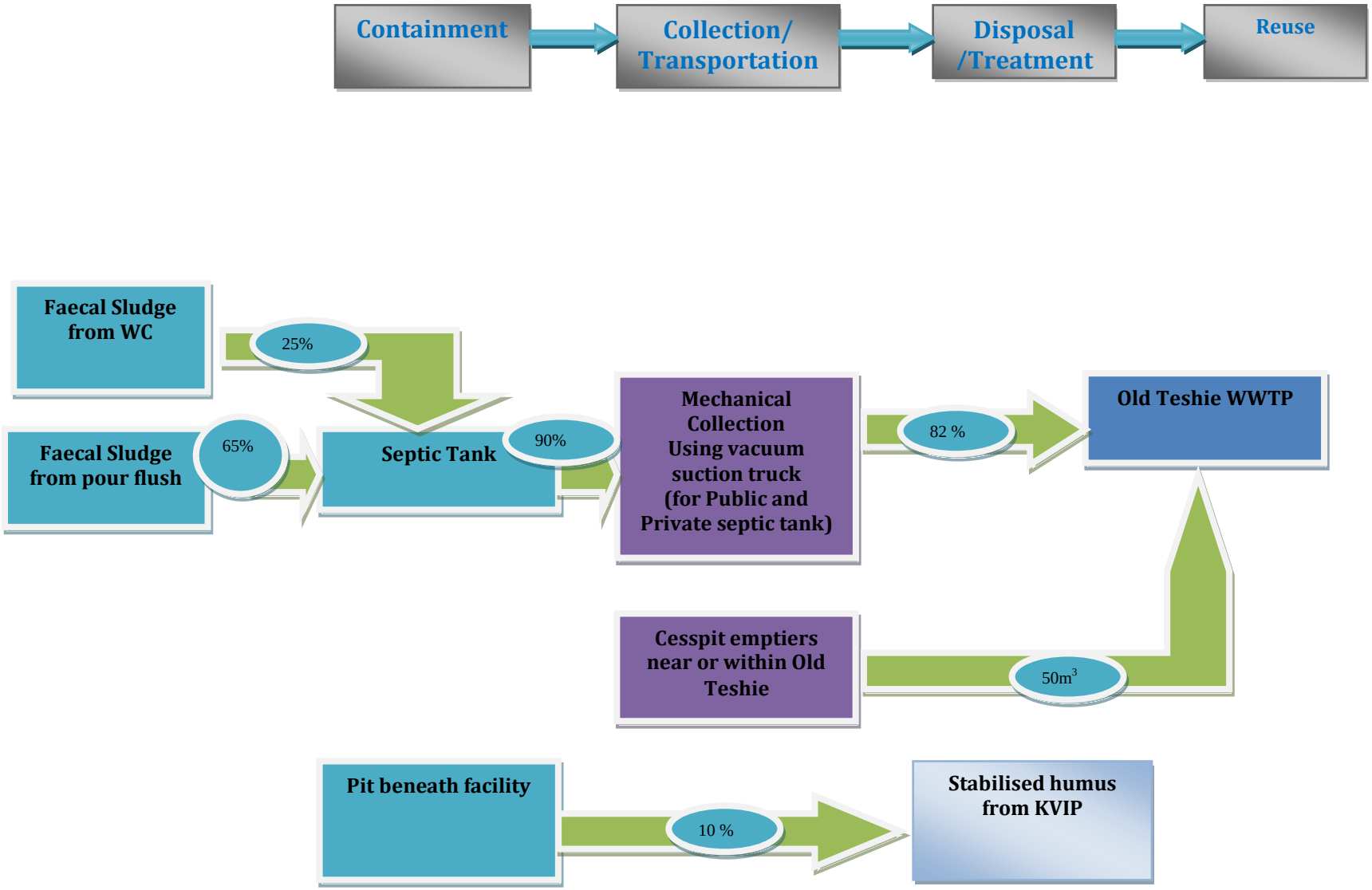


Figure 3-3: Modified Shit-flow Diagram showing projection of 100% wastewater and faecal sludge collection and transport to Teshie Old Town WWTP

3.5 Faecal Sludge Treatment Options

Faecal sludge from the community is currently sent to Lavender hill for disposal. Faecal sludge is disposed into the sea without treatment. Based on the shit/faecal sludge-flow analysis (refer to Figure 2.5 above) a list of applicable treatment options were developed. Figure 3.4 gives proposed faecal sludge treatment options for the community.

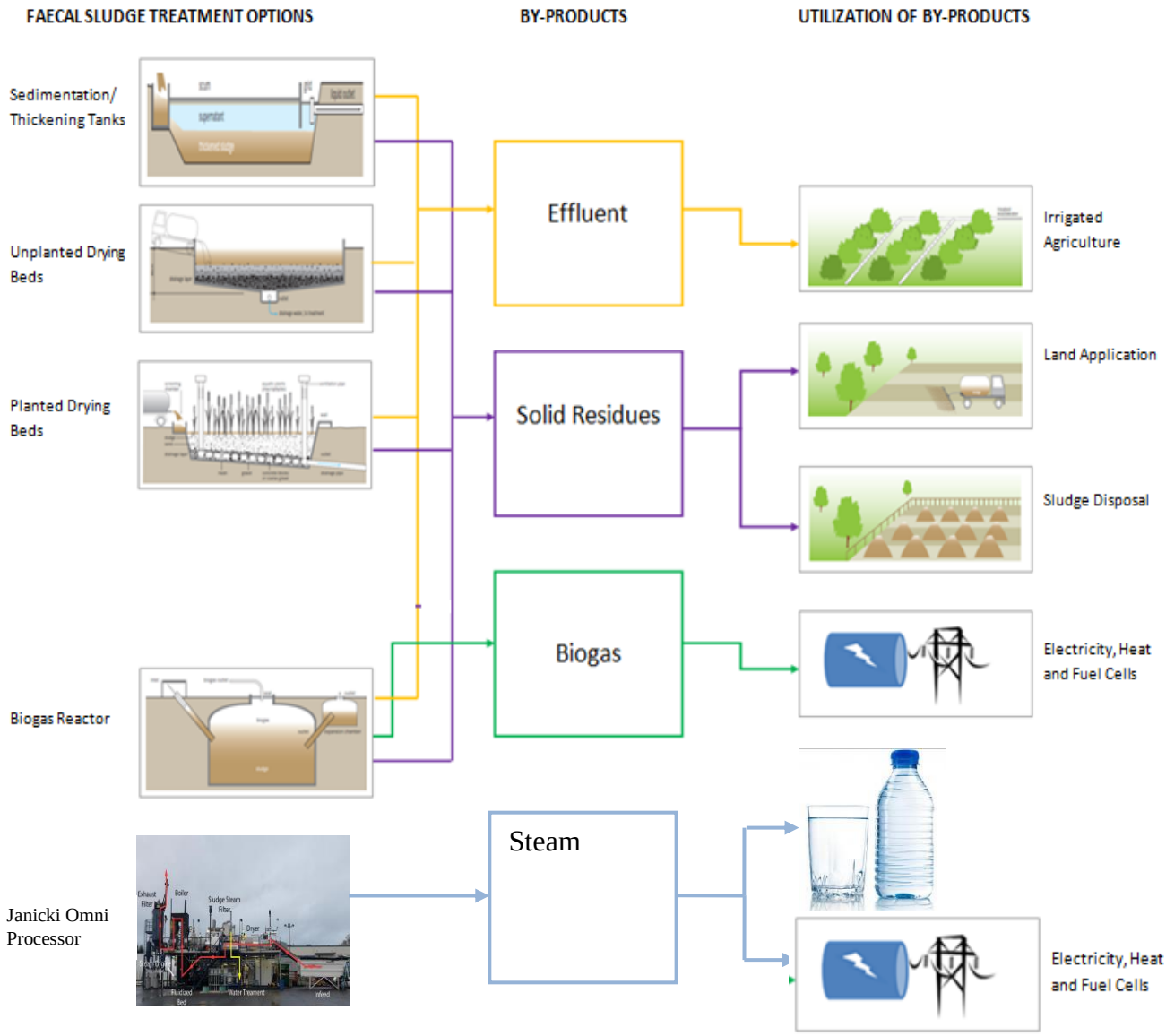


Figure 3-4: Selected Options for Faecal Sludge Treatment

Table 3.7: Assessment of selected faecal sludge treatment options

Treatment Option	Key Features/Treatment Procedure	Advantage s	Disadvantages
Sedimentation/ Thickening Tanks	Sedimentation or thickening ponds are settling ponds that allow sludge to thicken and dewater. The effluent is removed and treated, while the thickened sludge can be further treated in a subsequent technology	• Is a low-cost option and can be installed in most hot and temperate climates • Operation and maintenance not intensive • Can be built and repaired with locally available materials • Relatively low capital costs; low operating costs • No electrical energy is required	• Requires large land space and difficult to site in built-up areas • Issues associated with smell- ponds may cause a nuisance for nearby residents due to bad odours and the presence of flies • Not a "complete" treatment system- thickened sludge and effluent still infectious and requires further treatment before disposal/re-use • Trained staff for operation and maintenance is required to ensure proper functioning • Excessive rain may hinder optimum performance of the system- prevents the sludge from properly settling and thickening • Requires expert design and construction • Long storage times required for thickening of sludge
Unplanted Drying Beds	Is a simple, permeable bed that, when loaded with sludge, collects percolated leachate and allows the sludge to dry by evaporation. Approximately 50% to 80% of the sludge volume drains off as liquid or evaporates.	• Good dewatering efficiency, especially in dry and hot climates • Can be built and repaired with locally available materials • Relatively low capital costs; low operating costs • Simple operation, only infrequent attention required • No electrical energy is required	• Requires a large land area • Odours and flies are normally noticeable • Labour intensive removal of dried sludge • Limited stabilization and pathogen reduction • Requires expert design and construction • Leachate requires further treatment
Planted Drying Beds	Similar to an Unplanted Drying Bed but has the added benefit of transpiration and enhanced sludge treatment due to the plants. The key improvement of the planted bed over the unplanted bed is that the filters do not need to be desludged after each feeding/drying cycle. Fresh sludge can be directly applied onto the previous layer; the	• Can handle high loading of faecal sludge • Better sludge treatment than in Unplanted Drying Beds • Can be built and repaired with locally available materials • Relatively low capital costs; low operating costs • Fruit or forage growing in the beds can generate income • No electrical energy required	• Requires a large land area • Odours and flies may be noticeable • Trained staff required to ensure proper functioning • Long storage times • Labour intensive removal • Requires expert design and construction • Leachate requires further treatment- Faecal sludge is hazardous and anyone working

Treatment Option	Key Features/Treatment Procedure	Advantage s	Disadvantages
	plants and their root systems maintain the porosity of the filter.		
Biogas Reactor	A biogas reactor or anaerobic digester is an anaerobic treatment technology that produces (a) a digested slurry (digestate) that can be used as a fertilizer and (b) biogas that can be used for energy. Biogas is a mix of methane, carbon dioxide and other trace gases which can be converted to heat, electricity or light.	• Generation of renewable energy • Small land area required (most of the structure can be built underground) • Applicable at the household level, in small neighbourhoods or for the stabilization of sludge at large wastewater treatment plants • Similar level of treatment but with the added benefit of biogas generation • Long service life • No electrical energy required • Conservation of nutrients • Low operating costs The pilot 5m^3 biogas plant at Edina Essaman was constructed at an estimated cost of US$90,000.	• Requires expert design and skilled construction • The highest levels of biogas production are obtained with concentrated substrates, which are rich in organic material. e.g. as animal manure and organic market or household waste • Incomplete pathogen removal, the digestate might require further treatment • Limited gas production below 15 °C
Janicki Omni Processor	An alternative to the anaerobic digestion faecal sludge treatment system is the Janicki Omni-Processor. The waste-to-energy (WtE) plant (Omni-processor) treats the faecal sludge in an environmentally friendly manner producing electricity and treated water as it end/by-products. The processor is currently being piloted in a 12.3 m$^{3/}$day facility in Dakar, Senegal at an estimated cost of US $1.5 Million. To achieve optimum efficiency, household solid waste could be mixed the sludge from the hydro-segregation tank to enhance combustion and hence energy generation. This may potentially reduce the burden of solid waste management which has been a major challenge for most MMDAs in the country. For communities where the potential for re-use is high, the Janicki Omni-processor treatment plant can be assessed as an alternative to biomethanation (biogas). Further detailed feasibility study is required to establish the capacity of the plant as well as its viability in the local context. The initial investment cost of treatment using Janicki, US $125,000 per m^3, is comparatively higher.		

Adapted from Final Technical, Financial and Management Report -Development of Technically Feasible, Socially Acceptable and Financially Viable Toilets and Faecal Sludge Management in Some Rural Areas and Small Towns in Ghana, CWSA, 2015 and prepared by WasteCare Associates.

Based on the above assessments, negotiations on the existing and proposed faecal sludge facility options as well as the objective of resource recovery, the following treatment options are proposed:

Shared block treatment options	Sewer Network Treatment Options
Block Septic Tanks	Simplified sewer network connected to centralised Bio-digesters/Biogas Reactor treatment plant
Block Bio-digesters/Biogas (see Figure 3.5)	

Figure 3.5 shows the proposed typical shared block bio-digester system.

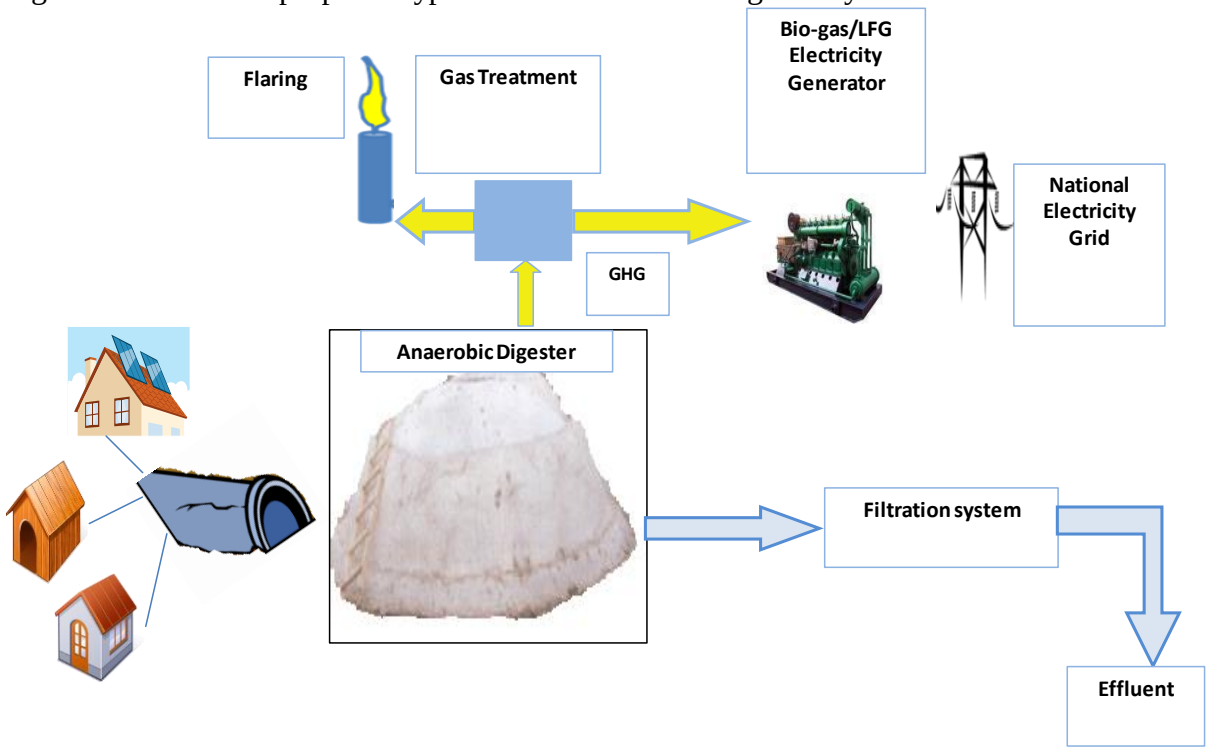


Figure 3-5: Typical shared block bio-digester system

Source: MDG Accelerated Framework (MAF) Report, 2010

3.6 Simplified Sewerage

A simplified sewer system is an adaptation of conventional sewer design concepts for high density Low Income Urban Communities (LIUCs). This allows use of smaller diameter pipes (sewers) laid at shallow depths following existing gentle slopes of the ground and based on the location of toilets within dwellings (housing units).

Simplified sewerage systems are designed to collect all household waste water directly for off-site treatment and disposal. The sewer network is constructed using smaller diameter pipes laid at shallows depth generally not exceeding 1.0 m (0.5m in areas not subjected to vehicular traffic and 0.8m in areas subjected to vehicular traffic); flat gradients of 1 in 100 for house connections and 1 in 167 for block connections have been used in Kumasi (Asafo simplified sewerage). The sewer pipes are laid within property boundaries often in back-alleys of buildings or under pedestrian pavements (often narrow walkways) not subjected to heavy vehicular traffic (see Figures 3.6 and 3.7).

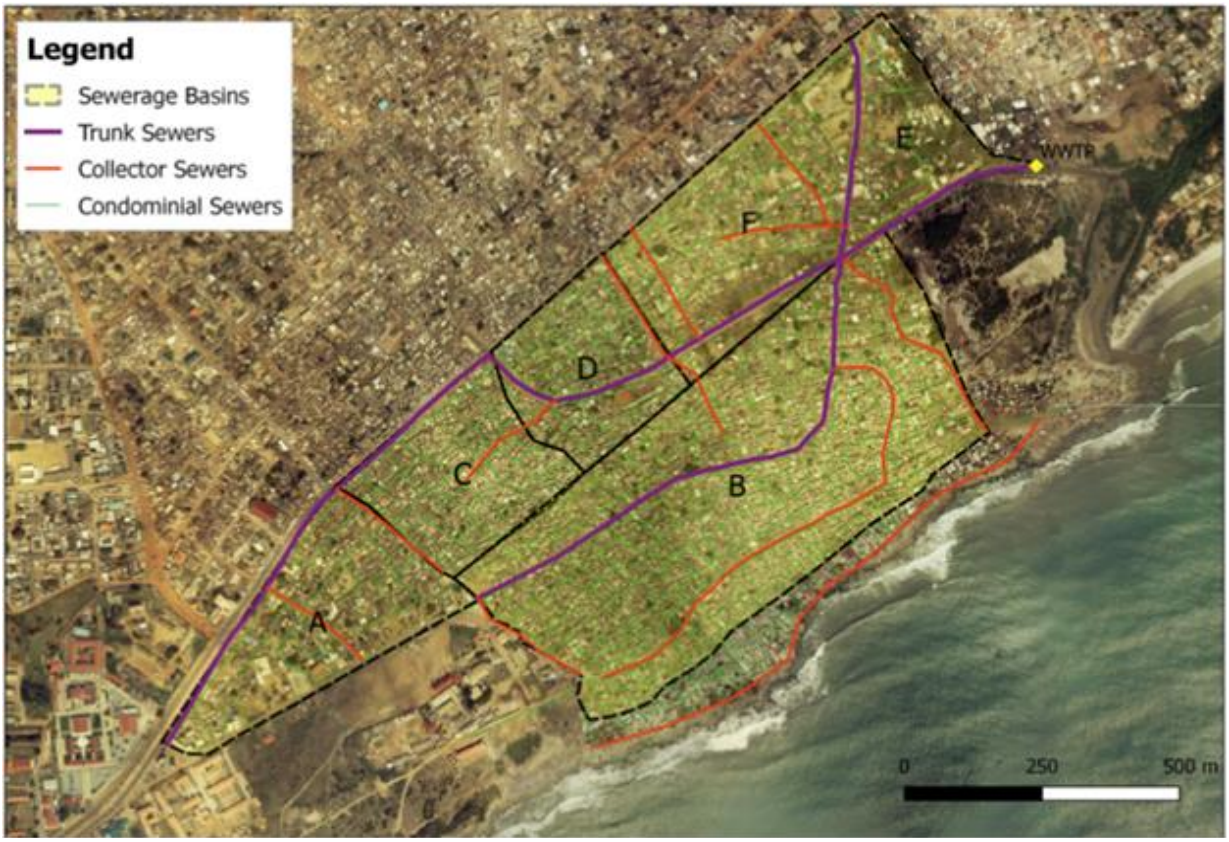


Figure 3-6: Layout of collector pipes for simplified sewer network in Teshie Old Town showing proposed location for Wastewater Treatment Plant (WWTP)

Simplified sewerage system was recommended for Teshie Old town which has the following peculiar characteristics:

- **High Population Density:** of 193.27 person/ha and housing density of 14.42 houses/ha in Teshie Old Town makes installation of on-site treatment facilities difficult because of lack of space. Even where there is space, installation of on-site systems are likely to meet opposition from some neighbours because of the need of desludging at some stage during operation. Simplified sewers require only shallow excavations for laying house and block collection sewers for conveyance of sewage for off-site treatment. Block sewers can be laid as part of project-sponsored intervention and for households to connect to block sewers as and when in-house plumbing and fixtures are purchased.
- **Adverse Ground conditions:** on-site excreta and sullage disposal systems rely on the ability of the soil to absorb sufficiently on-plot waste water generated and the excavated pit for excreta storage. The sea shore areas of Old Teshie typically experience high-saline water table.
- **High wastewater generation:** as population and housing density increases, more wastewater is generated per housing block thus requiring additional space for the expansion of existing soak pits. Furthermore, factors such as inadequate space, unfavorable soil conditions and cost of construction of soakpits may even deter household from investing in these on-site facilities. Households with connections to simplified sewers have the benefit of disposing both excreta and sullage for off-site treatment. The high housing and population density means that pour-flush (or micro flush) toilets can be used as there is enough volumes to meet minimum flow requirements.

Figure 3-7: Layout of block sewers for simplified sewer network in Teshie Old Town showing congested (dense and interlocked) nature of houses

The simplified sewerage system shall consist of gully (or grease) traps at the back of kitchens, house connections, inspection chamber/ manholes, common collector (trunk) sewer and a sewage treatment plant. The cost of proposed simplified sewerage system is estimated at **USD 2,454,805.50** while the cost of the bio-digester treatment plant is estimated at **USD 1,526,500.00**. Details of the proposed sewer network and sewage treatment plant are indicated in the Preliminary Design Report for Teshie Old Town Sewerage Network attached as Appendix 5 to this report.

3.7 Household Latrine Promotion Models

Training of Sanitation Activists/Canvassers: in order to ensure that household latrine promotion improves in the community, a number of community activists/canvassers for home latrine promotion have been trained as part of the GAMA SWP. The activists/canvassers have been trained on the recommended sanitation technology options and are expected to share information and deepen community members' understanding of the project benefits.

Artisan Driven Model: this model aims at creating a sustainable artisanal delivery of household toilets with the artisan carrying out both marketing and construction of toilets for households. In this model the artisan procures the materials and carries out all the construction works. Previous experiences show that if the artisans' businesses are project-driven then the demand from households for artisans' services decline at the end of project. This model can be sustained if the artisan is self-motivated and engaged in a sanitation business which is demand-driven (see Figure 3.8 below).

The artisan driven model is enhanced by the extension of credits to households by microfinance institutions and other financial intermediaries for home improvement including acquisition of household toilets. Existing groups like the Artisans Association of Ghana with offices in Accra and Ashaiman, and community savings groups will be engaged in the promotion of home improvement. This has the potential of increasing the construction of toilets by households.

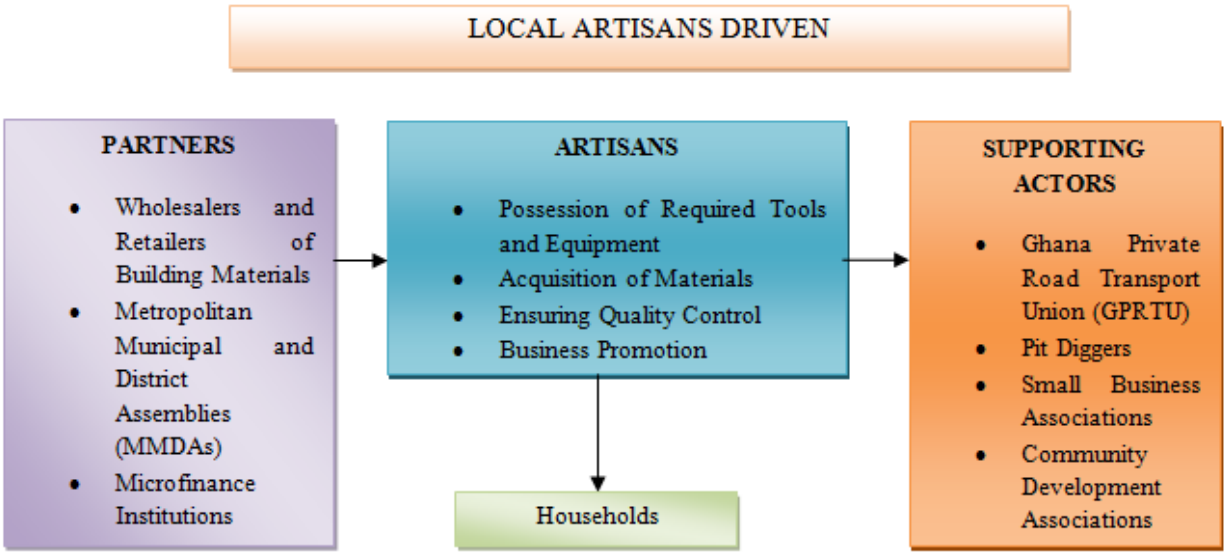


Figure 3-8: Key actors and roles of the local artisan driven household latrine promotion model
Source: UNICEF-GOG WASH Programme, Vol. 1 Assessment Report on Applying Business Solution and Micro-finance to Rural Sanitation Delivery in Ghana, 2014 by CDC Consult Limited, Accra, Ghana

Enterprises' Solutions: this proposed model involve a network of existing registered enterprises that engage trained artisans and/or agents to promote market and/or construct approved household toilets. The artisans are paid direct labour costs for constructing a facility. The trained agents are either paid-employees of the enterprises or are engaged on retainer basis often paid a percentage of the total cost of an installed facility. The operations of enterprises are not limited to the jurisdiction of any particular MA and may operate GAMA-wide.

The Ghana Federation of the Urban Poor Toilet Makers Company is an example of a registered Sanitation Enterprise operating at GAMA- wide level. Enterprises registered (or Licensed) by MAs may provide training to community members of the Sanitation Improvement Facilitation Team (SIFT) to promote the construction of household toilets in the community. The inclusion of various financial institutions (commercial banks and microfinance institutions) with the ability to advance credits to households to finance home improvements, including household toilets, has the potential for sustaining latrine promotion. The key features of the model are detailed in Table 3.8 below.

Table 3.8: Enterprise solution model for household toilets

<table>
<tr><th>Key Partners</th><th>Key Activities</th><th>Value Propositions</th><th>Customer Relationships</th><th>Customer Segments</th></tr>
<tr>
<td rowspan="2"> 
1.MMDAs
2.NGOs
3. Hardware Suppliers
4. Transport sector operators
5.Commercial Banks
7.Microfinance Institutions
8. Entrepreneur involved in latrine promotion.</td>
<td> 
1.
Entrepreneur markets household latrines.
2. Households secure funds (loans from microfinance institution) to construct household toilets.
3. Artisans/households procure materials for construction
4.Artisans construct household toilets
5. Household/MFI settles balance of facility cost.
6. Latrine promotion entrepreneur pays artisans labour costs</td>
<td rowspan="2"> 
1. Promoting a clean environment.
2.Reducing environmental pollution and degradation
3.Sustaining the health and well-being of communities
3. Increasing socio-economic activities and gains in the environmental sanitation value chain.
4. Constructing household toilets.</td>
<td> 

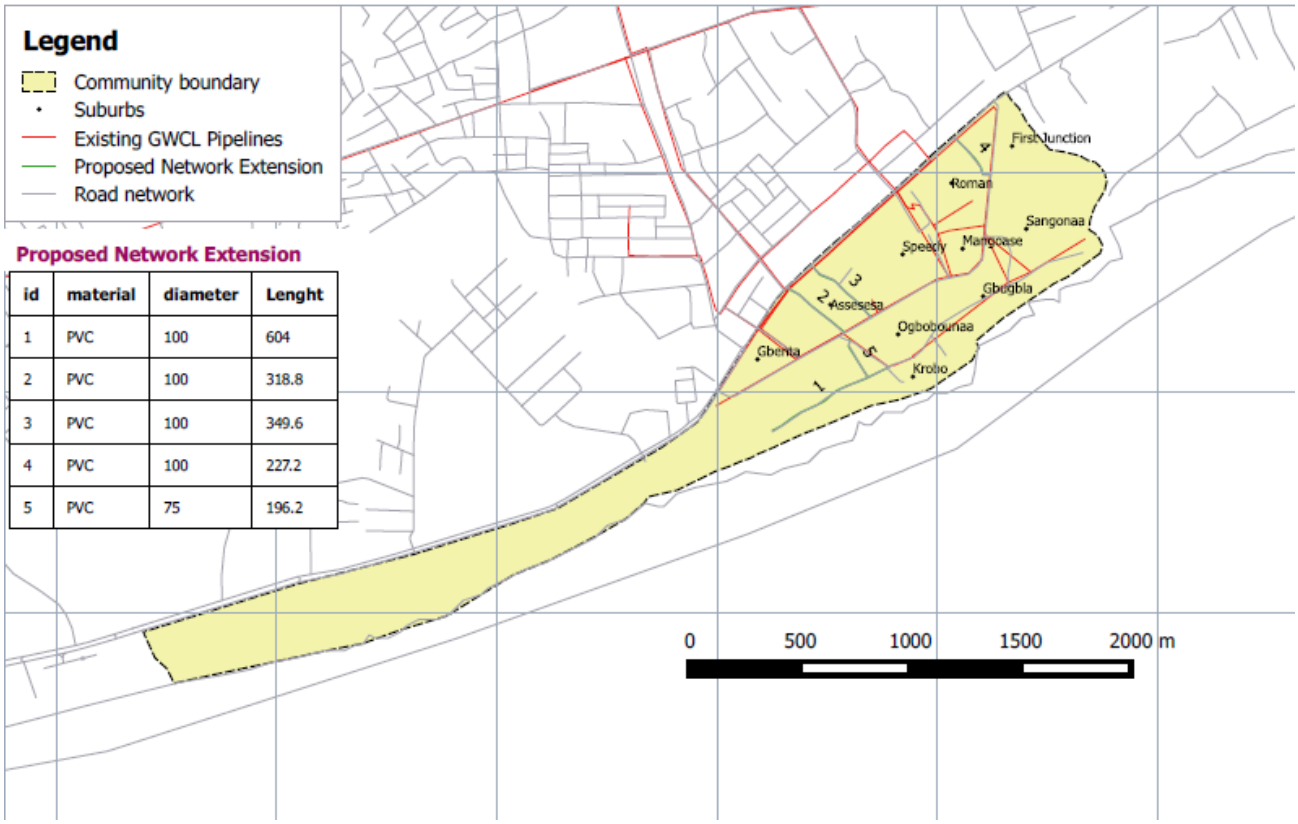
1. National, Municipal Assembly, Artisans and entrepreneur move from house to house to market toilets
2. Artisans maintain contact within the community for future engagements</td>
<td rowspan="2">Households</td>
</tr>
<tr>
<td>KEY RESOURCES
Well trained household artisans.
Efficient Hand tools
Toilet construction materials</td>
<td>CHANNELS OF DISTRIBUTION
 

House-to-house canvassing</td>
</tr>
<tr>
<td colspan="2">COST STRUCTURE
 
Toilet construction materials
Entrepreneur’s fees
Artisan commission</td>
<td colspan="3"> 
REVENUE STREAMS
Household savings
Micro finance loans and advances
Entrepreneur’s profit
Household Artisan’s commission</td>
</tr>
</table>

4. WATER SUPPLY IMPROVEMENTS AND COSTS

4.1 Extension of Distribution Lines into Teshie Old Town

Teshie Old Town has water supplied from GWCL connections. However, parts of Teshie Old Town need extension of distribution lines. Figure 4.1 gives an overview of the extension of distribution pipelines while Figure 4.2 gives the status of GWCL pipe connection in the community. Table 4.1 presents the cost of distribution lines extensions.



Proposed Network Extension

id	material	diameter	Lenght
1	PVC	100	604
2	PVC	100	318.8
3	PVC	100	349.6
4	PVC	100	227.2
5	PVC	75	196.2

Figure 4-1: Water supply needs assessment of Teshie Old Town

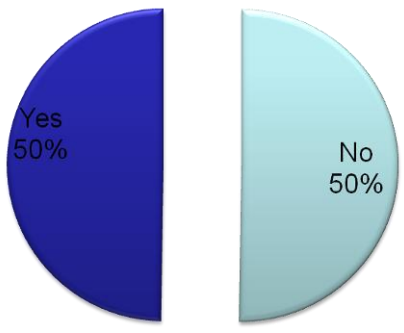


Figure 4-2: Status of GWCL connections in Teshie Old Town

Table 4.1: Cost of extending distribution mains to sections of Teshie Old Town without waterlines

Item	Description	Amount (USD)
1	General Items and Preliminaries	12,307.69
2	Site Clearance	10,673.08
3	Excavation and backfilling	26,794.87
4	Pipe-Laying works	29,866.92
5	Chambers and Pipework Ancillaries	16,891.03
6	Standpipes	119,230.77
7	**Subtotal**	**215,764.36**
8	Contingencies (15% of subtotal)	32,364.65
9	**Total**	**248,129.01**

A draft tender document including preliminary designs and bill of quantities for the extension of distribution pipelines is attached to this report as Appendix 6.

5. SOLID WASTE IMPROVEMENT AND COSTS

5.1 Household Solid Waste Collection and Storage Improvements

According to the baseline survey, about 17.4% of the households use bins as household waste storage containers. It is therefore recommended that the use of 240L bins should be encouraged to improve storage of household waste in compound, semi-detached and detached houses. Table 5.1 below presents the cost of provision of bins to HHs without their own refuse bins.

Table 5.1: Estimation of cost of provision of Household (HH) bins

S/No.	Indicator (Based on Baseline Survey)	Value
1	Total number of households	4,029
2	HHs relying on door-to-door waste collection system is (2.2%)	81
3	Number of HH with bins = (17.4% of Item 1)	701
4	Households relying on communal container (34.2%)	1,370
5	Targeted number of bins for HH without bins(Item 1- (Item 3+Item 4))	1,958
6	No. of 240L bins required in houses to ensure 48.4% door-to-door coverage	1,958
7	Unit cost provision and supply of 240l bins to houses by the MA in USD	70
8	Cost of supply of bins in USD	**137,066.58**

5.2 Improvements for Waste Segregation

The baseline survey indicated that only 16% of the households interviewed segregate their household waste. It is therefore recommended that separation of household waste be promoted using the strategies described below:

- Introduction of recyclable waste buyers to community and encourage households to separate recyclable waste from non-recyclable waste to enhance buyers to buy them from homes.
- Setting up a buy back centre equipped with buy back equipment (that can process recyclable materials), floor area 207m^2.

Table 5.2 below provides plastic generation of residents/households in Teshie Old Town.

Table 5.2: Estimation of volume of plastics generated in a day

Population	Total waste generated per day (m^3)	Volume of plastics per day (m^3)
14,603	43.81	6.66

5.3 Improvement in Communal Waste Collection

Open dumping is very prevalent in Teshie Old Town while few of the households dispose refuse at the communal waste collection point. The WASH inventory revealed that most households dispose of waste along the beach and communal refuse collection points. The Kponkpa and Akotobu communal refuse collection points are however in deplorable conditions. The sites lack well engineered refuse holding bays resulting in littering of the sites often. It is recommended that refuse holding bays be constructed. In addition, skip pads/holding bays (70m^2 floor area) should be provided at the three (3) communal refuse collection points to ensure better handling of refuse. The inclusion of one (1) toll booth (7.29m^2 floor area) at proposed refuse holding bay at the beach area behind the Presbyterian Church is proposed.

The sites lack any drainage measures controlling surface runoff and effects of erosion. Estimated total length of U450 side ditches for the sanitary site including U600 outfall drain that will discharge runoff water from the site to the nearby outfall is shown in Table 5.3.

Table 5.3 presents the estimated cost for carrying out all refurbishments outlined above at the communal waste collection site.

Table 5.3: Cost of Construction of Solid Waste Holding Bays

Item	Description	Amount in USD
1.0	Construction of 1no. Tool Booth, 7.29m^2 floor area	3,350.00
2.0	Construction of 3no. solid waste holding bays (SWHB), 70m^2 floor area	14,650.00
3.0	Improvement of site drainage, Length=950m, U450 and U600 precast U-drains	155,750.00
4.0	Construction of plastic buyback center equipment inclusive, 207m^2	97,900.00
5.0	**Total for communal waste collection site improvements**	**271,650.00**

Total cost of refurbishments is **271,650.00 USD**. The municipal assembly is advised to inspect the site regularly in order to check on the surroundings.

6. SULLAGE DISPOSAL AND COSTS

6.1 Construction of Soakpits

The entire Teshie Old Town area has a natural topography suitable for conveyance of grey water through tertiary drains into adjoining secondary and primary drainage networks to suitable outfall.

For areas without drains the construction of soakage pits is recommended. Simple percolation tests may be conducted at few selected locations in the area. This will help to establish average filtration potential of soils in the area for design of soakage pits.

It is proposed that houses that opt for soakage pits in the area be provided with technical support for constructing their own simple soakage pits located at the back of bathhouses to dispose of household sullage. Similarly simple uPVC pipes may be laid to connect to the simple soakage pits to discharge grey water from kitchens. The soakage pit will be sized using the estimated amount of wastewater and grey water generation rates. Simple excavated pits filled with boulders are appropriate for filtration and infiltration of the wastewater.

The cost of materials including cement and sand for blocks and $1m^3$ of clean granite boulders from nearby quarries as well as payment of skilled masons for construction of soakpits is about **153.36 USD** per house of an average of 35 occupants determined by the baseline statistics.

Table 6.1 below presents cost for constructing soakage pits in 327 houses within the project area. The estimated cost is **USD 50,148.72**

Table 6.1: Cost of constructing HH soakage pits in 572 houses in Teshie Old Town

Item	Description (Based on Baseline Survey)	Amount in USD
1	Cost of 1m3 of boulders ex-site including transport from quarry to each house	53
2	Cost of 3-bags of cement to each house for block moldings & construction	27.63
3	Cost of buying and transporting 1m3 of sand to each house for construction	39.47
4	Free HH level support for digging soakage pit by the occupants	-
5	1-skilled mason plus 1 labourer to assist HH to construct soakpit to design stds	26
6	Subtotal	146
7	5% of Subtotal as contingency for any unforeseen expenditure	7.3
8	Unit rate for construction 1-soakpit (USD)	153.36
9	Number of houses requiring soakpits under this subproject (21.8[6]% of Houses)	327
11	Total Cost for soakpits construction (USD)	**50,148.72**

[6] Percentage of dwellings that dispose of wastewater from bathouses into open grounds/lots (from baseline survey)

7. INSTITUTIONAL ARRANGEMENTS

7.1 Ledzokuku-Krowor Municipal Assembly

In line with National Policy, the MA will gradually move away from direct provision of environmental sanitation services, and instead will promote active involvement of both communities and the private sector in the delivery of WASH services. As part of its functions, the MA will mobilize resources to implement the proposed communal/bulk WASH infrastructure interventions (e.g. condominium sewer network, communal refuse collection stations, water supply upgrade, etc.), supervise the design and construction of the facilities and oversee service contracts. The MA will set and enforce the required regulations for the sustainable operation and maintenance of the interventions.

The bulk or communal WASH infrastructure interventions will be owned by the MA. To ensure sustainability of operation and maintenance of the bulk/communal infrastructure interventions (including the proposed sewer network), it is recommended a Management Committee involving representatives of the following should be formed:

- The Municipal Assembly
- Traditional/local Chiefs
- Teshie Old Town Community
- Local Opinion Leaders
- Ghana Water Company-Teshie District
- Other relevant stakeholders

This body or committee could as well be the proposed Water and Sanitation Users Association (WSUA).

7.2 LEKMA Waste Management Department

According to the Local Government (Department of District Assemblies) (Commencement) Instrument, 2009 (L.I. 1961), the Waste Management Department (WMD) has been mandated to provide facilities, infrastructural services and programmes for effective and efficient waste management for the improvement in the environmental sanitation, the protection of the environment and the promotion of public health. It is recommended the liquid waste section manages the programmes for households (home latrine promotion) and public facilities (neighborhoods and commercial areas). The solid waste section will also have oversight responsibility for solid waste improvement (including establishment and effective operation of "buy-back" centre, sullage and drainage infrastructure).

The Works Department will assist in facility design and procurement of works. It is expected that technical assistance to the LEKMA-WMD in the areas of planning and M&E will be provided through the Municipal Planning Coordinating Unit (MPCU).

7.3 Private Service Contractors

Currently the operation and maintenance of public toilets (sanitary sites) has been franchised to private service providers. It is recommended the existing arrangement be maintained. There is however currently no solid waste collection contractor serving the community. The impact is evident in indiscriminate disposal of refuse in the community resulting in several open dumps including along the beach. It is therefore recommended a private waste collection service provider or contractor be introduced in the community to improve household waste collection.

An extensive awareness campaign and community consultations should precede the introduction of the private service provider in order to ensure patronization of services by residents. The EHSD should enforce prohibiting indiscriminate disposal of solid waste.

Regarding the operation and maintenance management of the proposed sewer network and septage treatment plant, it is recommended the MA procures the services of a private operator. The private operator will also be responsible for the collection of service charges or fees from service users (households connected to the sewer network).

A similar system has been in operation under the Pilot Asafo Simplified Sewerage Scheme in Kumasi since 2000. Under the scheme, households are however responsible for in-house plumbing and block sewer repairs and maintenance while the KMA supports the repair of street sewer blockages and damages to trunk sewer lines and man-holes as well as desludging of anaerobic ponds.

8. SUMMARY OF TECHNICAL AND FINANCIAL OPTIONS

8.1 Implementation Packages

The facilities required to provide immediate interventions are set out in Table 8.1. As the project evolves and more data becomes available, the subsequent years of the first phase project interventions shall be defined to cover up to the third year. The facilities under the various components are grouped into financing packages. The estimated cost of each package is also given in Table 8.3.

In summary, the total cost of the first phase is estimated at **USD 6,415,364.77** out of which 3.87% would be for remedial intervention to improve water supply and the remaining 96.13% for Excreta (liquid waste) management which includes provision of household toilets, and simplified sewerage with centralized bio-digester sewage treatment plant. The solid waste improvement and sullage disposal interventions are to be implemented under phases two (2) and three (3). Appendix 7 gives a summary of cost of the various interventions.

Table 8.1: Financing Option and Associated Costs of Project

Projects Components	**Financing Option (US Million)**					
	IDA Credits	**Other Donors**	**Central Government**	**Metro/ Municipal Assembly**	**Household Beneficiaries**	**Total**
COMPONENTS TO BE IMPLEMENTED						
A. Construction of soakpits					0.05	0.05
B. Construction of Household Toilets					2.19	2.19
C. Construction of simplified sewer systems	2.46					2.46
D. Construction of centralized bio-digester sewage treatment plant	1.60					1.60
E. Provision of litter bins to households					0.14	0.14
F. Provide sanitary sites with ancillary facilities (communal containers and refuse holding bays)				0.27		0.27
G. Extension of Distribution Lines	0.26					0.25
Total	**4.32**	**-**	**-**	**0.27**	**2.37**	**6.96**

Table 8.2: Facilities to be provided under the proposed packages

Component Description	Total	Phase 1 (2016 - 2019)	Phase 2 (2020 – 2023)	Phase 3 (2024 -2027)
1. Excreta (Liquid Waste) Management				
Construction of pour flush toilets connected to sewer network	2,963	2,963		
Construction of WC toilets connected to sewer network	988	988		
Construction of simplified sewerage	NA			
Construction of centralised bio-digester sewage treatment plant	1	1		
2. Drainage and Sullage Improvement				
Construction of soakpits	327		163.50	163.50
3. Solid Waste Management				
Provision of litter bins to households	1,958		979	979
Construction of 1no. Tool Booth	1		1	
Construction of 3no. solid waste holding bays (SWHB)	3		2	1
Improvement of site drainage, Length=950m, U450 and U600 precast U-drains	950m			
Construction of plastic buyback center equipment inclusive	1		1	
4. Water Supply Improvement				
Extension of Distribution Pipelines	NA			

Table 8.3: Costs involved in implementation of all phases of the project

Component Description	Total (USD)	Phase 1 (2016 - 2019)	%	Phase 2 (2020 - 2023)	Phase 3 (2024 -2027)
1. Excreta (Liquid Waste) Management					
Construction of pour flush toilets connected to sewer network	1,602,318.17	1,602,318.17	24.98		
Construction of WC toilets connected to sewer network	583,612.09	583,612.09	9.10		
Construction of simplified sewerage	2,454,805.50	2,454,805.50	38.26		
Construction of centralised bio-digester sewage treatment plant	1,526,500.00	1,526,500.00	23.79		
Sub-total	**6,167,235.76**	**6,167,235.76**	**96.13**		
2. Drainage and Sullage Improvement					
Construction of soakpits	50,148.72			25,074.36	25,074.36
Sub-total	**50,148.72**			**25,074.36**	**25,074.36**
3. Solid Waste Management					
Provision of litter bins to households	137,066.58			68,533.29	68,533.29
Construction of 1no. Tool Booth	3,350.00			1,675.00	1,675.00
Construction of 3no. solid waste holding bays (SWHB)	14,650.00			7,325.00	7,325.00
Improvement of site drainage, Length=950m, U450 and U600 precast U-drains	155,750.00			77,875.00	77,875.00
Construction of plastic buyback center equipment inclusive	97,900.00			48,950.00	48,950.00
Sub-total	**408,716.58**			**204,358.29**	**204,358.29**
4. Water Supply Improvement					
Extension of Distribution Pipelines	248,129.01	248,129.01	3.87		
Sub-total	**248,129.01**	**248,129.01**	**3.87**		
Total	**6,874,230.07**	**6,415,364.77**	**100.00**	**229,432.65**	**229,432.65**
Total (with 10% to cater for all contingencies)	7,561,653.08				

Table 8.4: Investment Packages for Phase 1

Component Description	Phase 1							
	Proposed Infrastructure				Cost (USD)			
	Total	**Year 1**	**Year 2**	**Year 3**	**Total (USD)**	**Year 1**	**Year 2**	**Year 3**
1. Excreta (Liquid Waste) Management	-	-	-	-				
Construction of pour flush toilets connected to sewer network	2,963	1,185	889	889	1,602,318.17	640,927.27	480,695.45	480,695.45
Construction of WC toilets connected to sewer network	988	395	296	296	583,612.09	233,444.84	175,083.63	175,083.63
Construction of simplified sewerage	NA				2,454,805.50	2,454,805.50		
Construction of centralised bio-digester sewage treatment plant	1				1,526,500.00	1,755,000.00		
Sub-total					**6,395,735.76**	**5,084,177.60**	**655,779.08**	**655,779.08**
2. Water Supply Improvement	-	-	-	-				
Extension of Distribution Pipelines	NA				248,129.01	99,251.60	74,438.70	74,438.70
Sub-total					**248,129.01**	**99,251.60**	**74,438.70**	**74,438.70**

Table 8.5: Community Infrastructure Upgrading Program Summary Data and Cost

Communities	Area (Ha)	Population	Density Pers/ha	No. of Dwellings	Dwellings per/ha	Average HH/ Dwellings	Average HH Size	Cost/ ha(USD)	Cost/ Cap(USD)
Teshie Old Town	104	20,145	193.7	1,500	14.42	7	5	72,708.20	375.36

GAMA/SWP Financed Sub-Projects: As part of the Greater Accra Metropolitan Area Sanitation and Water Project (GAMA/SWP), the project will make provision to cover improvements of excreta management and water supply improvement as well as institutional strengthening, and capacity building over a four year period. However, costs of water connection to houses, construction of soakage pits, household connection to block sewer lines, refuse bins and household toilets shall be fully financed by households. Households that cannot afford the construction of household toilets shall have arrangement with micro-finance to provide facilitation and technical assistance. It is proposed that house owners be given access to G-Fund loans for general home improvements including the provision of household toilets.

The remaining financing packages will be done in the subsequent phases over a six year period.

Human Resources Development: The capacity building team of the project shall be responsible for human resource development. However, the consultant shall provide technical support to the team. The consultant shall be responsible for training of local activists that will promote the various sanitation technology options.

Artisans and selected sanitation enterprise-solution providers will be given the opportunity to participate in periodic workshops so that they can share and exchange information on construction of recommended types of household sanitation systems (i.e. WC/pour flush toilets) as well as other systems including single and twin-pit VIP latrines, various eco-san toilets and disposal units. Agents of enterprise-solution providers and trained local activists will inform households of the technical options, be encouraged to upgrade their household facilities, and information provided on use and maintenance of facilities through linkage to Enterprise solution providers.

7.2 Proposed Financing Options

Based on existing financing mechanisms within Teshie Old Town as well as from literature, the following financing options for the household sanitation facilities have been proposed for consideration of the individual households. The options also take into consideration the existing socio-economic conditions in the community.

a. Use Of Own/Family/Friend Income

This is where the family purchases their construction materials in the local market using their own income and savings. Toilets are built using their own labour, or in most cases with some help from a local mason. The latter is not necessarily a skilled toilet mason; a 'mason' may simply be a local person with some construction skills who carries out simple masonry work for a negotiated fee. Toilet models with some complexities, such as pour-flush, ventilated improved pit toilets, septic tank toilets and water-flushed toilets, are mostly built by more skilled masons.

b. Use Of Free Materials and Labour

The simplest way of facilitating the construction process of toilets is to provide information on how to build sanitary toilets with minimal costs, using natural materials. This allows poor households to cover all direct costs for safe, initial excreta containment themselves. Promoting self-built toilets and the self-management of services is the urban variant of Community Led Total Sanitation approach (CLTS).

c. Subsidy (Output Based)

Many programmes of national governments, municipalities and NGOs (such as People's Dialogue) offer subsidies for household toilets construction in Ashaiman for example, and similar subsidies could be targeted for LEKMA.

d. Loans and Micro Credit

Micro-credit is a very small loan extended by a bank or other financial organisations that provide services to poor households usually without collateral. A Micro Finance Institute (MFI) usually gives loans to households for starting up or improving income-generating activities, not for building toilets.

e. Self Help/Savings Groups

An important problem of poor households is not so much the cost or their willingness to pay, but the need for a sizable upfront lump sum investment, even for the simplest and most preliminary models. This is further compounded by the difficulty in reserving savings for capital investments.

f. Micro Credit With Insurance System

Poor households are often reluctant to take out loans to invest in home toilets if risks of destruction by floods, fire, etc. are high, or if they fear that they cannot pay back the loans for reasons of illness or other household crises. Micro-insurance protects low-income people against financial problems due to illness, natural disasters, socio-economic crises, etc. Insurance is given in exchange for regular premium payments that are proportional to the subscribers' income and the cost of the risk involved (Churchill, 2006; Evans and Tremolet, 2009). Micro-insurance takes away people's fear for not being able to pay back loans in case of crises. It allows the poor to invest in a healthier living environment, although the effects on improved urban sanitation have yet to be thoroughly investigated. Homeless Peoples Federation (affiliate of SDI and a sister of GHAFUP) are examples of micro-finance institutions that also provide micro insurance on health and housing.

Table 7.4 below gives the advantages and limitations of the financing options above.

Table 8.6: Advantages and limitations of financing options

Financing Option	Advantages	Limitations
Use of own/family/friend's income	**Applicability:** Implementation only requires family decision **Sustainability**: It is sustainable so far as the family owns it **Scalability:** Similar to sustainability **Equity:** It is equitable if all family members agree to partake	**Applicability:** saving may take long; inflation over time increases the amounts that must be saved for each member as well **Sustainability:** Family members who are always on the go trekking are likely not to sustain it if they are outside the enclave **Scalability:** Similar to Sustainability **Pro-poor:** No absolute basis for measuring this as it is in the hands of the family **Equity:** Some family members are likely not to contribute
Use of Free Materials And Labour	**Applicability:** Applicable in the entire community if members are educated well on the kind of materials to use for the construction **Sustainability:** Economically sustainable if beneficiaries understand the concept **Scalability:** Scalable as in the case of CLTS **Equity:** Poor communities embrace such concepts because of its workability	**Applicability:** Needs proven that it is able to work **Sustainability:** Not sustainable if materials are not sourced locally **Scalability:** Similar to Sustainability **Pro-poor:** Material cost could escalate and make it not poor-friendly **Equity:** It needs total community participation
Subsidy	**Simplicity:** Allocating subsidies at points of sale has advantages of simplicity because all households receive the same subsidy for the same basic service level **Sustainability:** The programme has led to rapid and sustained increase in coverage with the help of donor funding for market development **Scalability**: Same as above (Sustainability) Pro-poor: The mechanism for ensuring equitable access is simple. Households	**Applicability:** Many sanitation programmes with household subsidies are construction - and output driven **Simplicity:** Simplicity depends on the criteria of application. Construction by contractors is quick and easy, but when it is done without user participation in decision making, toilets are most likely left unused or are not used as frequently. Handing out cash subsidies or materials at the onset may result in the use of the subsidy or materials for other purposes. On the other hand, output based aid,

Financing Option	Advantages	Limitations
	in locations with the highest poverty levels receive a higher subsidy on the price of materials, while those in locations with a lower poverty level buy materials at less subsidized prices. To ascertain equitable distribution a certain level of uniformity in poverty must exist per location. This implies that it becomes difficult to ensure equity in mixed neighbourhoods where ultra-poor households live amongst less poor households	which gives subsidies upon evidence of construction (and ideally also use) requires for households to invest upfront, adding costs for assessing performance to the subsidy costs **Sustainability:** Subsidization is rarely sustainable over long periods of time, and most subsidy schemes are limited in size and duration. Thus, only part of the households may get served, while urban population growth continues to add new unserved households **Scalability:** For reasons of costs, scaling up toilet subsidies to all poor and future poor households is rarely possible. Subsidy schemes typically serve limited numbers of poor urban households **Pro-poor**: Many subsidized sanitation services benefit the better-off or less poor more than the poor and the ultra-poor. Transparency and accountability of subsidies are often low **Equity**: Same as above (Pro-poor)
Loans and Micro Credit	**Applicability:** There is some degree of success because of its commercial nature **Simplicity:** This depends on the rules and regulations of the scheme and the legal freedom facilitating lending to individuals **Sustainability:** They are self-sustaining when they are managed well, when interest rates are flexible to market dynamics, and when there are no economic crises **Pro-poor**: This depends very much on the terms of borrowing and repayment **Equity**: Same as above (Pro-poor)	**Applicability**: Sometimes it is not really tailored. The poor need more than just loans to build a sanitary toilet. From the perspective of a full sanitation life cycle, the costs for upgrade, maintenance, repairs and sanitary emptying must also be understood **Sustainability:** Loan repayments are always a problem. Interest rates must be commercially viable for the loan scheme to be sustainable. However, this will reduce accessibility to the poor. Conversely, subsidized rates make the revolving fund more pro-poor **Pro-poor:** Payment conditions are not adjusted to the situation of the urban poor **Equity:** Poor households often fear to take out private loans because they foresee or fear problems with repayment. Individual households also often do not have the required collateral.
Self Help Groups/Savings Groups	**Applicability**: There is high participation of women in savings and loan clubs. These clubs are often promoted and facilitated by NGOs, such as People's Dialogue on Human Settlements **Simplicity**: The system is easy to understand, implement and replicate	**Applicability:** Challenges to the effectiveness of savings and loan clubs are described by the following: saving may take long; inflation over time increases the amounts that must be saved for each member; members must withstand pressures to use the money for other purposes in times of crisis; and the

Financing Option	Advantages	Limitations
	Sustainability: Savings and loan clubs are sustained by the members themselves and so, depend on the perseverance of their members. Basic accounting and accountability are a must, but can be taught through horizontal learning **Scalability**: The system is easy to understand, implement and replicate **Pro-poor:** The Self Help Groups are especially popular among lower-income women, and match their pattern of small income and expenditure by day **Equity**: In principle, all members have equal rights, but variations do exist	club may disintegrate before all members have benefited equally, causing tension and conflict **Sustainability:** Learning and sharing across the city requires support from a municipal service, a programme, or an NGO **Scalability**: Gaps in knowledge exist on the city-wide spread and success of the mechanism **Pro-poor**: Ultra-poor women or women from minority groups are sometimes excluded as the organisers tend to invite women like themselves. Membership tends to be based on equal contributions and benefits. Hence, women who are unable to make the same level of contributions opt not to join **Equity**: Male family members may not contribute even if they share in the ultimate benefits of women's participation

7.2 Adaptation of WASH Infrastructure Financing Mechanism - G-Fund

People's dialogue has set up G-Fund (a saving scheme) with Ghana Federation of the Urban Poor (GHAFUP). The G-Fund consists of the savings of the urban poor and some contributions received from third parties. The aim of the G-Fund is to provide the urban poor with micro financing for a broad variety of needs that the urban poor of GHAFUP select themselves. Due to the high cost of using WASH facilities as described above, WASH hardware has been the need selected. Loans have been provided to water vendors, public/private bath houses etc. from the G-Fund. The G-Fund currently amounts 400,000 GHS and the default rates are less than 10%. This level of default is made possible because the G fund is a community social development fund and GHAFUP employs a system of accounting principle that calculates default only on principal unlike other financial institutions where loans and defaults are calculated on loan plus interest amount. Members of GHAFUP determine the interest levels, acceptable default rates and recoverable percentages. G Fund belongs to a global Community of funds operating within the Slum Dweller International (SDI) networks in over 34 countries that focuses not exclusively on Financial sustainability but equally on delivery of service to beneficiaries with tolerable recovery rates of seventy percent (70%) on the principal component of loans and hence extremely low default rates (10%) making it six (6) percentage lower than prevailing default rates of microfinance institutions in Ghana.

Members of GHAFUP determine the beneficiaries of loans and hence extremely low default rates (0% to 4%) have been given to beneficiaries.
This experience by People's Dialogue shall be developed and used in the community. Below is the process involved in obtaining loan from G-Fund to finance WASH facilities:

- Expression of interest in WASH facility: interest can be expressed through mobilization by the federation members in the form of advocacy, education and communication backed by the Assembly's policy on sanitation.
- Household is assessed if facility is affordable and data is collected and analysed.

- Loan is processed.
- Proposed site is inspected to determine if technical features such as topography, water table level etc. are favorable.
- The prospective beneficiary pays 10% of the total cost of the project and the savings group he/she belongs to may guarantee for the person.
- The prospective beneficiary then agrees on the loan requested and repayment scenario for the rest of the amount.
- Loan is approved and disbursed to sanitation solution provider.
- The facility is installed and commissioned for use.
- Details of the beneficiary are logged into a database and repayment is monitored by a credit officer.

Figure 8.1 gives the description of the proposed financing mechanisms

From the descriptions above, the following proposals are made in order to support the urban poor to construct toilet facilities:

- Collaboration will be made with GHAFUP, Rapid Results Initiative (RRI), artisans, and enterprise solution providers to jointly perform community development drive among the community members in order to educate them on sanitation, hygiene and loan repayment.
- Purchase and installation of the water and sanitation facilities will be taken care of by Enterprise Solution providers after certification by People's Dialogue/WasteCare-JV (consultants). The urban poor will be prepared as indirect clients of the WASH business.
- People's Dialogue/WasteCare-JV (consultants) proposes to obtain funds from GAMA through the MAs or directly into its G-Fund to be lent to the urban poor (individually or in groups) that the urban poor will apply for obtaining WASH related products for households.
- People's Dialogue/WasteCare-JV (consultants) will invest in the WASH business through its G-Fund.

The potential exits for households taking up financing of improved home toilets given that households are already paying for poor sanitation services especially the cost of relying mainly on public toilets (see Table 8.7). The challenge for meeting the expressed demand by households for improved sanitation facilities are mainly due to lack of means of financing and the issue of tenancy.

The financing challenge can be overcome by providing targeted incentives including granting of loans with very soft conditions such as long repayment period (three to five years), non-commercial interest rates and re-payment scheme designed to meet their income earning patterns.

Table 8.7 illustrates a summary of the cost involved in a public toilet on a daily, weekly, monthly or yearly basis in the community, based on discussion with households, during the baseline survey and WASH inventory. This seeks to determine the cost incurred or involved in using a decent public facility if the household do not have one.

Table 8.7: Cost involved in visiting a public toilet in the community

Facility Type	Average Household Size	Payment per visit (GHS)	Daily Payment (average twice in a day) (GHS)	Weekly Payment (GHS)	Monthly Payment (GHS)	Payment made annually (GHS)
Improved Facility	5	0.30	3.00	21.00	84.00	1,008.00
Unimproved Facility		0.50	5.00	35.00	140.00	1,680.00

The adaptation of the G-Fund model with clearly specified guidelines and rules of engagement for landlords and tenants will fill the financing gap.

The challenge of tenancy and ownership of home toilets is a much difficult one that can be overcome by considering low-cost options that provide individual households exclusive use of toilets they have invested in, such as shared-blocks with specific household allocated privy-rooms or in cases where space is available in outer-rooms (halls) or verandahs.

The ultimate solution is a tenant-friendly toilet with the option of moveable super-structure and fixtures for sitting/squatting connected to a shared primary treatment system e.g. septic-tank with soak pit, biogas digester or simplified sewerage.

There is the need for more focused research and development (R&D) by Enterprise-Solution providers as a means to enhancing business development.

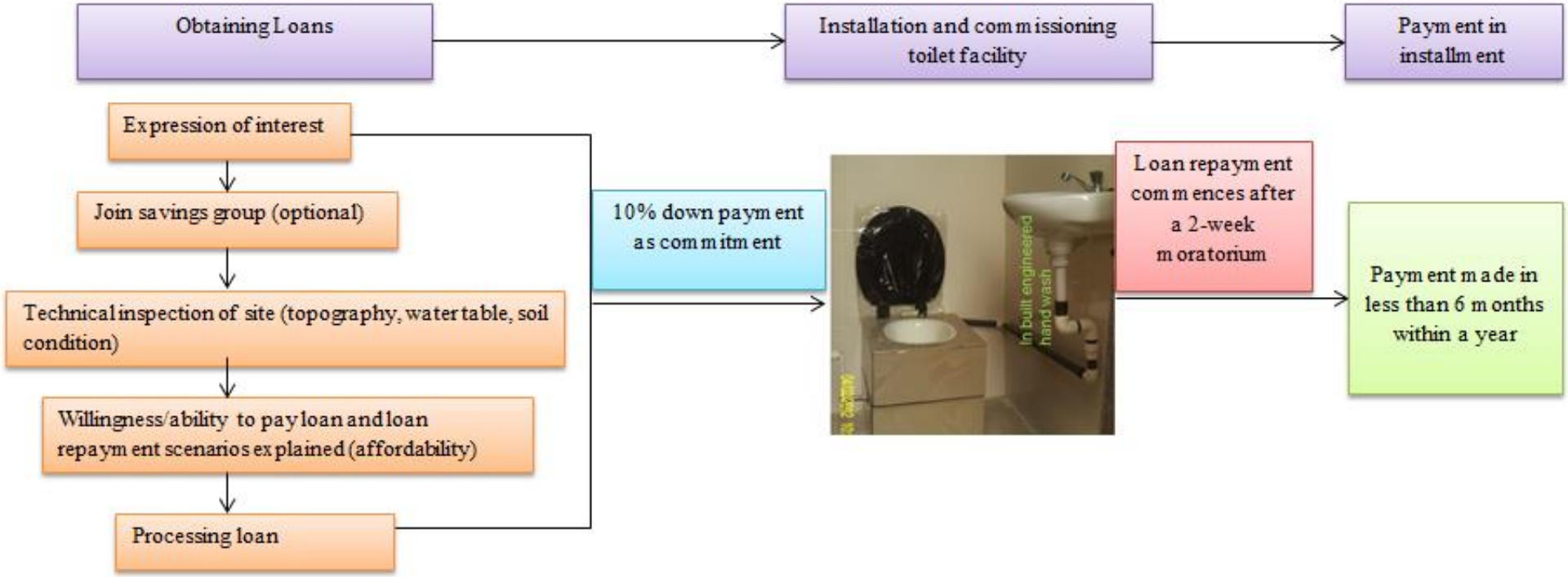
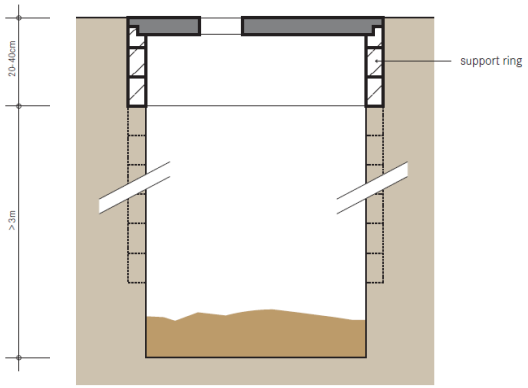
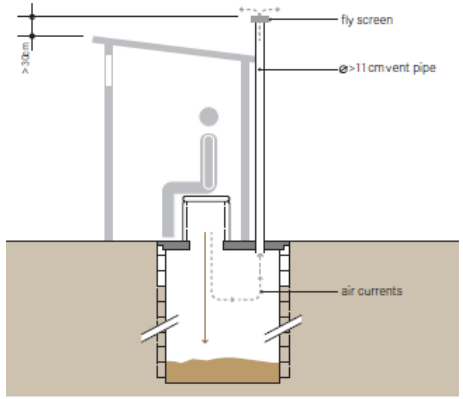
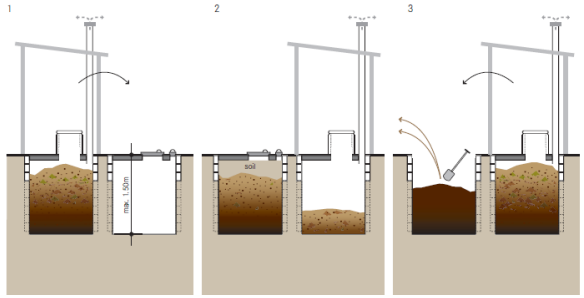
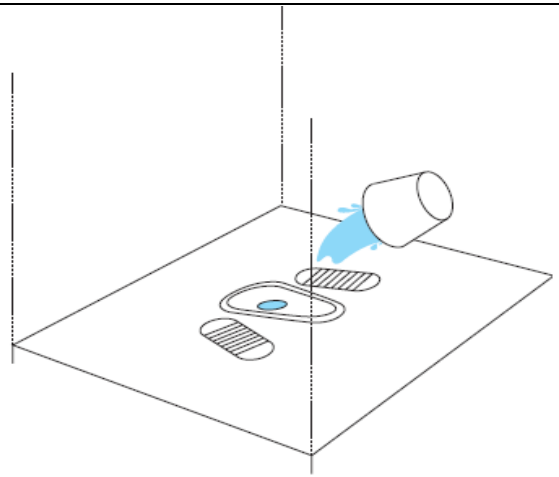


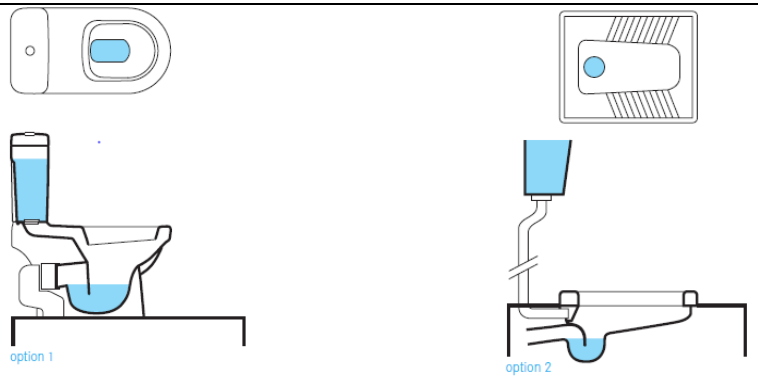
Figure 8-1: Financing mechanism proposed for the community

9. APPENDICES

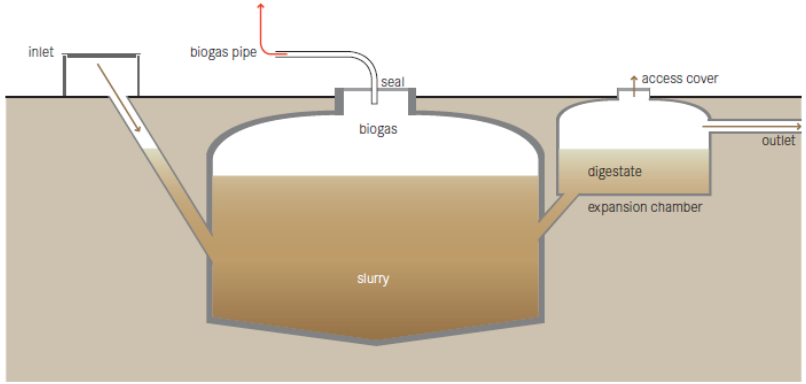
Appendix 1: Description of Sanitation Options

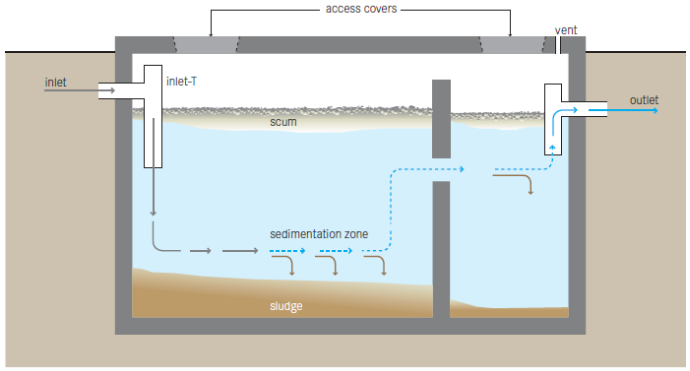
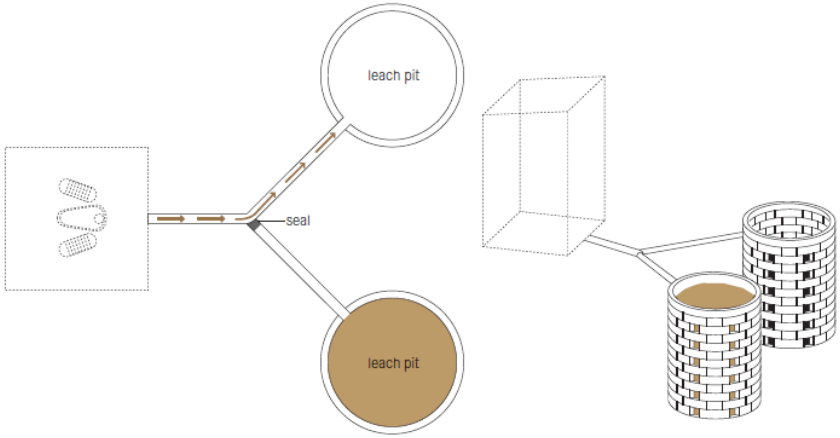
Sanitation Facility Type/ Technology	Key Technical Features	Pros and cons	Pictures
Simple Pit Latrine	• Lined/unlined pit • Hygienic cover slab/floor • Super-structure • Seat/squat hole with foot rest • Lid to cover squat hole	• Can be built and repaired with locally available materials • Low (but variable) capital costs depending on materials and pit depth • Small land area required • Flies and odours are normally noticeable • Low reduction in BOD and pathogens with possible contamination of groundwater • Costs to empty may be significant compared to capital costs • Sludge requires secondary treatment and/or appropriate	
VIP	• An improved form of pit latrine • Vent pipe with a fly-screen fitted outside the superstructure to trap flies and reduce odour nuisance	• Flies and odour are significantly reduced (compared to non-ventilated pits) • Can be built and repaired with locally available materials • Low (but variable) capital costs depending on materials and pit depth • Small land area required • Low reduction in BOD and pathogens with possible contamination of groundwater • Costs to empty may be significant compared to capital costs • Sludge requires secondary treatment and/or appropriate discharge	

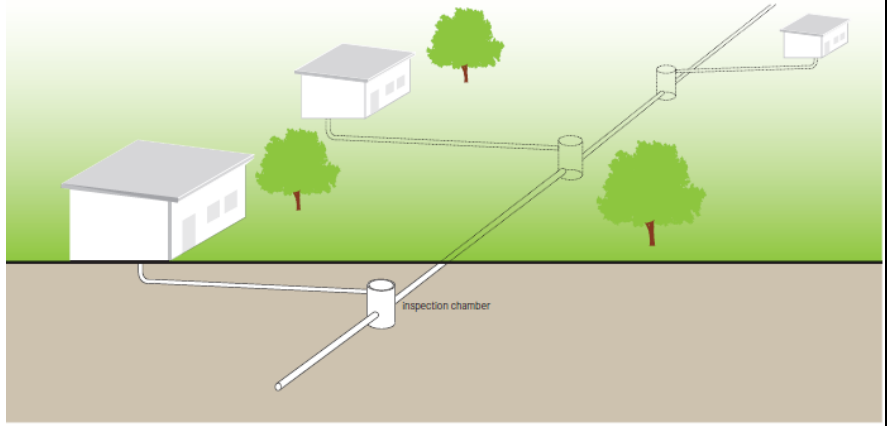
Sanitation Facility Type/ Technology	Key Technical Features	Pros and cons	Pictures
KVIP	• Same design as VIP but has two off-set pits. Use of pit is alternated to allow enough time (gestation period) for the decomposition/treatment of the pit contents into environmentally and healthily safe pit humus.	• Longer life than Single VIP (indefinite if maintained properly) • Excavation of humus is easier than faecal sludge • Significant reduction in pathogens • Potential for use of stored faecal material as soil conditioner • Flies and odours are significantly reduced (compared to non-ventilated pits) • Can be built and repaired with locally available materials • Manual removal of humus is required • Possible contamination of groundwater • Higher capital costs than Single VIP; but reduced operating costs if self-emptied	
Pour Flush	• Pour flush toilets use a pit for excreta disposal and have a special pan which is cast in the floor slab and provides a water seal. • Sometimes a vent pipe with screen is fitted to the pit	• The water seal effectively prevents odours • The excreta of one user are flushed away before the next user arrives • Suitable for all types of users (sitters, squatters, washers, wipers) • Low capital costs; operating costs depend on the price of water • Requires a constant source of water (can be recycled water and/or collected rainwater) • Requires materials and skills for production that are not available everywhere • Coarse dry cleansing materials may clog the water seal	

Sanitation Facility Type/ Technology	Key Technical Features	Pros and cons	Pictures
Water Closet/Cistern flush (connected to septic tank/sewer)	• Similar design feature as pour flush but water stored in the cistern above the toilet bowl and is released by pushing or pulling a lever	• The excreta of one user are flushed away before the next user arrives • No real problems with odours if used correctly • Suitable for all types of users (sitters, squatters, wipers and washers) • High capital costs; operating costs depend on the price of water • Requires a constant source of water • Cannot be built and/or repaired locally with available materials.	
Urine-Diverting Flush Toilet	• The urine-diverting flush toilet (UDFT) is similar in appearance to a Cistern Flush Toilet except for the diversion in the bowl. • The toilet bowl has two sections so that the urine can be separated from the faeces. • Both sitting and squatting models exist.	• Does not require a constant source of water • No real problems with flies or odours if used and maintained correctly • Can be built and repaired with locally available materials • Low capital and operating costs • Suitable for all types of users (sitters, squatters, washers, wipers) • Prefabricated models not available everywhere • Requires training and acceptance to be used correctly • Is prone to misuse and clogging with faeces • The excreta pile is visible • Men usually require a separate Urinal for optimum collection of urine	

Sanitation Facility Type/ Technology	Key Technical Features	Pros and cons	Pictures
Biofil	• The Biofil system combines the benefits of the WC flush toilet system and those of composting toilets • Flush water is channelled through a biofil digester and liquid waste separated from the solid waste • Liquid waste is purified by organic filtration system channelled into drain field, soak-away or reused • Separated solid/semi-solid waste (human excreta) is decomposed by natural macro and micro-organisms under aerobic conditions into humus	• Easy and convenient to use- like a Cistern Flush Toilet (WC) • No odour • No flies • Privacy • Long life time if well-operated • Eliminates issue of desludging and treatment of faecal sludge common to the septic tank system • Output (decomposed faecal matter) safe to use as humus • Effluent is treated and can be reused for irrigation • Digester requires little space • High capital investment required • Requires a constant source of water • Requires training and acceptance to be used correctly • Skilled personnel needed for maintenance • Requires a vast drain-field where water is not re-used for flushing	

Sanitation Facility Type/ Technology	Key Technical Features	Pros and cons	Pictures
Enviro loo	• The Enviro Loo has a sealed unit that captures and treats waste through the natural processes of dehydration and evaporation	• No water is required for its operations • Odourless and fly control • Permanent installation, no relocation • Output (decomposed matter in sealed unit) environmentally safe • Privacy • Can be in-built (within house) • Simple technology-easy to manage • Limited availability; cannot be built or repaired locally • Requires training and acceptance to be used correctly • Expensive (capital cost) compared to Arborloo • Associated maintenance and servicing cost	 The new Eloo C-60
Toilet facilities connected to Biogas Reactor	A biogas reactor is an airtight chamber that facilitates the anaerobic degradation of blackwater, sludge, and/or biodegradable waste. It also facilitates the collection of the biogas produced in the fermentation processes in the reactor. The gas forms in the slurry and collects at the top of the chamber, mixing the slurry as it rises. The digestate is rich in organics and nutrients, almost odourless and pathogens are partly	• Generation of renewable energy • Small land area required (most of the structure can be built underground) • No electrical energy required • Conservation of nutrients • Long service life • Low operating costs • Requires expert design and skilled construction • Incomplete pathogen removal, the digestate might require further treatment • Limited gas production below 15 °C	

Sanitation Facility Type/ Technology	Key Technical Features	Pros and cons	Pictures
	inactivated.		
Toilet facilities connected to Septic tank	A septic tank is a watertight chamber made of concrete, fibreglass, PVC or plastic, through which blackwater and greywater flows for primary treatment. Settling and anaerobic processes reduce solids and organics, but the treatment is only moderate.	• Simple and robust technology • No electrical energy is required • Low operating costs • Long service life • Small land area required (can be built underground) • Low reduction in pathogens, solids and organics • Regular desludging must be ensured • Effluent and sludge require further treatment and/or appropriate discharge	
Toilet facilities connected to leach pits	This technology consists of two alternating pits connected to a Pour Flush Toilet. The blackwater (and in some cases greywater) is collected in the pits and allowed to slowly infiltrate into the surrounding soil. Over time, the solids are sufficiently dewatered and can be manually removed with a shovel.	• Because double pits are used alternately, their life is virtually unlimited • Excavation of humus is easier than faecal sludge • Significant reduction in pathogens • Potential for use of stored faecal material as soil conditioner • Flies and odours are significantly reduced (compared to pits without a water seal) • Can be built and repaired with locally available materials • Low (but variable) capital costs depending on materials; no or low operating costs if self-emptied • Small land area required • Manual removal of humus is required • Clogging is frequent when bulky cleansing materials are used • Higher risk of groundwater contamination	

Sanitation Facility Type/ Technology	Key Technical Features	Pros and cons	Pictures
		due to more leachate than with waterless systems	
Simplified sewer system	A simplified sewer describes a sewerage network that is constructed using smaller diameter pipes laid at a shallower depth and at a flatter gradient. The simplified sewer allows for a more flexible design at lower costs.	• Can be laid at a shallower depth and flatter gradient than Conventional Sewers • Lower capital costs than Conventional Sewers; low operating costs • Can be extended as a community grows • Greywater can be managed concurrently • Does not require onsite primary treatment units • Requires repairs and removals of blockages more frequently than a Conventional Gravity Sewer • Requires expert design and construction • Leakages pose a risk of wastewater exfiltration and groundwater infiltration and are difficult to identify	

Appendix 2: Knowledge of Community Members on Proposed Household Sanitation Technology Options

Category 1: Sanitation technology options targeting specific households			
Household Sanitation Technology Type		No. of discussants with knowledge and acceptance of the facility type	Percentage of discussants with knowledge and acceptance of the facility type
Total No. of Community Representatives			30
1	Simple pit latrine	30	100.00%
2	VIP	30	100.00%
3	KVIP	30	100.00%
4	Pour flush with septic tank	30	100.00%
5	Pour flush with leach pit	0	0.00%
6	WC/cistern flush with septic tank (single/double)	30	100.00%
7	WC/cistern flush with leach pit (single/double)	0	0.00%
8	Urine diversion flush toilet (UDFT) with ash flush	0	0.00%
9	Biofil toilet	10	33.33%
10	Biogas toilet	5	16.67%
11	Enviro loo/Ecosan waterless toilet	15	50.00%
Category 2: Household shared sanitation technology options			
1	Shared block VIP	0	0.00%
2	Shared block KVIP	0	0.00%
3	Shared block pour flush with shared septic tank	0	0.00%
4	Shared block WC with shared septic tank	0	0.00%
5	Shared block Urine Diversion Flush Toilet (UDFT) with ash flush	0	0.00%
6	Shared block biofil toilet	0	0.00%
7	Biogas toilet with shared digester (in house)	0	0.00%
8	Shared block enviro loo/Ecosan waterless toilet	0	0.00%
Category 3: Communal based/network sanitation technology options			
1	Pour flush with centralized septic tank	0	0.00%
2	WC/cistern flush with centralized septic tank	0	0.00%
3	Biogas toilet with centralized/communal digester	0	0.00%

Appendix 3: Photo shots from the Stakeholders Negotiation Meeting on Proposed WASH Infrastructure and Service Options

Cross section of participants at the negotiation meeting

Municipal Chief Executive (Hon. Badu Tawiah) welcoming participants to the meeting

GAMA SWP Project coordinator briefing participants on purpose of the meeting

Presentation by the Consultant on the proposed WASH interventions

Participants contributing to the discussions

Presentations by local sanitation enterprise solution providers (e.g. Sanigree, Biofil, Menosack, etc.)

Presentations by Micro-finance Institutions (e.g. HFC Boafo Microfinance, Boafo Microfinance, etc.)

Representative of the GAMA SWP CBT giving remarks

Cross section of participants

Appendix 4: Cost estimates of proposed household sanitation options

Toilet Code	Type of Sanitation Technology Option	Unit	Quantity	Unit Cost (USD)	Amount (USD)
VIP, (CSD/H-01)	2-vaults VIP Latrine	No.	25	864.48	21,612.00
VIP, (CSD/H-02)	3-vaults VIP Latrine	No.	25	1,296.72	32,418.00
VIP, (CSD/H-03)	4-vaults VIP Latrine	No.	25	1,728.96	43,224.00
VIP, (CSD/H-04)	5-vaults VIP Latrine	No.	25	2,161.20	54,030.00
VIP, (CSD/H-05)	6-vaults VIP Latrine	No.	24	2,593.44	62,242.56
Subtotal Households In-House VIP Toilets			**124**		**213,526.56**
KVIP, (CSD/H-01)	2-privy room KVIP toilet	No.	25	877.50	21,937.50
KVIP, (CSD/H-02)	3-privy room KVIP toilet	No.	25	1,316.25	32,906.25
KVIP, (CSD/H-03)	4-privy room KVIP toilet	No.	25	1,755.00	43,875.00
KVIP, (CSD/H-04)	5-privy room KVIP toilet	No.	25	2,193.75	54,843.75
KVIP, (CSD/H-05)	6-privy room KVIP toilet	No.	24	2,632.50	63,180.00
Subtotal Households In-House KVIP Toilets			**124**		**216,742.50**
PFST, (CSD/H-01)	2-privy room pour flush with septic tank	No.	14	3,450.00	48,300.00
PFST, (CSD/H-02)	3-privy room pour flush with septic tank	No.	14	5,200.00	72,800.00
PFST, (CSD/H-03)	4-privy room pour flush with septic tank	No.	14	6,950.00	97,300.00
PFST, (CSD/H-04)	5-privy room pour flush with septic tank	No.	14	8,700.00	121,800.00
PFST, (CSD/H-05)	6-privy room pour flush with septic tank	No.	14	10,400.00	145,600.00
Subtotal Households Pour Flush Toilets with Septic Tanks			**70**		**485,800.00**
WCST,(CSD/H-01)	2-privy room water closet with septic tank	No.	17	2,051.28	34,871.76
WCST, (CSD/H-02)	3-privy room water closet with septic tank	No.	17	3,076.92	52,307.64
WCST, (CSD/H-03)	4-privy room water closet with septic tank	No.	17	4,102.56	69,743.52
WCST, (CSD/H-04)	5-privy room water closet with septic tank	No.	17	5,128.20	87,179.40
WCST, (CSD/H-05)	6-privy room water closet with septic tank	No.	17	6,153.84	104,615.28
Subtotal Households WC Toilets with Septic Tanks			**85**		**348,717.60**
PFLP, (CSD/H-01)	2-privy room pour flush with leachate pit	No.	4	1,747.44	6,989.76
PFLP, (CSD/H-02)	3-privy room pour flush with leachate pit	No.	4	2,621.16	10,484.64
PFLP, (CSD/H-03)	4-privy room pour flush with leachate pit	No.	4	3,494.88	13,979.52
PFLP, (CSD/H-04)	5-privy room pour flush with leachate pit	No.	4	4,368.60	17,474.40
PFLP, (CSD/H-05)	6-privy room pour flush with leachate pit	No.	2	5,242.32	10,484.64
Subtotal Households Pour Flush Toilets with Leachate Pits			**18**		**59,412.96**

Toilet Code	Type of Sanitation Technology Option	Unit	Quantity	Unit Cost (USD)	Amount (USD)
WCLP, (CSD/H-01)	2-privy room water closet-leachate pit	No.	4	3,100.00	12,400.00
WCLP, (CSD/H-02)	3-privy room water closet-leachate pit	No.	4	4,600.00	18,400.00
WCLP, (CSD/H-03)	4-privy room water closet-leachate pit	No.	4	6,125.00	24,500.00
WCLP, (CSD/H-04)	5-privy room water closet-leachate pit	No.	4	7,650.00	30,600.00
WCLP, (CSD/H-05)	6-privy room water closet-leachate pit	No.	2	9,200.00	18,400.00
Subtotal Households WC Toilets with Leachate Pits			**18**		**104,300.00**
Toilet Code	**Type of Sanitation Technology/ Option**	**Unit**	**Quantity**	**Unit Cost (USD)**	**Amount (USD)**
BFG, (CSD/H-01)	2-privy room Biofil/Biogas toilet	No.	13	2,051.28	26,666.64
BFG, (CSD/H-02)	3-privy room Biofil/Biogas toilet	No.	13	3,076.92	39,999.96
BFG, (CSD/H-03)	4-privy room Biofil/Biogas toilet	No.	13	4,102.56	53,333.28
BFG, (CSD/H-04)	5-privy room Biofil/Biogas toilet	No.	13	5,128.20	66,666.60
BFG, (CSD/H-05)	6-privy room Biofil/Biogas toilet	No.	13	6,153.84	79,999.92
Subtotal Households Biofil/Biogas toilet			**65**		**266,666.40**
EVL, (CSD/H-01)	2-privy room Enviro-Loo Toilet	No.	12	8,500.00	102,000.00
EVL, (CSD/H-02)	3-privy room Enviro-Loo Toilet	No.	12	11,500.00	138,000.00
EVL, (CSD/H-03)	4-privy room Enviro-Loo Toilet	No.	12	13,900.00	166,800.00
EVL, (CSD/H-04)	5-privy room Enviro-Loo Toilet	No.	12	16,550.00	198,600.00
EVL, (CSD/H-05)	6-privy Enviro-Loo Toilet	No.	12	19,300.00	231,600.00
Subtotal Enviro-Loo Toilets			**60**		**837,000.00**
Total Cost of Households Sanitation Subproject			**589**		**2,532,166.02**

Appendix 5: Preliminary Design Report for Teshie Old Town Simplified Sewerage

(Find attached as separately bound document)

Appendix 6: Draft Tender Documents for Water Supply Extension Works in Teshie Old Town

(Find attached as separately bound document)

Appendix 7: Summary of Technical and Financial options for Teshie Old Town

S/No.	Project Intervention	Amount in USD
1	Promotion of household sanitation facilities	2,185,930.26
2	Construction of sewage network	2,454,805.50
3	Construction of sewage treatment plant	1,526,500.00
4	Water supply improvements	248,129.01
5	Provision of solid waste bins	137,066.58
6	Construction of 3No. communal refuse collection/holding bays	271,650.00
7	Promotion of HH sullage drainage and disposal measures	50,148.72
8	Subtotal	6,874,230.07
9	Add 10% of Subtotal as contingency	687,423.01
10	**Total**	7,561,653.08