

Action Plan for Environmental Sanitation in Luchenza Municipality



Executive summary

Inadequate access to safe water, sanitation and practical hygiene services are some of the challenges faced in Luchenza municipality. This environmental sanitation planning project conducted in 2017/2018 follows the Community-Led Urban Environmental Sanitation (CLUES) approach (www.sandec.ch/clues) to assist in the assessment and planning of environmental sanitation services in Luchenza. The CLUES approach presents comprehensive guidelines for the planning and implementation of environmental sanitation infrastructure and services accounting for drinking water (water supply), grey and storm water, sanitation, and solid waste management. It has six distinct planning steps: Process Ignition and Demand creation, Launch of the Planning Process, Detailed Assessment of the Current Situation, Prioritization of the Community Problems and Validation, Identification of Service Options and Development of an Action Plan.

The project has conducted the following activities in Luchenza: a launching workshop, analyses of the enabling environment, a household survey, public water point mapping, microbiological water quality tests, public toilet mapping, key informant interviews and finally, a data validation and priorities workshop. The Luchenza Action Plan Report is a comprehensive outline of improved sanitation options (presented as targets) for all components of environmental sanitation i.e. drinking water, grey- and storm water, sanitation, fecal sludge, and solid waste, which the community members (both the municipal council and individual households) can adopt. Each target has specific roles for community members and the council secretariat. These roles must be undertaken by both parties collaboratively for the target to be met.

Table of Contents

1	Introduction.....	1
1.1	Background	1
1.2	Project overview.....	1
1.3	The environmental sanitation action plan report.....	2
2	Proposed improved sanitation options	3
2.1	Drinking water.....	3
2.1.1	Summary of findings from previous planning steps	3
2.1.2	Proposed targets for drinking water	3
2.2	Grey and storm water management.....	9
2.2.1	Summary of findings from previous planning steps:	9
2.2.2	Proposed targets for grey and storm water management	9
2.3	Sanitation and fecal sludge.....	15
2.3.1	Summary of findings from previous planning steps:	15
2.3.2	Proposed targets for sanitation and fecal sludge management	15
2.4	Solid waste management.....	32
2.4.1	Summary of findings from previous planning steps:	32
2.4.2	Proposed targets for Solid Waste Management	32
3	Annexes.....	45
3.1	Annex 1: List of all functional water points in Luchenza	45
3.2	Annex 2: Awareness campaign approach	47
3.3	Annex 3: Water point inspection questionnaire	54
3.4	Annex 4: Microbiological water testing protocol using the membrane filtration method 55	
3.5	Annex 5: Household inspection questionnaire/ checklist	3
3.6	Annex 6: The model household in Luchenza.....	7

1 Introduction

1.1 Background

Small towns are broadly defined as settlements that usually have populations between 5,000 and 50,000 but can be larger or smaller (Mugabi, 2006). Small towns face many challenges in environmental sanitation such as the provision of water, solid waste and sanitation services (Mugabi, 2006).

Luchenza municipality is one of the seven major urban councils in the country and also, next to Kasungu, one of only two municipalities in Malawi (Luchenza SEP, 2013). Luchenza is situated in the southern region of Malawi and shares boundaries with Thyolo district to the west and south, Mulanje district to the east and Chiradzulu to the north. Luchenza municipality has an area of 14 square kilometers making it the smallest council in the southern region (Luchenza SEP, 2013). In 2013, Luchenza municipality registered a total population of 25,523. (Luchenza SEP, 2013).

Inadequate access to safe water, sanitation and practical hygiene services are some of the key challenges faced by Luchenza. All wards in the Luchenza have mixed housing densities, from low to high, which makes planning difficult and leads to poor sanitation and environmental pollution (Luchenza City Council, 2013). The heterogeneous layout is attributed to a failure to adhere to the housing plan, proper zoning and land control by chiefs, laxity in development control and poor staffing levels (Luchenza City Council, 2013). Hence, we conducted a study to evaluate the CLUES framework in the context of Luchenza municipality. The main output of the project is an action plan for the municipality.

1.2 Project overview

‘Environmental sanitation planning in small towns: a case study of Luchenza municipality’ is a project conducted in collaboration between the municipality of Luchenza, the WASHTED centre at the Malawi Polytechnic, and Sandec at Eawag in Switzerland. This project followed the Community-Led Urban Environmental Sanitation (CLUES) framework (www.sandec.ch/clues) to assist in the assessment and planning of environmental sanitation services in Luchenza. The CLUES approach presents comprehensive guidelines for the planning and implementation of environmental sanitation infrastructure and services in low-income settings. The planning approach builds on a framework which balances the needs of people with those of the environment to support human dignity and a healthy life. CLUES is a multi-sector and multi-actor approach accounting for water supply, sanitation, solid waste management and storm drainage. The CLUES planning approach has three distinct elements: the planning steps, cross-cutting tasks relevant throughout the entire planning process, and the enabling environment (government support, legal and regulatory framework, institutional arrangements, skills and capacity, financial arrangements and socio-cultural arrangements) which are required for sustainable interventions.

1.3 The environmental sanitation action plan report

Hence, this action plan presents a comprehensive outline of the service options that are recommended to Luchenza municipality. The report contains details of improved sanitation options in all the components of environmental sanitation i.e. drinking water, grey- and stormwater, sanitation, fecal sludge, and solid waste, which the community members (both the municipal council and individual households) can adopt. The report is structured by environmental sanitation components i.e. drinking water, grey- and stormwater, sanitation and solid waste. Under each component is a summary of findings from the previous stages and exercises e.g. the household survey. Additionally, each sanitation component has guidelines of possible options presented with proposed targets to be met. Each target is assigned the number of years within which the target can be undertaken. Furthermore, each target has specific roles for community members and the council (secretariat). These roles must be undertaken by both parties collaboratively for the target to be met. Lastly, each target has a section on approximate costs that may be incurred by the community members and the council (secretariat) in order to achieve the proposed target.

The action plan targets all aspects of environmental sanitation but should be implemented in the order of priorities identified during the priorities workshop.

It should be noted that the community mobilization exercise applies to all aspects of environmental sanitation. This does not mean that separate awareness campaigns will be conducted, but rather, a single event will be held at which all sanitation aspects will be tackled. The goal of the awareness campaign will be to sensitize the community on environmental sanitation issues. Appendix 2 is a detailed description of the awareness campaign approach, sample program, and budget. In addition, most targets contain a recommendation for an annual random household inspection to be done by the Director of Health in collaboration with 4 ward committee representatives and 1 Health Surveillance Assistant (HSA). Similarly, this inspection will be done at the same time for all targets and for all sanitation components. Appendix 5 proposes the inspection guide/ questionnaire.

2 Proposed improved sanitation options

2.1 Drinking water

2.1.1 Summary of findings from previous planning steps

- Drinking water was the number one priority of all environmental sanitation challenges in Luchenza
- Most households used public boreholes in Luchenza except for wards like Luchenza, Sambagalu and Thundu, where people mostly use piped water to yard/plot. The water service was mostly payable across all wards.
- On average, people made four trips/day to fetch water, of which each trip took an average of 20 minutes.
- Water purification was rarely practiced
- In Luchenza and Sambagalu ward, water outages for a day/longer or week/longer occurred most frequently, and households used public boreholes as a replacement.
- Most people were willing to contribute monetary resources for additional water points (80%)
- A total of 58 public water points (boreholes, kiosks, communal taps) were discovered, of which 45 were functional. Annex 1 shows a list of all functional water points in Luchenza and their location. Table 1 below presents the number of water points in Luchenza, stratified by ward
- Microbiological water tests revealed absence of pathogenic organisms (E.coli and Total Coliforms). However, these samples were only taken at one point in time and the results are therefore not conclusive. Furthermore, water turbidity was a concern in most public water points

Table 1: Number of public water points in Luchenza

Ward	Number of water points
Thundu	2
Lolo	3
Namadzi	3
Sambagalu	5
Namisonga	6
Luchenza	5
Mapanga	10
Kapiri	11
Total	45

2.1.2 Proposed targets for drinking water

Target 1 All households that do not have piped water to their yard use public water points as their drinking water source

Target year (s): 1

Description: Households that do not use piped water to their yard or plot should use water from boreholes, kiosks or community taps rather than unprotected water sources such as rivers. The

households will use water from these public water points which were, according to our single sampling campaign, free of E.coli and Total Coliforms.

Household responsibility:

1. Draw drinking water from public water points i.e. boreholes, kiosks, and community taps.
2. Pay fees associated to use that particular water point

Household cost:

Water point associated costs i.e. on average: K210/month for public borehole users, K8,935/month for piped water to plot users, K780/month for public tap users and K743/month for kiosk users.

Municipal council responsibility:

Hold a community mobilization exercise (awareness campaign) covering all aspects of environmental sanitation (see annex 2).

Municipal council cost:

K192,000/day/ ward for 7 days (see annex 2 for budget breakdown)

Target 2 All 45 functional public water points monitored yearly

Target year (s): 1

Description:

All 45 public water points in Luchenza should be monitored yearly, by the Director of Health in collaboration with respective water point committees.

The inspections' objectives are to:

- ✓ Assess functionality of the water point
- ✓ Identify challenges faced in managing the water points
- ✓ Determine amount of money generated by running a particular water point
- ✓ Estimate the number of users per water point

Water point committees should perform monthly inspections while the Director of Health performs yearly inspections. The Director of Health should use a checklist (appendix 3) to perform the inspection. Appendix 1 is a list of all water points that will be inspected and their location.

Household responsibility:

Water point committees should write and submit monthly reports to the director of health. These reports should include number of users per water point (determined by number of people who

have paid for the service), amount of money collected, functionality of the water point, and challenges faced in managing the water points.

Household cost:

K500 to type and print a 3 page report per month (done by water point committees)

Municipal council responsibility:

1. Request monthly reports from water point committees to assess number of users, amount for money collected, functionality and challenges faced in managing the water points
2. The director of health to conduct an annual inspection in all 45 public water points for 5 days to assess functionality of the water points

Municipal council cost:

K3,000/ day allowance for the director of health for 5 days hence K15,000 for the entire exercise

Target 3 All 45 public water points tested annually for microbiological quality (E. coli and Total Coliforms) using the membrane filtration method

Target year (s): 2

Description:

The director of health for Luchenza Municipal Council should be responsible for overseeing the microbiological water tests for all the public water points. These tests should be conducted during the rainy season as this is the time when waterborne diseases are more prevalent. The goal of the testing is to determine if the water is free from pathogenic organisms i.e. E.coli and Total Coliforms, and hence, if the water is safe for human consumption. These water tests could be conducted at Chonde Health Center. Alternatively, the council should send requests to external institutions such as the Malawi Polytechnic to test the water on their behalf.

To conduct the microbiological water quality tests, the membrane filtration method should be used. A protocol for this method (appendix 4) should be followed when conducting these tests. The protocol also provides information on the materials that will be used.

Household responsibility: None

Household cost: None

Municipal council responsibility:

1. Write requests to private institutions such as the Polytechnic to test the water
2. Pay for the water testing fees
3. Write reports about water quality findings after each water testing exercise
4. Disseminate water testing outcomes to the community members and Thyolo District Health Office (DHO)

Municipal council cost:

Water testing fee i.e. K5000 per water sample if done by Polytechnic

Target 4 New public water points (kiosks) are constructed in 15 neighborhoods of Luchenza**Target year(s): 3**

Description: Since water scarcity is a priority problem in Luchenza, there should be a project to construct new and additional public water points, prioritizing neighbourhoods that have the fewest or no public water points. In the long run, the project can be extended to all other neighbourhoods, enabling them to construct additional water points. As the number of water points in Luchenza will increase, the sanitary needs of more people will be met easily. For instance, more people will have access to protected water sources and water fetching time by individuals will be reduced. The water points to be constructed in this project are water kiosks. There should be a total of 19 water points to be constructed for a start. These water points will be constructed in 15 neighborhoods. The priority neighborhoods have been determined based on the current number of functional water points in the respective neighborhoods and other neighborhoods close by. Appendix 1 is a list of all functional water points in Luchenza. Table 2 presents the prioritized sites for the construction of new public water points.

Table 2: Prioritized sites for the construction of new public water points

Ward	Neighbourhood	Existing functional water points	New/ additional water points to be constructed
Luchenza	Luchenza	5	0
Thundu	Thundu	2	1
Lolo	Saikonde	3	1
Sambagalu	Sambagalu 1	2	1
	Sambagalu 2	3	0
Namadzi	Chiromo 1	2	1
	Chiromo 2	1	2
Namisonga	Kanthawire	4	0
	Goliyati	1	2
	Feliyati	0	3
Kapiri	Mwarama	4	0
	Mbulaje	0	1
	Njete	7	0
	Kaswanjete	0	1
	Maulidi	0	1
	Nthuli	0	1
	Likhonyowera	0	1
	Liphombwe	0	1
	Duwaduwa	0	1
Mapanga	Malembe	0	1
	Chonde	3	0
	Kululira	7	0

This water point construction project should be done by the community members in respective neighbourhoods in collaboration with the town council, water board and external donors if the council does not have the funds to implement the project. Citizens of Luchenza will provide human and material resources. Material resources include sand, soil, bricks, and water. Households in the neighbourhoods where the new water points will be constructed should contribute K100 to procure bricks and cement for the construction. The council's role is to provide technical equipment and pay for technical services from water board i.e. piping. Alternatively, the council should submit proposals to external donors, to request of funds for the technical equipment and work. In the case where the council writes a proposal for external funds, the proposal should be detailed, explicitly explaining:

- ✓ The background of water resources and water services in Luchenza
- ✓ Challenges faced by residents and the council in terms of water supply
- ✓ The justification for funding
- ✓ How responsibilities will be determined e.g. how water committees will be selected
- ✓ How the council will work collaboratively with other stakeholders to ensure success of the project

- ✓ How the council will ensure sustainability of the project

To ensure success of this project, the following should be considered:

- ✓ The project should be community led. Community members from respective neighborhoods should be involved in the planning and implementation of the project; they should provide some resources in implementing the project. In addition, community members should liaise with chiefs, neighborhood committees, ward committees, councilors, and the municipal council to select sites where the water points will be constructed.
- ✓ There should be water point committees who will bridge the gap between the community members and the council. These committees will represent each construction project/water point and will take part in mobilizing the community by building awareness and sourcing funds for the project. The water point committees should also be responsible for collecting K100s from households in the respective neighbourhoods to procure bricks. In addition, the committees should be in charge of the water points when the project is completed i.e. overseeing security issues and collection of user-fees from people wanting to use the water point. Water point committees should be appointed by the community members themselves to ensure that they choose people whom they can trust. The appointment of these water point committees should be done in a community meeting organized by chiefs, neighborhood committee members, ward committee members, and councilors.

During the environmental sanitation awareness campaign, the community members should be briefed about this project so as to build momentum, understanding and a basis for community participation in the project.

Household responsibility:

1. 5 volunteers to do the construction work/ water point/ 2 days
2. 10 volunteers to collect sand for the water point construction project/ water point/ 2 days
3. 5 volunteers to draw water for the water point construction project/ water point/ 2 days
4. All households in the respective neighbourhood will contribute a fee to procure bricks and cement

Household cost: K100 per each household in the neighborhood where the new/additional public water points will be constructed. This money will be used to procure bricks, cement, and any other materials required.

Municipal council responsibility:

1. Hold brief community meetings in neighbourhoods where the construction projects will be undertaken. These meetings will be held in collaboration with respective councilors, chiefs, ward committees, and neighbourhood committees of that area. These meetings will target all community members, to inform and plan for the water point construction project. In addition, water point committees will be appointed during these meetings.
2. Write proposals to potential sponsors to seek for funding to sponsor technical materials i.e. pipes and water connection fees to water board

3. Coordinate resources and equipment during the project

Municipal council cost:

None

2.2 Grey and storm water management

2.2.1 Summary of findings from previous planning steps:

- For households whose plots had ever been affected by flooding, they did not have any flood barriers on their plot
- Most households disposed of their greywater on the open ground (52%) and most households had standing water present on their plot (69%)
- Municipal drains are blocked with sand, stones and solid waste which prevents stormwater from flowing freely

2.2.2 Proposed targets for grey and storm water management

Target 1 50% of households have no stagnating water around their plot

Target year(s): 1

Description: Households that have potholes around the plot should cover these potholes with sand or rocks which will prevent the collection of standing water. In turn, other public health hazards such as water borne illnesses e.g. malaria will be prevented.

Household responsibility: Cover potholes and trenches around the household plot with sand or rocks to prevent collection of stagnant water and therefore, breeding of disease vectors e.g. mosquitoes

Household cost:

1. Sand
2. Stones/ rocks

Municipal council responsibility:

1. Hold an awareness campaign as described in annex 2
2. Formulate and enforce a punishable by-law that households should not have stagnant water around their plot
3. The director of health to conduct annual random household inspections in collaboration with 4 respective ward committee representatives and 1 Health Surveillance Assistant (HSA). The aim of conducting the inspections is so that households follow the instruction.

These inspections will be conducted in all wards of Luchenza and will be done in 800 households (100 households/ward). The inspections will be conducted for 8 days. Annex 5 is the household inspection guide/ questionnaire.

Municipal council cost:

1. K192,000/day/ ward for 7 days (see annex 2 for budget breakdown).
2. K3,000/ day allowance for each of the 6 inspectors for 8 days

Target 2. 50% of households close to river or stream banks have simple, low-cost water barriers at their household to control flooding

Target year(s): 1

Description: Households that have been affected before or are at risk of flooding because they reside close to rivers or streams should adopt low-cost water barriers on their plot. These water barriers will also be used on plots that are situated on low lands, such that there is no water flow control to their plot. One example of a water barrier are sand bags. This option involves filling up bags with sand and placing them around the house/yard/plot to restrict water flow on the area. The bags can be readymade sacks or made from scratch using thick plastic material. Not only are sand bags easy to make, but also cheap since they are made using locally available materials.

To make the sand bag shield, fill the sacks with sand. The sand can also be supplemented with soil or by using a 10-to-1 ratio of sand and soil to cement mix. Next, close the opening of the bag with string or duct tape just above the sand line. Finally, place the sandbags on the required area so that there are no gaps between them. If a component of cement was used, the bags should be sprinkled with a little water for reinforcement (Hippler, 2018).

Household responsibility:

1. Construct low-cost water barriers at household level i.e. the sand in bags method
2. Approach the council (health and physical planning office) to seek for guidance if their household is still experiencing flooding challenges despite the water barriers

Household cost:

1. Sand
2. Plastic bags/ sacks
3. Pieces of string

Municipal council responsibility:

1. Hold an awareness campaign as described in annex 2
2. Formulate and enforce by-laws that households close to river or stream banks should have simple low-cost water barriers at their household to control flooding and that households too close to river banks should relocate
3. The director of health to conduct annual random household inspections in collaboration with 4 respective ward committee representatives and 1 Health Surveillance Assistant (HSA). The aim of conducting the inspections is so that households follow the instruction.

These inspections will be conducted in all wards of Luchenza and will be done in 800 households (100 households/ward). The inspections will be conducted for 8 days. Annex 5 is the household inspection guide/ questionnaire.

4. The health and physical planning office to be open and ready to give guidance to households experiencing flooding challenges i.e. handing them a manual/ leaflet on how to make a flood barrier using the sand in bags method and in cases where households are too close to river banks, to consider relocation.

Municipal council cost:

1. K192,000/day/ ward for 7 days (see annex 2 for budget breakdown).
2. K3,000/ day allowance for each of the 6 inspectors for 8 days

Target 3. 50% of households with no rain water harvesting system construct rain water gutters

Target year(s): 3

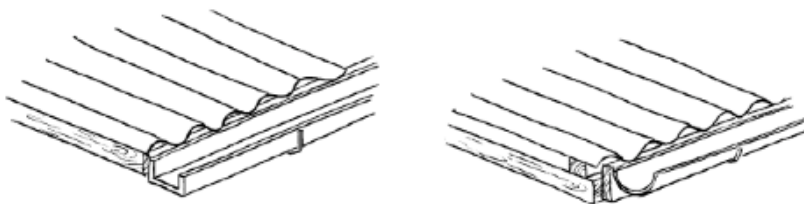
Description: A rain water gutter is a channel on the roof of a building for carrying off rain water. Since water scarcity is a problem, households will construct rain water gutters to trap and transport rain water. The rain water will be collected in simple household basins, pails or drums. The collected rain water will be used for non-drinking purposes e.g. bathing, cleaning, laundry etc. Hence, harvesting rain water using these gutters will enable households to have more options for water sources, other than just relying on public water points. In addition, drainage around the households will be controlled.

Since there are some households still using thatched roofs on their houses, they should adopt more improved roofing systems such as corrugated iron sheets. This will enable them to install rain water gutters for rain water harvesting.

Setting up a rain water gutter:

The rooftop catchment will consist of gutters hanging from the sides of the roof. Gutter forms can be cut from PVC pipes or folded iron sheets. Households will then set catching basins or tanks at the bottom to trap or collect the rain water for use. Figure 1 displays a rain water gutter set-up.

Figure 1: Rain water gutter design



Source: HATUM & WORM (2006)

When installing the system, the following should be noted:

- ✓ If a PVC pipe is used, the pipe should be cut in half, longitudinally. If a ridged iron sheet is used, it should be straightened by hammering to remove the ridges.
- ✓ The pipe or the iron sheet is then drilled and strings are attached and hung at the edge of the iron sheet on the roof
- ✓ For a more durable set-up, the pipe or iron sheet is hammered directly to the iron sheet on the roof

Household responsibility:

1. Purchase required materials for constructing rain water gutters e.g. PVC pipe or an iron sheet and wire
2. Construct the rain water gutters or hire people to construct rain water gutters
3. Seek technical guidance about constructing gutters from the ‘model household’ as described in annex 6

Household cost:

Table 3 presents a budget breakdown for constructing a 5.5m iron sheet rain water gutter. It costs approximately K4,650 for materials only and K5,650 for both materials and labour charges.

Table 3: Approximate cost of a 5.5m iron sheet rain water gutter:

Item	Cost (MWK)
Iron sheet	3, 650
Wire	1, 000
Labour	1, 000
Total	4, 650
Total incl. labour	5, 650

In case the household is planning on changing the roofing system to allow insertion of a rain water gutter, table 4 is an estimated budget breakdown for inserting iron sheets on an 8mx5.5m house.

Table 4: Iron sheet roofing system approximate cost for an 8x5.5m house:

Item	Quantity	Cost (MWK)
Iron sheets	30 pieces	135, 000

Wood	24 pieces	144, 000
Ridges	5 pieces	9, 000
Roofing nails	4Kg	5, 600
Wire nails	4Kg	4, 800
Galvanized wire	2Kg	2, 000
Solignum	1 litre	1, 500
Labour	-	30, 000
Total	-	301, 900
Total incl. labour	-	331, 900

Municipal council responsibility: Hold an awareness campaign as described in annex 2

Municipal council cost: K192,000/day/ ward for 7 days (see annex 2 for budget breakdown).

Target 4. 50% of households with no plumbing system for grey water construct soak pits

Target year(s): 3

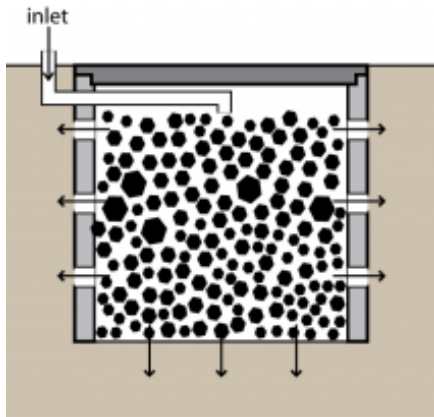
Description:

A soak pit, also known as a soak pit or leach pit, is a covered, porous-walled chamber that allows water to slowly soak into the ground. It is an inexpensive way to dispose of greywater if there is no need to reuse it (Tilley et al, 2014). Figure 2 displays a soak pit design.

Advantages:

- ✓ Can be built and repaired using locally available materials
- ✓ Small land area is required
- ✓ Low capital costs; low operating costs
- ✓ Recharging ground water bodies

Figure 2: Soak pit design



Source: (Tilley et al, 2014)

System design and maintenance:

To construct a soak pit, simply dig a pit and fill it with coarse rocks and gravel. Furthermore, a layer of sand and fine gravel can be spread across the bottom to help disperse the flow. The surface of the soak pit should be covered with a concrete or wooden slab to prevent dirt from clogging the pores and to prevent injuries. Normal ground cover with a plastic sheet beneath can also be used.

A soak pit should be between 1.5- 4 m deep, but as a rule of thumb, never less than 2 m above the groundwater table. It should be located at least 30m from a drinking water source. Furthermore, it is recommended that a soak pit should be constructed 5m away from any habitable building.

A well-sized soak pit should last between 3 and 5 years without maintenance. When the performance of the soak pit deteriorates, the material inside the soak pit can be excavated and refilled.

Household responsibility:

1. Purchase required materials for constructing the soak pit i.e. a pipe, rocks (stones) and a plastic sheet/ sack
2. Construct the soak pit/ hire people to construct the soak pit
3. Seek technical guidance about constructing a soak pit from the 'model household' as described in annex 6

Household cost: A soak pit costs approximately K40,000 or K60,000 including labour charges. The material costs are for a 50mm pipe, rocks (stones) and a plastic sheet for covering the surface.

Municipal council responsibility:

1. Hold an awareness campaign as described in annex 2
2. Formulate and enforce a by-law that all households with no plumbing system for grey water should construct soak pits

3. The director of health to conduct annual random household inspections in collaboration with 4 respective ward committee representatives and 1 Health Surveillance Assistant (HSA). The aim of conducting the inspections is so that households follow the instruction. These inspections will be conducted in all wards of Luchenza and will be done in 800 households (100 households/ward). The inspections will be conducted for 8 days. Annex 5 is the household inspection guide/ questionnaire.

Municipal council cost:

1. K192,000/day/ ward for 7 days (see annex 2 for budget breakdown).
2. K3,000/ day allowance for each of the 6 inspectors for 8 days

2.3 Sanitation and fecal sludge

2.3.1 Summary of findings from previous planning steps:

- Most households had sanitary facilities (96%) on their plot
- Most households had the ‘soil & sticks slab and pit’ designs except for Luchenza and Thundu ward which had mostly concrete slab and pit designs followed by flush toilet and septic tank designs.
- Most households in all wards had abandoned sanitary facilities on their plot (an average of 2)
- Places where community members mostly identified as new potential sites for public toilets were: Chonde market, Luchenza market, Luchenza depot, and Luchenza hall.

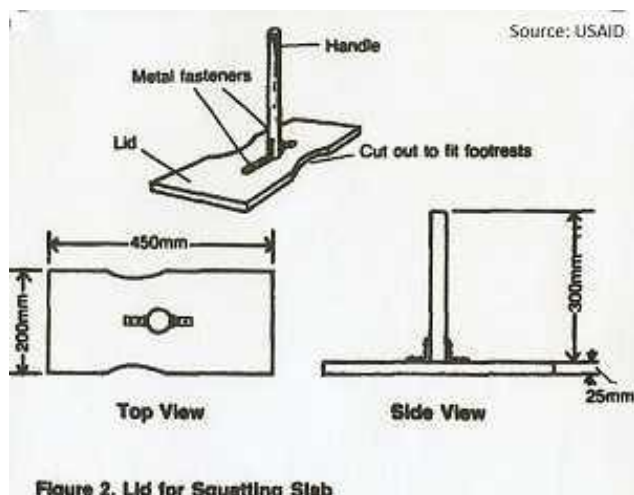
2.3.2 Proposed targets for sanitation and fecal sludge management

Target 1. 100% of households have lids on latrine holes

Target year(s): 1

Description: Households in Luchenza should improve their pit latrines by placing lids/ covers on the latrine holes. The reason for placing these latrine lids is to reduce flies and smell nuisance. These lids can be made of wood, iron sheet or concrete form. The size of the lid should be custom made depending on the size or shape of the hole so that the lid properly fits. Figure 3 shows an example of 450mm by 200mm pit latrine lid.

Figure 3: Rectangular wooden pit latrine lid



Household responsibility: Construct latrine lids or find materials to use as latrine lids i.e. metal sheet/ wooden piece / a concrete slab attached to a wire handle

Household cost: K1,000 for a wooden cover; nothing for found material

Municipal council responsibility:

1. Formulate and enforce a by-law for every household to place latrine hole covers in their latrines
2. Hold an awareness campaign as described in annex 2
3. The director of health to conduct annual random household inspections in collaboration with 4 respective ward committee representatives and 1 Health Surveillance Assistant (HSA). The aim of conducting the inspections is so that households follow the instruction. These inspections will be conducted in all wards of Luchenza and will be done in 800 households (100 households/ward). The inspections will be conducted for 8 days. Annex 5 is the household inspection guide/ questionnaire.

Municipal council cost:

1. K192,000/day/ ward for 7 days (see annex 2 for budget breakdown).
2. K3,000/ day allowance for each of the 6 inspectors for 8 days

Target 2. 50% of households have improved hand washing stations near their sanitary facilities

Target year(s): 1

Description: Households in Luchenza should construct or set up hand washing facilities near the pit latrine/ toilet they use. Keeping hands clean after toilet use by washing them with soap and running water prevents the spread of germs that causes gastrointestinal diseases such as cholera. Placing hand washing stations near the public sanitary facilities will motivate users to wash their

hand since water and soap will be readily available, right at the site. There are several hand washing station designs that can be employed. Hand washing facilities are easy to construct and easy to use. Furthermore, some hand washing facilities such as the ‘scooping cup’ and the ‘tippy tap’ are hygienic since the user does not touch the handle when washing the hands. Figures 4-6 show different types of hand washing stations.

Option 1: Scooping cup hand washing station



Figure 4: Scooping cup hand washing station

Source: WASHTED and SHARE, 2018

Materials required: Three sticks (2 forked sticks and 1 straight stick), a jar/large bottle cut in half, a smaller bottle cut in half, a piece of string, matches, and nails

Set up:

- ✓ Dig two holes 18 inches deep for a firm grip.
- ✓ Place the two forked sticks in each holes, cover with soil and some stones and pack tightly
- ✓ Place the third piece of wood on top of the two forked sticks
- ✓ Drill two holes on the top opposite side of the big jar using a heated nail and tie one piece of string on both sides
- ✓ Drill two holes on the top opposite side of the small jar using a heated nail and tie one piece of string on both sides
- ✓ Hang both jars on the top stick
- ✓ Make a gravel basin between the forked sticks to avoid a muddy area

Option 2: Tippy tap hand washing station



Figure 5: Tippy tap hand washing station

Source: tippytap.org

Materials required: Four sticks (2 forked sticks and 2 straight sticks), two pieces of string, nail, matches, and water container.

Set up:

- ✓ Dig two holes 18 inches deep and about 2 ft. apart.
- ✓ Place the two forked sticks in each holes, cover with soil and some stones and pack tightly
- ✓ Heat the nail and make holes in the water container
- ✓ Make a hole in the soap and tie a string
- ✓ Hang the water container and soap on the straight wood and place between the forked sticks
- ✓ Fill the container with water and tie a string to the cover
- ✓ Attach the end of the string to a stick
- ✓ Make a gravel basin between the forked sticks to avoid a muddy area

Option 3: Pail with tap hand washing station



Figure 6: Pail with tap hand washing station

Source: WASHTED and SHARE, 2018

A pail with tap is simply be mounted on a concrete stone. The mounting can also be done on a wooden stool. To minimize splashing, a gravel basin can be made at the bottom. A 20 litre pail with a tap approximately costs K3, 000.

Household responsibility: Construct/ set up improved hand washing stations near household sanitary facilities i.e. 'Pail with tap' hand washing station or the 'tippy tap' hand washing station.

Household cost: The 'pail with tap hand washing station costs approximately K3,000. For the rest of the hand washing station options, i.e. 'Tippy tap' and 'Scooping cup', materials are found locally, hence no costs incurred.

Municipal council responsibility:

1. Formulate and/or enforce a by-law for every household to have a hand washing station near the latrine
2. Hold an awareness campaign as described in annex 2
3. The director of health will conduct annual random household inspections in collaboration with 4 respective ward committee representatives and 1 Health Surveillance Assistant (HSA). The aim of conducting the inspections is so that households follow the instruction. These inspections will be conducted in all wards of Luchenza and will be done in 800 households (100 households/ward). The inspections will be conducted for 8 days. Annex 5 is the household inspection guide/ questionnaire.

Municipal council cost:

1. K192,000/day/ ward for 7 days (see annex 2 for budget breakdown).
2. K3,000/ day allowance for each of the 6 inspectors for 8 days

Target 3. 25% of households that have pit latrines adopt an improved sanitary facility option i.e. the ‘Fossa Alternata’

Target year(s): 5

Description: The Fossa Alternata is a short cycle alternating, waterless (dry) double pit technology. The system is designed to make an earth-like product, called Eco-Humus that can be used as a nutrient-rich soil conditioner. The Eco-Humus can easily be removed manually and applied as soil conditioner, thereby promoting agricultural activities. Figure 7 displays the Fossa Alternata design.

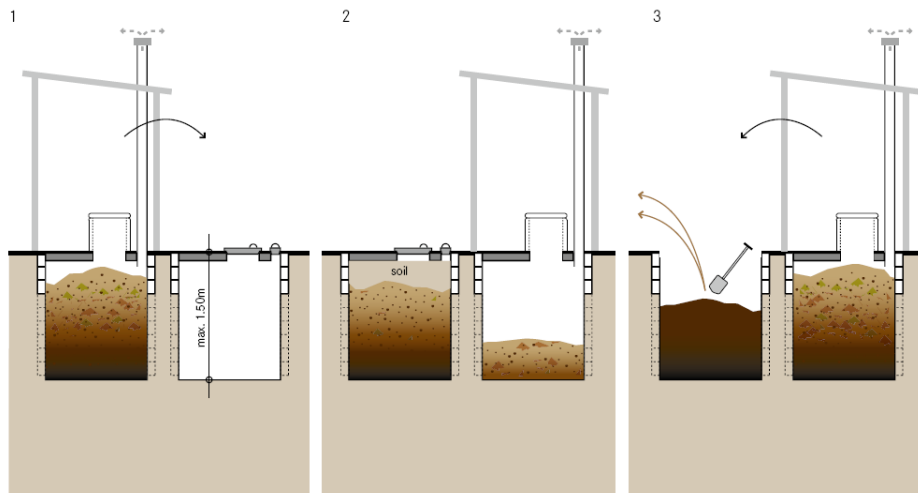


Figure 7: The Fossa Alternata design

Source: Tilley et al, 2014

The Fossa Alternata requires a constant input of cover material (soil, ash, and/or leaves). Cover material should be added to the pit after defecation (not urination). When the first pit is put into use, a layer of leaves should be put onto the bottom of the pit. The organic waste added i.e. soil and leaves introduce a variety of organisms like worms, fungi and bacteria which help in the degradation process. The organic waste added also increases the pore space, which allows for aerobic conditions. In addition, ash helps to control flies, reduces odours and makes the mix slightly more alkaline.

Since most pit latrines currently in use in Luchenza are constructed in a way that they cannot easily be transformed into Fossa Alternas due to the inability to open the slab for emptying, households should consider constructing a new system once their current pit is full.

Design considerations:

The system composes of two pits. The first pit degrades while the second pit is filling, which, approximately takes a year. The material in the full pit will degrade into a dry, earth-like mixture that can be easily removed, manually. A Fossa Alterna pit would fill over a period of 12 to 24 months depending on its size and the number of users. Even though the pits are shallow (1 to 1.5 m), each of them can be used by a family of six for one year. The Fossa Alterna technology will only work properly if the two pits are used sequentially and not concurrently. Therefore, an adequate cover for the out of service pit is required.

The Fossa Alterna should be used for urine, but water should not be added (small amounts of anal cleansing water can be tolerated). Not only does water encourage the development of vectors and pathogens, but also fills the pore spaces, and causes anaerobic conditions.

For the superstructure, one can use a movable design for both pits e.g. made of reed which would follow as people alternate when using the system. Alternatively, there can be two superstructures for each pit.

Appropriateness:

- The Fossa Alterna is appropriate for rural and peri-urban areas and is especially suitable to water-scarce environments. The Fossa Alterna is a useful solution for areas that have poor soils and could benefit from the use of the stabilized humic material as a soil amendment.
- The Fossa Alterna technology is not appropriate for greywater as the pit is shallow and the conditions must remain aerobic for degradation.
- The EcoHumus from the Fossa Alterna is manually emptied (it is dug out, not pumped out); thus, vacuum truck access to the pits is not necessary.
- Lastly, the Fossa Alterna is not suited for rocky or compacted soils (that are difficult to dig) or for areas that flood frequently, except if the pits are raised.

Health Aspects/Acceptance:

By covering faeces with soil, ash, and/or leaves, flies and odours are kept to a minimum. Keeping the contents sealed in the pit for the duration of at least one year makes the material safer and easier to handle.

Operation & Maintenance:

When the first pit is put into use, a layer of leaves should be put onto the bottom of the pit. Periodically, more leaves should be added to increase the porosity and oxygen availability. Following the addition of faeces to the pit, a small amount of soil, ash, and/or leaves should be added. Occasionally, the mounded material beneath the toilet hole should be pushed to the sides of the pit in order to optimise the use of space.

Advantages:

1. Because double pits are used alternately, their life is virtually unlimited
2. Excavation of humus is easy
3. Significant reduction in pathogens
4. Generates nutrient-rich humus with good potential for use as soil conditioner
5. Flies and odours are significantly reduced
6. Can be built and repaired with locally available materials
7. Low (but variable) capital costs depending on materials; no or low operating costs if self-emptied

Disadvantages:

1. Requires constant source of cover material
2. Manual removal of humus is required
3. Garbage may ruin end-use opportunities of the product

Cost approximation:

There are several Fossa Alterna design options that households will choose from, depending on the type of materials used, hence determining the overall cost of the system. These varying designs stem from the type of slab used and the type of superstructure the Fossa Alterna has. Tables 5-7 outline the cost approximations for 6 different possible combinations.

1. Concrete slab and fixed brick superstructure

This system is composed of two pits and a slabs made of concrete that can be opened easily. The superstructure is made up of two rooms made of brick material, for each of the pits, hence fixed on the ground.

Table 5: Concrete slab and fixed brick superstructure cost approximation

Pit and slab		
Item	Quantity	Amount (MK)
Bricks	500	6,000
Cement	3 bags	25,500
Sand	1m ³	2,000
Quarry stone	1m ³	4,500
Reinforcement bars	4 pieces	26,000
Supporting timber	16 pieces	30,000
Poles	2 pieces	3,000
Total		97, 000
Superstructure		
Item	Quantity	Amount (MK)
Bricks	3000	46,000
Sand		5,000
Cement	4bags	34,000
Iron sheets (7ft)	5 pieces	15,000
Nails	1kg	1,200

Wire nails	1kg	1,400
Galvanized wire	1kg	1,000
Total		103,600
Net cost		200,600
Cost including labour		290,600

2. Concrete slab and mobile grass superstructure

This system is composed of two pits and a slabs made of concrete that can be opened easily. The superstructure is made up of one thatched room, made of grass material. This superstructure can be moved to either of the pits being used at that point in time.

Table 6: Concrete slab and mobile grass superstructure cost approximation

Pit and slab		
Item	Quantity	Amount (MK)
Bricks	500	6,000
Cement	3 bags	25,500
Sand	1m3	2,000
Quarry stone	1m3	4,500
Reinforcement bars	4 pieces	26,000
Supporting timber	16 pieces	30,000
Poles	2 pieces	3,000
Total		97, 000
Superstructure		
Item	Quantity	Amount (MK)
Grass		5,000
Wood	8 pieces	12,000
Nails	1kg	1,200
String (Linya)		1,100
Total		19,900
Net cost		116,900
Cost including labour		191,900

3. Concrete slab and mobile reed superstructure

This system is composed of two pits and a slabs made of concrete that can be opened easily. The superstructure is made up of one thatched room, made of reed material. This superstructure can be moved to either of the pits being used at that point in time.

Table 7: Concrete slab and mobile reed superstructure cost approximation

Pit and slab

Item	Quantity	Amount (MK)
Bricks	500	6,000
Cement	3 bags	25,500
Sand	1m3	2,000
Quarry stone	1m3	4,500
Reinforcement bars	4 pieces	26,000
Supporting timber	16 pieces	30,000
Poles	2 pieces	3,000
Total		97, 000
Superstructure		
Item	Quantity	Amount (MK)
Reed		6,000
Grass (for roof)		1,000
Wood	8 pieces	12,000
Nails	1kg	1,200
String (Linya)		1,100
Plastic sheet	3m	600
Total		21,900
Net cost		118,900
Cost including labour		193,900

Household responsibility:

1. Construct Fossa Alternas/ hire people to construct Fossa Alternas
2. Seek technical guidance about constructing a Fossa Alterna from the ‘model household’ as described in annex 6

Household cost: The cost to be borne by households will be the construction costs, for materials and/or labour. In summary, any of the following cost options will be incurred;

- Timber slab and fixed brick superstructure: K154,500 (K204,500 including labour)
- Timber slab and mobile grass superstructure: K70,800 (K100,800 including labour)
- Timber slab and mobile reed superstructure: K72,800 (K102,800 including labour)
- Concrete slab and fixed brick superstructure: K200,600 (K290,600 including labour)
- Concrete slab and mobile grass superstructure: K116,900 (K191,900 including labour)
- Concrete slab and mobile reed superstructure: K118,900 (K193,900 including labour)

Municipal council responsibility: Hold an awareness campaign as described in annex 2

Municipal council cost: K192,000/day/ ward for 7 days (see annex 2 for budget breakdown).

Target 4. Public toilets in Luchenza are improved by allocating and defining responsibilities of people in charge of the sanitary facilities

Target year(s): 1

Description: There are 6 public toilets in Luchenza: two are at Chonde market (one is a flush toilet and is not functional due to blockage issues while the other is a pit latrine and is in use. Three public toilets are at Luchenza market (one is a flush toilet and is not functional due to blockage issues while the other two are pit latrines and are in use one, although there is no one in charge of them. The last public toilet is in Lolo ward. It was built by the council but has been privatized and is functional. Since there is no one in charge of the two public toilets at Luchenza market, the council should start by employing an individual to look after the facility. Alternatively, the council will privatize the sanitary facilities. This should be done by the council releasing an open tender for people to apply for ownership of the facility. The individual who will be given ownership of the facility to operate the facility as theirs. The individual should be responsible for operating and maintaining the facility and subsequently, the income generated will be for that individual. In either case, putting an individual in charge of the facility will improve the functionality of the system since the facility will be more hygienic.

The individual assigned to be in charge of the facility will be responsible for:

- ✓ Cleaning the sanitary facility i.e. mopping, sweeping around the site
- ✓ Guarding the sanitary facility for security during the day
- ✓ Collecting fees from people that want to use the sanitary facility
- ✓ Handing over cleansing materials to people wanting to use the sanitary facility

For all the public facilities, the council should work collaboratively with the committees in charge of the facilities.

Household responsibility:

Individuals wanting to use a particular public toilet to pay assigned fees to use that particular public toilet

Household cost:

K50 to use a public toilet

Municipal council responsibility:

1. The council to develop written records of who looks after which particular public toilet
2. The council to define responsibilities at every public toilet i.e. the individual or committee looking after the place which are: cleaning the sanitary facility i.e. mopping and sweeping around the site; guarding the sanitary facility for security during the day; collecting fees from people that want to use the sanitary facility and finally, handing over cleansing materials to people wanting to use the sanitary facility. The council should communicate to all individuals or committees responsible for public toilets about these tasks.
3. The council to request quarterly reports from individuals looking after the sanitary facilities on issues to do with functionality, security, availability of sanitary materials, and challenges faced in managing the sanitary facility.

4. The council to fix the two public toilets at Chonde and Luchenza markets and assign individuals or a committee to be in charge of them

Municipal council cost: Salary for the individual looking after a public toilet if the council chooses not to privatize the sanitary facility

Target 5. All 4 public toilets in Luchenza are improved by improving hygiene conditions

Target year(s): 1

Description: The council should provide latrine lids and set-up hand washing stations on each public sanitary facility as described in targets 1 and 2 of the sanitation and fecal sludge section. If a particular sanitary facility is privatized or if the sanitary facility is in the hands of a committee, the individual/ committee in charge of the sanitary facility should provide the latrine lids and hand washing stations.

Household responsibility:

1. Individuals using the public toilets to keep them clean upon each use
2. Individuals using the public toilets to use hand washing stations sustainably, i.e. taking care of them

Household cost: None

Municipal council responsibility:

1. Provide cleansing materials and latrine lids and constructing a hand washing station for each public toilet if the public toilet is not privatized
2. The Director of Health at the council will conduct quarterly inspections in all public sanitary facilities to ensure that the facilities have all sanitary and hygienic materials

Municipal council cost:

1. K3,000 for the 'pail with tap' hand washing station
2. K3,000 for the Director of Health for one quarterly inspection to be held in 1 day

Target 6. 100% sanitation coverage in Luchenza

Target year(s): 3

Description: This target will be met if:

- ✓ All households have sanitary facilities which they will use
- ✓ Individuals in Luchenza use the public toilets provided
- ✓ Individuals in Luchenza stop open defecation altogether

To meet this target, households with no sanitary facilities on their plot (4%) should construct their sanitary facilities to be using (see target 3 under sanitation and fecal sludge). In addition, the council should print and hang posters discouraging open defecation in places where it is most

likely to occur such as the Thundu road (Umve), the bus depot, the markets (Chonde and Luchenza), and the road going to Lolo. These posters should contain text prohibiting open defecation or urination in those sites. It should also contain the penalty of conducting such, i.e. a fine.

Household responsibility:

1. Households without sanitary facilities to construct sanitary facilities as mentioned in target 3 under sanitation and fecal sludge
2. Report law breakers (people that do not have a sanitary facility at their house) to chiefs or the council offices
3. Follow newly formed municipal laws on open defecation

Household cost: Household latrine costs as described in target 3 under sanitation and fecal sludge

Municipal council responsibility:

1. The council to formulate and/or enforce by-laws covering sanitation and fecal sludge management issues. These by laws should be formulated to discourage open defecation. These by-laws are:
 - ✓ Each household should have a sanitary facility
 - ✓ Each business premise e.g. bar and restaurant should have a sanitary facility
 - ✓ If anyone is found defecating openly, they shall pay a fine
2. The council should work collaboratively with traditional leaders such as chiefs and Group Village Headmen to enforce this by-law.
3. The council should print and hang posters and signs to discourage open defecation. These posters will be placed at Chonde and Luchenza markets and each ward's market or trading center point.
4. The council should hold an awareness campaign as described in annex 2
5. The director of health to conduct annual random household inspections in collaboration with 4 respective ward committee representatives and 1 Health Surveillance Assistant (HSA). The aim of conducting the inspections is so that households follow the instruction. These inspections will be conducted in all wards of Luchenza and will be done in 800 households (100 households/ward). The inspections should be conducted for 8 days. Annex 5 is the household inspection guide/ questionnaire. If any households are found without a sanitary facility, they should be given a two month notice to construct one, of which if they fail, they should be punished according to the by-law.

Municipal council cost:

1. K5,000 for 50 printed posters
2. K192,000/day/ ward for 7 days (see annex 2 for budget breakdown).
3. K3,000/ day allowance for each of the 6 inspectors for 8 days

Target 6. Four additional and improved public toilets are constructed (Luchenza market, Chonde market, and along the M1 road, and Luchenza municipal hall

Target year(s): 6

Description: The council should construct additional public toilets in critical areas. These areas are: Luchenza market, Chonde market, and along the M1 road and Luchenza municipal hall. Each household will contribute K100 towards the public toilet construction project. If there are other costs that the collected money will not be able to cover, the council should cover the charges by sourcing funds internally or requesting for funding. Each public toilet construction site will have a committee chosen by the council. These committees will bridge the gap between the council and other community members. The committees' roles are to:

- ✓ Collect contribution fees from households to undertake the construction project
- ✓ Purchase required materials from shops using the money collected
- ✓ Coordinate volunteers in the project i.e. assigning volunteers tasks and locations
- ✓ Updating the council on the construction projects in reports and through meetings

Community volunteers should do the construction work. Alternatively, the council can employ a private builder and plumber to carry out the work.

The type of toilets to be constructed are Cistern Flush Toilets.

Description of a Cistern Flush Toilet (adapted from Tilley et al, 2014):

A cistern flush toilet is a toilet that consists of a water tank that supplies the water for flushing the excreta and a bowl into which the excreta are deposited. The toilet is usually made of porcelain material. A Cistern Flush Toilet incorporates a sophisticated water seal to prevent odours from coming back up through the plumbing. Water that is stored in the cistern above the toilet bowl is released by pushing or pulling a lever. This allows the water to run into the bowl, mix with the excreta, and carry them away.

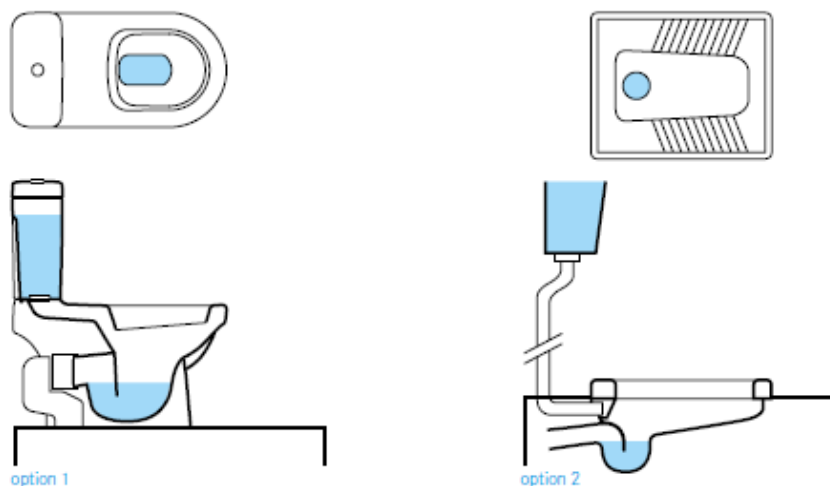


Figure 8: A Cistern Flush Toilet design

Source: Tilley et al, 2014

Design Considerations:

Modern toilets use 6 to 9L per flush, whereas older models were designed for flushwater quantities of up to 20 L. There are different low-volume flush toilets currently available that can be used with as little as 3 L of water per flush. In some cases, the volume of water used per flush is not sufficient to empty the bowl and, consequently, the user has to flush two or more times to adequately clean the bowl, which negates the intended saving of water. A plumber who is install a flush toilet should ensure that all valves are connected and sealed properly, therefore, minimizing leakage.

Appropriateness:

A cistern flush toilet must be connected to both a constant source of water for flushing and a Collection and Storage/Treatment or Conveyance technology to receive the blackwater. In this case, the public toilets in Luchenza will be connected to a septic tank which will be emptied from time to time if the septic tanks are full.

Health Aspects/Acceptance:

A cistern flush toilet is a safe and comfortable toilet to use provided it is kept clean.

Operation & Maintenance:

Although flushwater continuously rinses the bowl, the toilet should be scrubbed clean regularly to maintain hygiene and prevent the buildup of stains. Maintenance is required for the replacement or repair of some mechanical parts or fittings. Menstrual hygiene products should be collected in a separate bin.

Cost approximation:

Table 8 presents an estimated cost for constructing a Double Cistern Flush Toilet

Table 8: Double Cistern Flush Toilet approximate cost

Building materials (superstructure)			
Item	Quantity	Price per unit (MK)	Total (MK)
Bricks	8,000	12	96,000
Cement	15 bags	8,500	127,500
Sand	5m3	1,500	7,500
Quarry stone	3m3	15,000	45,000
Reinforcement bars (6m)	3	6,500	19,500
Shattering timber	15	1,500	22,500
Roofing timber (4x2x8)	4	6,000	24,000
7ft iron sheets	7	3,000	21,000
Galvanized wire	2	1,500	3,000
Roofing nails	2kg	1,500	3,000
Wire nails	2kg	1,400	2,800
Wooden door frames	2	10,000	20,000
Doors	2	25,000	50,000
Rim lock	2	10,000	20,000
Hinges	2	500	1,000
Wood screws	20	25	500
Total			463,300
Plumbing			
Item	Quantity	Price per unit (MK)	Total (MK)
6m galvanized pipe (20mm)	2	6,500	13,000
4m PVC pipe (30mm)	2	4,500	9,000
PVC pipe (40mm)	1	6,000	6,000
PVC pipe (110mm)	3	8,000	24,000
PVC bend (40mm)	4	1,500	6,000
PVC bend (30mm)	4	1,500	6,000
PVC bend (110mm)	4	4,500	18,000
PVC T inspection	1	4,500	4,500
PVC gulley (110mm)	1	15,000	15,000
Cistern	2	10,500	21,000
Toilet seat & cover	2	15,000	30,000
Galvanized elbows(20mm)	10	500	5,000
Galvanized nipples	10	500	5,000
Galvanized socket	6	500	3,000
Copper connector	2	3,500	7,000
Stop cock	2	4,500	9,000
Gate valve	1	6,000	6,000
PVC vent cover	1	2,500	2,500
Galvanized inion	4	1,500	6,000
Total			196,000

Septic tank (2.5mx2mx2.5m)			
Item	Quantity	Price per unit (MK)	Total (MK)
Bricks	8,000	12	96,000
Cement	12 bags	8,500	102,000
Sand	5m3	1,500	7,500
Quarry stone	3m3	15,000	45,000
Reinforcement bars	4	6,500	26,000
Shattering timber	15	1,500	22,500
Manhole cover	2	8,500	17,000
Total			316,000
Grand total			948,300

It should be noted that transportation costs for bricks, cement, sand, and quarry stone would be an additional K160,000 and if a private contractor would carry out the construction work, the labour charge would be approximately K334,490.

Household responsibility:

1. 5 volunteers to do the construction work/ public toilet for 2 weeks
2. 10 volunteers to collect sand for the public toilet construction project/ public toilet for 2 weeks
3. 5 volunteers to draw water for the public toilet construction project/ public toilet/ 2 weeks
4. All households to contribute a fee to procure bricks and for any other arising costs

Household cost: K50 per household to procure bricks and for any other arising costs

Municipal council responsibility:

1. Coordinate all chiefs to hold community meetings at neighbourhood level in collaboration with respective councilors, ward committees, and neighbourhood committees of that area, targeting all community members to inform and plan for the public toilet construction project. During these meetings households will be notified that they will have to contribute K50s towards this project.
2. Identify 5 public toilet committees to be in charge of each of the public toilets. These individuals will be responsible for collecting K50 contributions from households.
3. Coordinate resources and equipment in the project
4. Formulate the building design/plan for the public toilets
5. Oversee/ monitor the construction projects

Municipal council cost:

1. Working energy
2. K948,300 to construct a Double Cistern Fluch Toilet

2.4 Solid waste management

2.4.1 Summary of findings from previous planning steps:

- Most households in all wards disposed their solid waste directly i.e. without storage in bins except for Thundu.
- Most households identified burning and using as cleansing materials as most common ways of handling paper waste
- Most households identified burning, dumping in garbage pit and open dumping on-site as most common ways of handling plastic waste
- Most households identified dumping in pit latrine, dumping in garbage pit, open dumping on-site, burying, dumping in rivers and keeping as most common ways of handling metal waste
- Most households identified dumping in pit latrine, dumping in garbage pit and open dumping on-site as most common ways of handling glass waste
- Overall, most households did not practice composting in their homes (60%)
- Overall, 60% of households were willing to pay money for a public skip located 10 minutes with an exception in Kapiri ward, where most households were not willing
- Overall, 51% of households were willing to pay money for weekly garbage collection

2.4.2 Proposed targets for Solid Waste Management

Target 1. 25% of households practice composting

Target year(s): 1

Description: Composting is the biological decomposition of biodegradable solid waste under controlled predominantly aerobic conditions to a state that is sufficiently stable for nuisance-free storage and handling and is satisfactorily matured for safe use in agriculture. The process involves decomposition of organic waste into humus known as compost which is a good fertilizer for plants.

Importance of compost as a soil conditioner

1. Compost provides plant nutrients that are released throughout the growing season. Compost contains the main plant nutrients – nitrogen (N), phosphorus (P) and potassium (K), often written as NPK. When applied to fields, these plant nutrients dissolve in the water in the soil and are taken in by the roots of the crops.
2. Compost improves soil structure so that plant roots can easily reach down into the soil. In sandy soil, the humus makes the sand particles stick together. This reduces the size of the spaces (pores) so that water stays longer in the soil. In clay soils, the humus surrounds the clay particles making more spaces (pores) in the soil so the root systems of plants can reach the water and nutrients that they need, and air can also move through the soil.

Therefore, because heavy clay soils become lighter and sandy soils become heavier, soil that has had compost added to it is easier to work, i.e. to plough and dig.

3. Compost improves the moisture-holding capacity of soil.

The humus is a dark brown or black soft spongy or jelly-like substance that holds water and plant nutrients. One kilogram of humus can hold up to six litres of water. In dry times, soil with good humus in it can hold water longer than soil with little humus. In addition, when it rains, water easily gets into the soil instead of running off over the surface.

4. Compost helps farmers improve the productivity of their land and their income.

Compost is made without having to pay cash or borrow money, i.e. farmers do not have to take credit and get into debt like they do for taking chemical fertilizer.

What to compost

1. Plant materials, both dry and green:

- Weeds, grass and any other plant materials cut from inside and around fields, in clearing paths, in weeding, etc.
- Waste from cleaning grain, cooking (kitchen waste), and cleaning the house and compound
- Crop residues: stems, leaves and straw of all field crops
- Garden waste e.g. old leaves, dead flowers, hedge trimmings, grass cuttings, etc.
- Dry grass, hay, and straw left over from feeding and bedding animals

2. Animal materials. These include:

- Dung and droppings from all types of domestic animals, including from chicken, cattle, goats etc.

How to compost at household level:

Selecting the site

1. The following factors need to be considered:
2. The site should be accessible for receiving the materials composting raw materials, and for frequent watching/monitoring and follow-up.
3. The site should be protected from strong sunlight and wind, e.g. in the shade of a tree, or on the west or north side of a building or wall.
4. The site should be protected from high rainfall and flooding.

Making the compost pile

- Mark out the area for the compost heap. A minimum area is 1.25 m x 1.25 m. If it is smaller than this, the heap will dry out quickly so compost will not be made properly. The area can be larger, up to 3 m x 2.5 m.
- Dig a shallow trench in the ground the same size as the compost heap. Make the trench about 20–25 cm deep. The bottom and sides of the trench should be smeared with water or

a mixture of cow dung and water. This seals the pit so that moisture with nutrients does not leak out of the base of the compost heap.

1. The foundation layer

Dry plant materials, e.g. strong straw and stalks of maize and sorghum, which are thick and long, are used for the foundation. These need to be broken into short lengths (about 10–15 cm long). The stalks can be crushed, and then chopped. Spread the dry materials evenly over the bottom of the trench to make a layer 15–25 cm thick, as deep as a hand. Then sprinkle water with a watering can or scatter water evenly by hand over the dry plant materials so they are moist, but not wet. The foundation layer provides ventilation for air to circulate, and excess water to drain out of the upper layers.

2. The three basic layers

The compost heap is built up of layers of materials, like in a big sandwich. The basic sequence is:

Layer 1: A layer of dry plant materials, or mixture of dry plant materials with compost making aids like good soil, manure and/or some ashes. The layer should be 20–25 cm thick, i.e. as deep as a hand. The compost making aids can be mixed with the water to make slurry. Water or slurry should be scattered by hand or sprinkled with a watering can evenly over this layer making it moist but not soaking wet.

Layer 2: A layer of moist (green) plant materials, either fresh or wilted, e.g. weeds or grass, plants from clearing a pathway, stems and leaves left over from harvesting vegetables, damaged fruits and vegetables. Leafy branches from woody plants can also be used as long as the materials are chopped up. The layer should be 20–25 cm thick. Water should NOT be sprinkled or scattered over this layer.

Layer 3: A layer of animal manure collected from fresh or dried cow dung, mule or donkey manure, sheep, goat or chicken droppings. The animal manure can be mixed with soil, old compost and some ashes to make a layer 5–10 cm thick. If there is only a small quantity of animal manure, it is best to mix it with water to make slurry, and then spread it over as a thin layer 1–2 cm thick. Layers 1 and 2 are essential to make good compost, but layer 3 can be left out if there is a shortage or absence of animal manure.

Layers are added to the heap in the sequence, Layer 1, Layer 2, Layer 3, until the heap is about 1–1.5 metres tall. The covering layer can be made of wet mud mixed with grass or straw, with or without cow dung, or wide leaves of pumpkin, banana, fig trees, etc. The covering layer:

- ✓ Prevents rain water from getting into the heap and damaging the compost making process; and
- ✓ Helps keep heat inside the compost making heap.

It is necessary to turn the compost pile from time to time. Turning in this case means tearing down the pile and reconstructing it. Turning promotes aeration and also ensures uniformity of decomposition by exposing at one time or another all of the composting material to the particularly

active interior zone of a pile. Once the pile has been completed (this may take some weeks or even months), it should be turned. It can be turned again after 4-6 weeks.

A mature compost heap is about half the height of the original heap, and the inside is full of dark brown or black substance, humus, which smells good. When the compost is mature, it should be very difficult to see the original materials. This mature compost can be used immediately in the field, or it can be covered and stored until the growing season. When it is put in the field, it should be covered quickly by soil so the sun and wind do not damage it.

Household responsibility:

1. Compost organic waste i.e. kitchen waste, yard waste, and animal manure
2. Seek technical guidance and advice on composting from the 'model household'

Household cost: None

Municipal council responsibility: Hold an awareness campaign as described in annex 2

Municipal council cost: K192,000/day/ ward for 7 days (see annex 2 for budget breakdown).

Target 2. Zero open waste disposal in public areas i.e. Chonde and Luchenza markets, Luchenza depot and the M1 road (sidewalks and the municipal drain)

Target year(s): 5

Description: To achieve zero open waste disposal in Luchenza's public spaces, several strategies will be adopted. First, the council should formulate and enforce by-laws covering municipal solid waste. These laws include:




- ✓ Every household should have a garbage pit or bin. For the households that have bins, they should have a defined and acceptable place to dispose the waste i.e. a public skip.
- ✓ Every business premises should have a garbage pit or bin. For the households that have bins, they should have a defined and acceptable place to dispose the waste i.e. a public skip.
- ✓ Every individual found disposing waste in any other places aside from bins, garbage pits or public skips will pay a fine

Second, the council should print and hang posters discouraging open solid waste disposal. These posters will be hung at the depot, the markets (Luchenza and Chonde), and along the M1 road. These posters will contain text prohibiting open solid waste disposal in those particular sites and the rest of the municipality. It will also contain the penalty of conducting such, i.e. a fine.

Third, the council should provide more public skips. A total of 3 skips will be provided for the trading centre. Two skips will be placed along the main road while one skip will be placed at the depot. The council will write proposals to potential sponsors to seek for funding to purchase public skips and/or source internal funds to assist in sponsoring the project. The following map displays

the current places where bins and skips are, and the potential places where the additional skips will be placed. Figure 9 displays potential sites where new public skips should be placed.

Map key:

Symbol on the map	Meaning
	Existing bins
	Existing skips (concrete)
	Potential sites for new skips

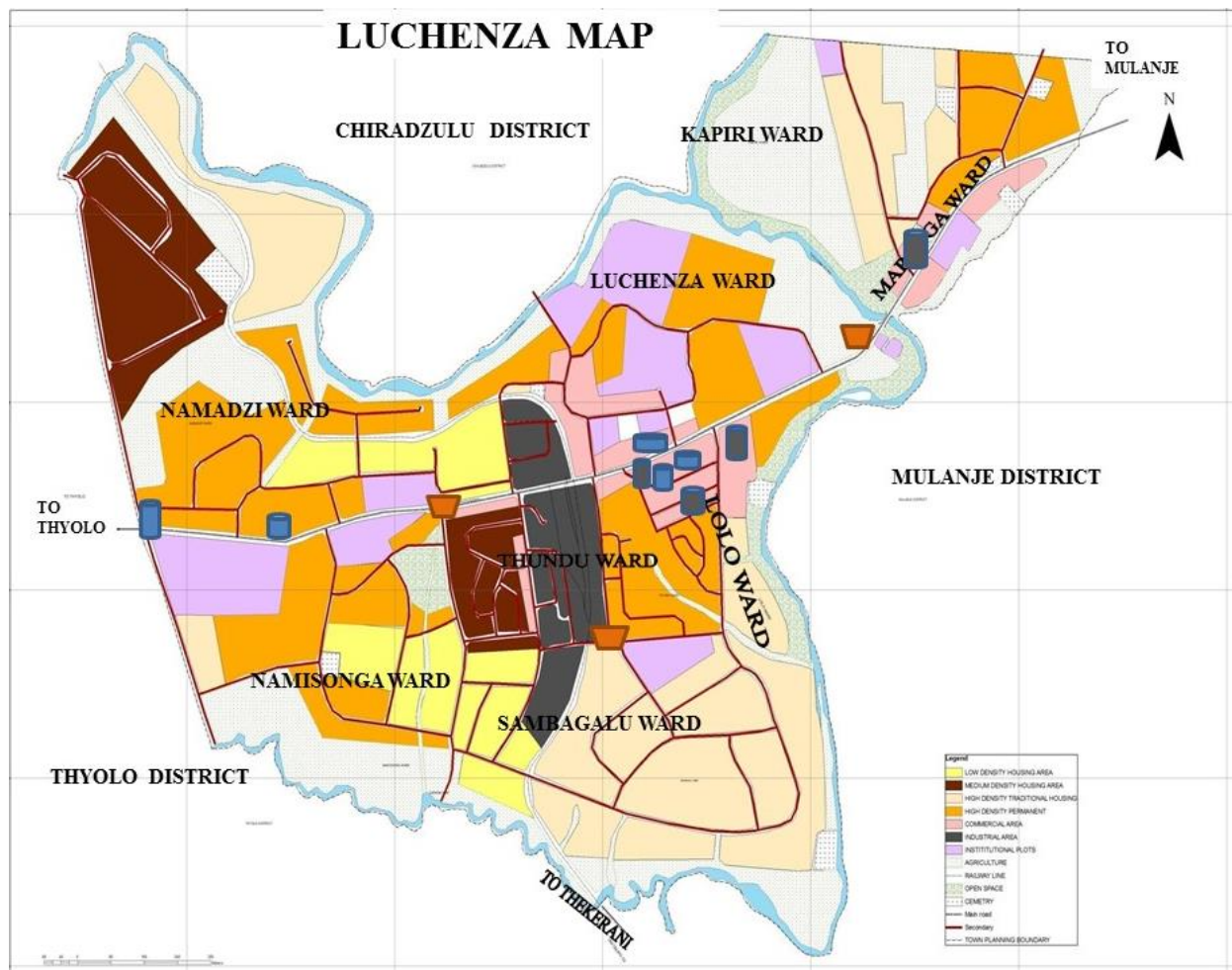


Figure 9: potential sites to place public skips in Luchenza

Fourthly, the council should hold an awareness campaign as described in annex 2. Lastly, the director of health to conduct yearly reviews on performance in solid waste disposal i.e. general inspections in public municipal spaces waste disposal

Household responsibility:

1. Abide to newly formed municipal laws to only dispose public waste (markets, streets, depots) in public bins or skips
2. Report law breakers to the council (health and public works department)

Household cost: None

Municipal council responsibility:

In summary, the council should

1. formulate and enforce a by-law for people to only dispose public waste (markets, streets, depots) in public bins or skips
2. hold an awareness campaign as described in annex 2
3. purchase new public skips to put around public spaces in the municipality (trading center routes and along the M1 road)
4. write proposals to potential sponsors to seek for funding to purchase public skips and/or source internal funds to assist in sponsoring the project
5. print and hang posters and signs to discourage open solid waste disposal
6. conduct yearly reviews on performance in solid waste disposal i.e. general inspections in public municipal spaces waste disposal

Municipal council cost:

1. K192,000/day/ ward for 7 days (see annex 2 for budget breakdown).
2. K5,000 for 50 printed posters
3. K22,000/bin *10 bins
4. 200,000,000/ public skip

Target 3. 25% of households adopt an improved solid waste management strategy

Target year(s): 8

Description: A solid waste management system consists of a chain of linked processes from garbage generation to disposal of the garbage. Figure 10 displays a solid waste management chain.

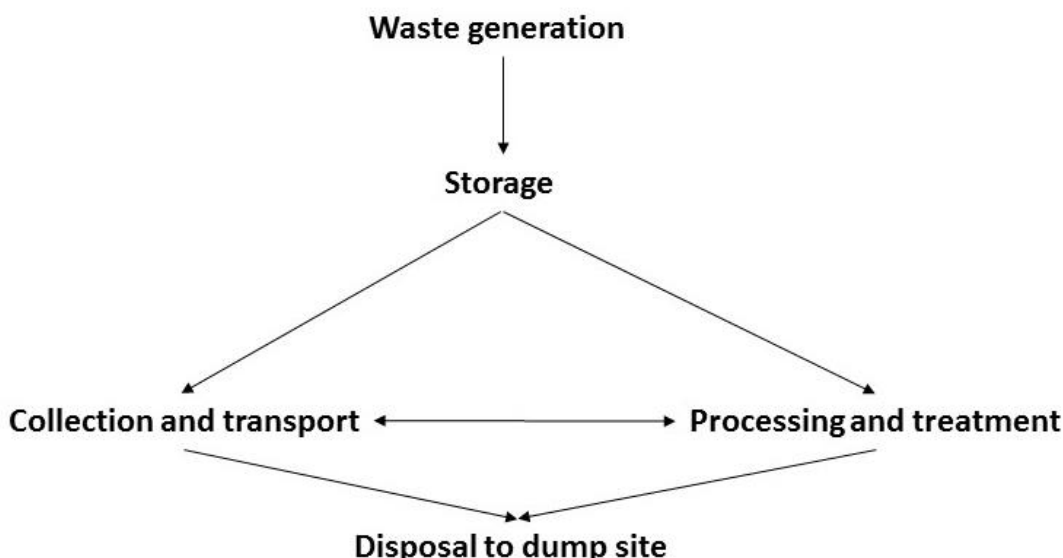


Figure 10: Solid waste management chain

An improved solid waste management strategy should be introduced in Luchenza. The strategy should be run by the council in collaboration with community members and other private service providers in the chain such as private waste collectors.

The strategy should be operated as depicted in the following plan:

All waste that is not composted will be stored by households, awaiting collection. Households should have simple storage materials such as plastic or metal containers, plastic bags, sacks, or woven baskets to store their household waste.

Waste collection:

The council should identify individuals interested to venture into a private waste collection business during the awareness campaign (see annex 2). Specifically, there should be a call for applications for private waste collectors to the council. Then the council will make a selection of individuals that will have the tenders of the business. There should be a total of 22 private waste collectors, i.e. 1 waste collector per neighbourhood. The waste collectors will collect waste using tricycles or any other means to ward transfer stations. Each collector should have a time table for collecting waste from households throughout the week. Nevertheless, each waste collector should collect waste from an individual household once a week i.e. weekly garbage collection. Each household using this waste collection service should pay a monthly fee for the collection to the private waste collectors and this fee should be standardized in all neighbourhoods. Alternatively, households wanting to transport the waste from households to transfer stations on their own could do so, thereby skipping the weekly waste collection by private waste collectors. Before the actual waste collection system is set up, the council should conduct a pilot exercise in one neighbourhood for two months, specifically to determine the pricing and efficiency of the collection. The starting

monthly fee during the pilot test will be K500. After the pilot test, the service will be extended to all other wards with the new determined price.

At the transfer stations:

Each ward should have a central communal waste collection point (transfer station) where there will be public skips. Therefore, solid waste should be transferred from households by private waste collectors to this point. Similarly, households not wanting to pay for the weekly waste collection should transfer their waste to these sites. These transfer stations should be constructed by the council. The council's waste collection truck should collect garbage from this point going to the dump site. Similarly, all other municipal waste will be collected by the council to the dump site. The transfer stations should be constructed in areas close to the main road (Thyolo-Mulanje road). The council together with councilors and chiefs should identify potential sites where the transfer stations will be placed. The physical planning department at the council should have to conduct an Environmental Impact Assessment in these sites and after being approved, the transfer stations will be constructed.

Transfer station design:

The transfer station should be built by brick and will have an iron sheet opening (gate). Alternatively, the transfer station can be made of iron sheet entirely or other materials. Nonetheless, the transfer station should be enclosed to isolate the place from scavengers, animals, and to prevent the waste from blowing away. A transfer station should measure 8m x12m x1.8m to enable access of a waste collection truck trailer to enter the room. After the 1.8m wall, there should be a 1m open space before the roof all around the building perimeter. This space will act as a ventilation point. The transfer station should have 4 drainage pipes on all 4 bottom corners of the building.

Inside the transfer station, the floor should be made of concrete material to avoid waste water from seeping into the ground and to enable easy shoveling of waste from the ground without digging up the soil. The transfer station should also have space on the inside perimeter where waste will be stored. The central space should be left free as this is the spot where the waste collection vehicle will be put as waste is being shoveled in. Figure 11 displays a width cross sectional view of the transfer station

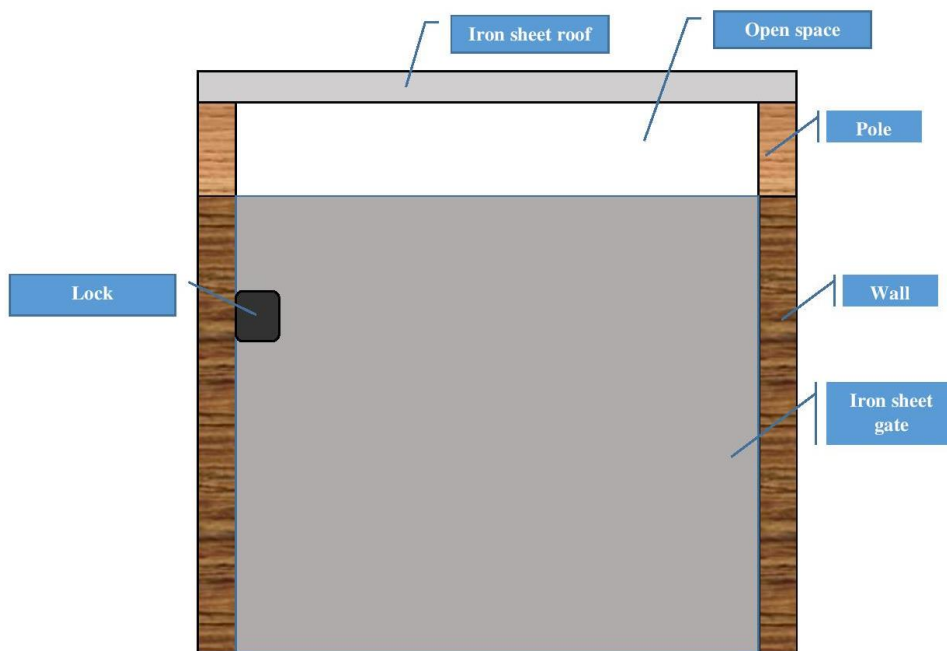


Figure 11: Cross-sectional view of the proposed transfer station design

Table 9 presents an approximate cost for constructing a 8m x12m x1.8m transfer station.

Table 9: Transfer station budget

Materials	Quantity	Amount (MK)
bricks	100 pieces	150,000
cement	56 bags	491,000
Brick-force wire	20 rolls	30,000
Nails	2kg	3,000
Wood for the gate	4 pieces	34,000
Iron sheet for the gate	6 pieces (6 ft. pieces)	36,000
Iron sheet for the roof	48 pieces (16 ft. pieces)	600,000
Timber for the roof	48 pieces (6x2 pieces)	408,000
Timber for the roof	20 pieces (3x2 pieces)	90,000
Galvanized wire	4 rolls	4,800
Ridges	6 pieces	21,000
Total		1,867,800

Note: for the budget above, the costs are inclusive of transportation costs. Hence if transport costs would be removed, the budget for materials would reduce significantly. Also, if the council would hire a private person to construct this, the labour charges would be approximately K560,340.

Table 10 is a proposed timetable for the municipal waste collection.

Table 10: Proposed timetable for municipal waste collection

Day	Places (sites)
Mondays	Namadzi and Namisonga ward transfer stations
Tuesdays	Sambagalu and Lolo ward transfer stations
Wednesdays	Luchenza and Thundu ward transfer stations
Thursdays	Mapanga and Kapiri ward transfer stations
Fridays	Chonde market
Saturdays	Luchenza market
Sundays	M1 road bins and public skips

Disposal at the dump site:

From the transfer stations, the municipal solid waste collection truck should transport all garbage to the dumpsite at Lomola.

Household responsibility:

1. Pay monthly household waste collection fees to primary waste collectors for a weekly garbage collection
2. Transfer household garbage to the respective ward transfer station if the household not to engage a primary waste collector

Household cost: K500/household/month as a starting price during the pilot test

Municipal council responsibility:

1. Hold an awareness campaign as described in annex 2
2. Hold community meetings in collaboration with respective councilors, ward committees, neighbourhood committees and chiefs of that area to alert community members of the solid waste collection service
3. Identify individuals that would be interested in being primary waste collectors during the awareness campaign
4. Identify waste pickers (recyclers) for inorganic waste during the awareness campaign
5. Construct a waste transfer station for every ward
6. Collect waste from all ward transfer stations and all other municipal bins and public skips to the dump site

Municipal council cost:

1. K192,000/day/ ward for 7 days (see annex 2 for budget breakdown).

2. 20 litres of fuel which would cost K16, 320 per day for two transfer stations for four days hence K65,280 and 7 liters of fuel per day which would cost K6,528 for three days hence K19,584. In total, fuel cost per week would be K84,864.
3. K1,867,800 for constructing a transfer station . Hence for 8 wards, K14,942,400

Target 4. The dump site is reconstructed

Target year(s): 5

Description: The council should embark on a project to renovate the dumpsite at Lomola. The dump site measures approximately 70m x50m and is currently an open dump site. Upgrading open dumps to controlled dumps involves reduction of environmental nuisances like odor, dust and infestation by vermin and birds. Controlled dumps are operated with basic inspection and recording of incoming wastes, compaction of waste and application of soil cover. The controlled dump technique is one step better than open dumping with certain basic control measures that include basic handling techniques that are used to consolidate the waste and eliminate open burning, foraging by animals and controlled salvaging operations by waste pickers. Preliminary drainage control measures are also used to manage leachate flows and storm-water runoffs from the sites.

The aim of the reconstruction exercise is to:

- ✓ minimise contact of solid waste with humans
- ✓ minimise the aesthetic nuisance caused by the dump site such as smell and flies
- ✓ protect individuals living around the dumpsite from disease vectors such as mosquitoes
- ✓ prevent the solid waste at the dumpsite from blowing away and
- ✓ ensure that waste is disposed of in a safe and acceptable manner

In order to achieve these improvements from the current open dumping system in Luchenza to controlled dumps, an appropriate combination of simple techniques should be used during the dumpsite reconstruction.

a. Fencing

The main purposes of fencing the dumpsite is to control access to the disposal site and curtail open dumping, manage uncontrolled scavenging by waste pickers, to prevent waste from blowing away, and to protect the surrounding vegetated sites. The fence should be 70m x50m and will measure 1.8m in height.

b. Scavenging control

Scavenging is when individuals collect valuables from the waste and make a living out of them. This activity hampers controlled and safe operation of solid waste disposal sites and should be banned, ideally through a policy formed by the council.

c. Levelling

The dump site should be levelled (slope stabilization) so that the entire area it is flat to allow the waste collection truck to easily pass through. This will also prevent rain water from collecting in the low points at the dump site.

d. Access road (vehicle pathway)

A sufficiently wide access road to a disposal site from the main road is essential to enable the passing trucks. A proper road should be formed to service the dumpsite in all seasons to a standard that enables easy passage of trucks carrying waste to the site. At the same time, dumping of the waste on the road side should be banned and the callously dumped waste on the road sides will be cleared, weekly, by municipal waste collectors. The road surface should be compacted earth with a top dressing of gravel to enable a firm running surface.

Household responsibility:

1. 20 volunteers to excavate 2 fecal sludge pits for 2 weeks
2. 15 volunteers to help with ground levelling for 2 weeks
3. 15 volunteers to improve path/ road access for 2 weeks
4. 15 volunteers to help with fence construction
5. 15 volunteers to draw water

Household cost: Working energy

Municipal council responsibility:

1. Write proposals to potential sponsors to seek for funding and/or source internal funds to assist in sponsoring the project i.e. procuring materials such as cement, sand, and bricks.
2. Coordinating resources in the project
3. Directing and supervising the project
4. Providing Personal Protective Equipment (PPE)

Municipal council cost:

The council's costs will be for PPE and materials to construct the fence. Table 11 presents an estimated budget for a 70m x50m fence at the dump site.

Table 11: Cost approximation for a 70m x50m fence at Lomola dump site

Item	Quantity	Cost in MK (including transport)
Bricks	40,968 pieces	641,616
Cement	312 bags	2,682,000
Sand	79m ³	1,425,000
Quarry stone	16m ³	380,000
Brick force wire	100 rolls	150,000
Iron sheet gate	2 pieces for one opening	300,000
Total		4,578,616

Note: If the fence would be constructed by a private person, the labour charge would be approximately K1,434, 634.

3 Annexes

3.1 Annex 1: List of all functional water points in Luchenza

Ward	Neighbourhood	Water point type	Water point name
Luchenza	Luchenza	Public borehole	Primary school TDC borehole
Luchenza	Luchenza	Public borehole	Primary school wakuphala
Luchenza	Luchenza	Public borehole	Primary school ground
Luchenza	Luchenza	Public borehole	Police
Luchenza	Luchenza	Public borehole	Council
Thundu	Thundu	Public borehole	Muchiwa
Thundu	Thundu	Public borehole	Market
Namadzi	Chiromo 1	Public borehole	Baluwa
Namadzi	Chiromo 1	Public borehole	M'mangisa
Namadzi	Chiromo 2	Public borehole	Cdss
Namisonga	Goliyati	Public borehole	Secondary
Namisonga	Kanthawire	Public borehole	Naison
Namisonga	Kanthawire	Public borehole	Dick
Namisonga	Kanthawire	Water kiosk	Pearson
Namisonga	Kanthawire	Public borehole	Chikonyo
Sambagalu	Sambagalu 1	Public borehole	Aroma
Sambagalu	Sambagalu 1	Public borehole	Kawawa
Sambagalu	Sambagalu 2	Water kiosk	Kanada
Sambagalu	Sambagalu 2	Water kiosk	Ndalama
Sambagalu	Sambagalu 2	Public borehole	Bwaila
Lolo	Saikonde	Water kiosk	Mfumu
Lolo	Saikonde	Public borehole	Maononga
Lolo	Saikonde	Water kiosk	Laston
Mapanga	Kululira	Public borehole	Chonde
Mapanga	Kululira	Water kiosk	Manda
Mapanga	Kululira	Public borehole	Give me
Mapanga	Kululira	Public borehole	Kalembera
Mapanga	Kululira	Communal tap	Chikwiri
Mapanga	Kululira	Water kiosk	Khobili
Mapanga	Chonde	Water kiosk	Banda
Mapanga	Chonde	Public borehole	Chipatala
Mapanga	Chonde	Public borehole	Chonde mzikiti
Mapanga	Kululira	Water kiosk	Kalilombe
Kapiri	Mwarama	Public borehole	Pak
Kapiri	Njete	Public borehole	Maulidi mzikiti
Kapiri	Njete	Public borehole	Paulo
Kapiri	Njete	Public borehole	Maison

Kapiri	Njete	Public borehole	Khamolela
Kapiri	Njete	Water kiosk	Balineti
Kapiri	Njete	Public borehole	Mbulaje mzikiti
Kapiri	Njete	Public borehole	Mbulaje mzikiti
Kapiri	Mwarama	Public borehole	Namoyo
Kapiri	Mwarama	Public borehole	Dungwe
Kapiri	Mwarama	Public borehole	Malo

3.2 Annex 2: Awareness campaign approach

Community mobilization is the process of bringing together as many stakeholders as possible to raise people's awareness of and demand for a particular programme, to assist in the delivery of resources and services, and to strengthen community participation for sustainability and self-reliance. Community mobilization helps to empower communities and enable them to initiate and control their own development. One important aspect when mobilizing the community is building awareness hence there will be awareness campaigns in Luchenza.

There should be 7 awareness campaigns held, in all 8 wards. Since Luchenza ward and Thundu ward are smaller in size and are very close together, one awareness campaign should be held for these two wards. These awareness campaigns should be targeted for all community members. Luchenza Municipal Council should hold these awareness campaigns in collaboration with other stakeholders: all 6 Community Based Organizations (CBOs) in Luchenza, ward committees, councilors and traditional leaders.

Nonetheless, there should be 8 leading organizers for the awareness campaign. These organizers will also be the speakers at the event. The direct organizers and speakers for these campaigns will be:

- ✓ The Director of health
- ✓ The Chair of health and environment
- ✓ Two Health Surveillance Assistant (HSAs)
- ✓ Any other 4 assistants chosen by the 4 people mentioned above

Awareness campaign strategy:

1. Planning

- ✓ Setting up themes and objectives for the event. The theme should be 'Improving environmental sanitation in Luchenza'
Objectives of the awareness campaign are to;
 - build a relationship among all environmental sanitation stakeholders
 - assess the understanding of community members on environmental sanitation issues
 - teach and raise awareness in community members on new and improved sanitation technologies e.g. composting
 - prepare community members of upcoming projects
- ✓ Setting the date, time and schedule for the event. The awareness campaign should be a half day event per each setting (ward). Below is a proposed schedule which can be adapted to the dates and the specific venues in the wards the campaign will be held during implementation.

Date	Day	Ward	Venue	Time
	Monday	Namadzi		08:00-12:00
	Tuesday	Namisonga		08:00-12:00
	Wednesday	Luchenza and Thundu		08:00-12:00
	Thursday	Lolo		08:00-12:00
	Friday	Sambagalu		08:00-12:00
	Monday	Mapanga		08:00-12:00
	Tuesday	Kapiri		08:00-12:00

- ✓ Sharing information/the plan to other stakeholders so as to prepare them for their participation and also gain additional information
- ✓ Gathering resources internally (council) or the council could write and submit proposals to other organizations/ institutions to request for funding
- ✓ Training teachers/ speakers on the information they will share during the campaign
- ✓ Gathering all required materials such as charts, posters, the Public Address System and hiring a vehicle for the day

2. Communicating

- ✓ Making announcements about the event. Announcements should be made using posters pasted in the streets. The posters should contain name of the event, objectives of the awareness campaign, location schedule, dates, and time. Furthermore, the organizing team should hire messengers to make community public addresses the night before the awareness campaign in each respective neighbourhood and therefore, ward.

Below is a sample poster/ announcement of the awareness campaign that could be posted for the public



Invitation to attend an awareness campaign in Luchenza

This is to cordially invite all community members to participate in an awareness campaign with the theme: 'Improving environmental sanitation in Luchenza'. Environmental sanitation is a term that encompasses;

- ✓ Water supply
- ✓ Storm water management & Waste water management
- ✓ Basic sanitation
- ✓ Solid waste management

This awareness campaign is organized by Luchenza Municipal Council in collaboration with all other environmental sanitation stakeholders.

The goal of the awareness campaign is to:

1. build a relationship among all environmental sanitation stakeholders
2. assess the understanding of community members on environmental sanitation issues
3. teach and raise awareness in community members on new and improved sanitation technologies e.g. composting
4. prepare community members of upcoming environmental sanitation projects

Participants will be asked to take part in several activities that will happen at the awareness campaign. The awareness campaign will be held for 7 days in individual wards. The event will be held on fromto (Date) and will be held from **8AM to 12:00 noon** in each respective ward. Below, is a schedule of the event;

Date	Day	Ward	Venue	Time
	Monday	Namadzi		08:00-12:00
	Tuesday	Namisonga		08:00-12:00
	Wednesday	Luchenza and Thundu		08:00-12:00
	Thursday	Lolo		08:00-12:00
	Friday	Sambagalu		08:00-12:00
	Monday	Mapanga		08:00-12:00
	Tuesday	Kapiri		08:00-12:00

We look forward to meeting you at this event.

Regards,

..... (Awareness campaign chairperson)

3. Holding the campaign

The awareness campaign will be a half day event per each setting (ward). The following is a description/ schedule/ program of activities that are to take place during the event by awareness campaign committee members.

07:00-Start with event speakers (planners) going to one of the traditional leaders' house in the ward. For instance, if the awareness campaign is happening in Namadzi ward, the Group Village Head associated with this area will be visited. Alternatively, the chief (village headman) closest the venue where the event will be held will be visited. Here, the awareness campaign committee will notify the chief of their presence in the area and briefly remind him/her about the event.

07:20- From the traditional leader's house, get into a vehicle with a Public Address System. Here, one of the organisers should be making announcements of the event. The vehicle should go around the ward, inviting community members to go to the event site. The aim of this approach is to remind community members of the event and lure community members to the venue so that the event starts in good time.

08:00- At the awareness campaign venue, make an introductory remark comprising objectives of the event and a highlight of activities that will follow during the awareness campaign.

Note: An interactive quiz should follow, to assess the knowledge of people on sanitation issues in Luchenza. The quiz should follow the order of drinking water, storm- and greywater management, sanitation and fecal sludge management, and lastly, solid waste management. Rewards such as drinking water bottles should be given to encourage people to participate. The interactive quiz should be mixed in with an environmental sanitation sensitization talk at the end of each quiz segment. Awareness campaign committee members will alternate in delivering the sensitization talk. This talk is where participants will be taught about what they should do to improve in that particular environmental sanitation aspect and about feasible methods or technologies that community members can adopt.

08:15- Environmental sanitation and drinking water quiz

Quiz questions:

- ✓ What are the components of environmental sanitation?
- ✓ What is the importance of hygiene and sanitation?
- ✓ Where do households obtain their drinking water?

08:25- Drinking water sensitization talk

- ✓ Advise participants to drink water from public water points as the water is safe, as determined in the environmental sanitation planning project
- ✓ Take and answer questions from participants under this segment

08:30- Greywater and stormwater management quiz

Quiz questions:

- ✓ What are the challenges in managing greywater at household level?
- ✓ What are the appropriate ways of disposing greywater at household level?
- ✓ How can households optimize the capturing and usage of rain water?

08:40- Greywater and stormwater management sensitization talk

- ✓ Teach participants on how to make simple flood barriers at household level as described on target 2, under section 2.2.2 of this document. Include a simple demonstration of the process.
- ✓ Advise participants to prevent stagnating water around their plot by placing sand, stones, or rocks as described on target 1 under section 2.2.2 of this document
- ✓ Teach participants about soak pits. The talk should include: what soak pits are, how to construct them, appropriateness, required materials, and cost approximation. Information to be disseminated is described on target 4 under section 2.2.2 of this document

09:10- Sanitation and fecal sludge quiz

Quiz questions:

- ✓ What is the importance of every household having and using a pit latrine?
- ✓ What type of latrines do most of the community members have? What conditions are they in?
- ✓ What are the basic requirements for every pit latrine?

09:20- Sanitation and fecal sludge sensitization talk

- ✓ Sensitize the participants for each household to have a toilet/ pit latrine at their house
- ✓ Highlight the basic hygienic requirements of a pit latrine i.e. latrine lid, cleansing materials, and a hand washing station
- ✓ Outline the critical points/ times for hand washing (after toilet use, after changing a diaper for a baby, before feeding infants, before eating)
- ✓ Describe and make a demonstration of 3 possible hand washing stations that households should employ as described on target 2 under section 2.3.2 of this document
- ✓ Teach the participants about Fossa Alternas as described on target 3 under section 2.3.2 of this document. The disseminated information should include what a Fossa Alterna is, how to construct a Fossa Alterna, usage, appropriateness, health issues, maintenance, cost approximations, and advantages.

09:50- Solid waste management quiz

Quiz questions:

- ✓ How is waste handled at household level?
- ✓ What challenges are faced in handling garbage at the household level?
- ✓ What do you know about the composting procedure?

10:00- Solid waste management sensitization talk

- ✓ Sensitize the participants to stop open waste disposal at household level and in public municipal spaces such as markets and roads
- ✓ Teach and make a brief demonstration of how to compost as described on target 1 under 2.4.2 of this document

10:30- A short drama should follow by Umoyo Travelling Theatre. The drama should be focused on sanitation and hygiene covering all aspects of drinking water, drainage, sanitation and fecal sludge, and solid waste. The goal of this drama should be to encourage behavior change in people. An example of a scene in the drama is where a person does not wash hands after using the toilet, and later falls sick. Another example is where two people are chatting about farming and one person tells the other how faeces can be used as fertilizer in place of inorganic fertilizer etc. In summary, the drama should be focused on new innovative projects being proposed to the community i.e. from the community service options e.g. composting, knowledge of the Fossa Alterna technology, hand washing importance etc.

10:45- A song organized by Umoyo Travelling Theatre will be sung. The song should sensitize Environmental sanitation issues. This should be followed by a brief singing/ and or dancing competition to motivate participants to stay at the awareness campaign.

11:00- Highlight possible future activities. These activities are:

- ✓ The water point construction project. Explain to the participants as described on target 4 under section 2.1.2 of this document. In this announcement, community members will be prepared that each of their neighborhoods will have a community meeting led by chiefs, Neighborhood Development Committees and Ward Committee to plan for these projects e.g. by choosing water point committees
- ✓ The public toilet construction project. Explain to the participants as described on target 6 under section 2.3.2 of this document
- ✓ The solid waste management strategy. Explain to the participants as described on target 3 under section 2.4.2 of this document. On this point, make an announcement to call for people that are interested to venture in the solid waste collection business. In addition, also identify any waste recyclers in the area (people that would be interested in collecting specific fractions of household garbage such as plastic bottles or metal waste)
- ✓ Any other activities that the council will be undertaking such as annual water point inspections as described on target 2 under section 2.1.2, quarterly inspections of public toilets as described on target 5 under section 2.3.2, and annual household inspections as described under annex 5

11:45-The awareness campaign should then end with closing remarks

11:50- Have participants line up and distribute fliers/handouts for:

- ✓ How to make flood barriers at household level
- ✓ How to construct a soak pit
- ✓ How to set up hand washing stations
- ✓ The Fossa Alterna information and guide
- ✓ How to compost at household level

Each of these topics listed should have 200 copies of handouts. Hence, there will be 1000 handouts per setting (200 times 5 topics).

Awareness campaign budget

This budget is estimated per day. Hence the total should be multiplied by 7 days.

Item	Cost/unit	Quantity	Amount (MK)
Lunch allowance	4,000	8 organizers	24,000
Public Address System	50,000	1	50,000
Umoyo Travelling Theatre allowance	7,000	1 group	7,000
Incentives (water bottles)	1,800	20	36,000
Handouts	60	1000 copies	60,000
Emergency fee/ other costs	NA	NA	15,000
Total			192,000

Hence for 7 days, the total cost will be **K1,344,000**

3.3 Annex 3: Water point inspection questionnaire

The enumerators/ inspectors should use KoBo Toolbox when carrying out this exercise. KoBo Toolbox is a free, open-source tool for mobile data collection. It enables data collection on digital devices such as mobile phones, tablets and computers. Planners, development professionals, researchers, and private companies use KoBo Toolbox to design and implement primary data collection and baseline surveys. It is quick and avoids input errors, since data does not need to be transcribed from paper to computers before it can be analysed. KoboToolbox can be visited at <http://www.kobotoolbox.org>

Question number	Question	Answer	Skip logic
1	Date	Number	
2	Ward name	Text	
3	Id	Number	
4	What is the water point?	Public borehole	
		Kiosk	
		Community tap	
5	Specify	Text	
6	Water point name	Text	
7	Is there a latrine within 30 steps from the water point?	Yes	
		No	
8	Is there a body which is incharge of the water point?	Yes	
		No	
9	Is the water point functioning?	Yes	
		No	Go to Q 16
10	Why not?	Broken handle	Skip Q 11
		Broken pipe	Skip Q 11
		Blockage	Skip Q 11
		No water	Skip Q 11
		Other	Go to Q 11
11	Specify	Text	
12	Do people pay to use the water point?	Yes	To to Q 13
		No	Go to Q 16
13	How is the payment made?	Per day	
		Per month	
		Other	
14	Specify	Text	
15	How much do they pay?	Number	
16	Take a GPS point		
17	Take a photo		

3.4 Annex 4: Microbiological water testing protocol using the membrane filtration method

Required items:

1. Ice packs
2. Gloves
3. Alcohol swabs/wipes
4. Tissue roll
5. Cleaning sponges
6. Hand sanitizer
7. Tongs
8. Pipettes
9. Tweezers
10. Scissors
11. Permanent marker
12. Strainer
13. Lighter
14. Tray
15. Cups
16. Plastic container
17. Pot with lid
18. Beakers
19. Measuring funnel
20. Kettle
21. Hot plate
22. Extension cord
23. Cooler box
24. Alcohol
25. Dishwashing liquid
26. Filtered water
27. Whirl packs
28. Filtration apparatus (plastic collar and filtration funnel)
29. Compact dry plates
30. Filter membrane pack
31. Incubator
32. Car battery
33. Car battery stand (wood)
34. Chicken droppings
35. Fuel for motorcycle

Sample collection procedure:

1. Sanitize hands
2. Have another person ready to open the tap (for tap water points) or to spin the borehole (for borehole water points)
3. Carefully open a whirl pack without touching the inside
4. Carefully let water flow into the whirl pack about halfway, while avoiding splashing of the water from hands or fingers into the whirl pack
5. Tightly seal the whirl pack and label the water point identity using a permanent marker
6. Place the whirl pack in a cooler box and move to the next water source

Water testing procedure:

1. Wash hands
2. Clean and sterilize the working station
3. Wash kettle, pot, lid and tongs
4. Set water to boil in a kettle while heating up some on the hot plate
5. Wash the holding tray, filtration funnels and measuring filter
6. Put the filtration funnels and measuring filter in the boiling water
7. Wash and sanitize hands with a hand sanitizer
8. Sterilize the holding tray by rubbing it with alcohol swabs
9. Remove the filtration funnel and measuring funnel using tongs and place them on the sterile tray to cool/dry
10. Pour 2ml of methanol in the lower filtration unit and burn
11. Sanitize hands
12. Fix the plastic collar in a loose but not free state
13. As the flame is dying out, place the plastic collar over the lower filtration unit and wait for 10 minutes

(Start working on the second sample from step 7-13)

14. Remove the filter funnel and place it up (push it in the vacuum cup)
15. Remove the plastic collar and put it on the sterile tray
16. Fix the vacuum pump on the vacuum cup
17. Remove the first water sample from the cooler box and put it in a cup on the working station, together with the data sheet
18. Dip tweezers in alcohol and burn them
19. Open a filter packet and pick a sterilized membrane using the tweezers and place it on the filter funnel
20. Sanitize hands
21. Place the plastic collar back on the filter funnel and screw it on tightly
22. Rub the tip of the whirl pack containing the water sample with an alcohol swab

23. Rub scissors with an alcohol swab
24. Cut the sterilized tip of the tip of the whirl pack, measure 100ml of water in the measuring funnel and pour it in the filter funnel to start the filtration process

(Turn the incubator on and resume working on the second sample from step 14-24)

25. Prepare compact dry plates-Label date and ID and add 3 drops of water on it to make it moist
26. Sterilize tweezers
27. Detach the filter funnel and take the membrane filter out and place it on the compact dry plate
28. Label incubation start time and place the plate in the incubator upside down
29. Record incubation time on the sheet

Resume working on the second sample from step 25-29, and start working on the third sample and so on.....

3.5 Annex 5: Household inspection questionnaire/ checklist

A. Demographics			
	Question	Response	Logic
A1	Ward name	Luchenza	Select
		Lolo	
		Kapiri	
		Namadzi	
		Namisonga	
		Mapanga	
		Sambagalu	
		Thundu	
A2	Respondent name		Text
A3	Respondent sex	Male	Select
		Female	
A4	Respondent age		Numeric
A5	What is your position in the household	Wife/mother/female head of hh	Select
		Husband/father/male head of HH	
		Daughter of head of HH	
		Son of head of HH	
		Other (female)	
		Other (male)	
A6	Who owns the house?	Self	Select
		Rented	
		Other	
A7	Specify		Text
A8	How many people live in this household? Including non-members (ie people that may not be related to the family but live there eg workers etc)		Numeric
B. Water supply			
	Question	Response	Logic
B1	What is the main source of water for the household?	Piped water to yard/plot	Select
		Public tap/stand pipe	
		Water kiosk (pay to use)	
		Public borehole	

		Well	
		Surface water (River, dam, stream)	
		Other (specify)	
B2	How is the collected water stored before use?	Plastic containers with a lid	Select
		Plastic containers without a lid	
		Clay containers with a lid	
		Clay containers without a lid	
		Other (specify)	
B3	Specify		Text
B4	Do you practice rain water harvesting in your home?	Yes	Select
		No	
C. Grey and storm water (includes water after bathing, washing dishes, clothes, etc.)			
	Question	Response	Logic
C1	What is the most common way that you manage your grey water?	Soak-pits	Select
		Septic tank connected to a toilet	
		Underground tank	
		Open (on the ground)	
		Open trench	
		Reusing	
		Other (specify)	
C2	Specify		Text
C3	Do you ever have stagnant water on the premises?	Yes	Select
		No	
C4	What is the most common way that you manage stagnant water?	Drawing out the water	Select
		Add soil	
		Add stones/bricks	
		Nothing	
		Other	
C5	Specify		Text
C6		Yes	Select

	Has your plot ever been affected by flooding?	No	Go to C9
C7	What is the most common way that you manage floods?	Rain water gutters	Select, applies if c6 = yes
		Dug channels/drains	
		Sand bags	
		Nothing	
		Other (specify)	
C8	Specify		Text
C9	Observation: do you see standing water on the property?	Yes	Select
		No	
D. Sanitation and fecal sludge management			
	Question	Response	Logic
D1	Do you have a sanitary facility on the premise which you can use?	Yes	Select, skip d2 and d3
		No	Go to D2
D2	Where do you urinate/defecate?	Bush	Select, applies if d1 = no
		River	
		Other(specify)	
D3	Specify		Text
D4	How many sanitary facilities do you have for the household that are in use?		Numeric, applies if d1 = yes
D5	What type of sanitary facility (s) do you have?	Flush toilet & septic tank	Select, applies if d1 = yes
		Pour flush toilet & septic tank	
		Pour flush and pit	
		Concrete slab & pit	
		Soil & sticks slab & pit	
		Wood board & pit	
		Urine diverting toilet	
		Other (specify)	
D6	Specify		Text
	Observations:		
D35	Is there a hand washing station near the pit latrine?	Yes	Select
		No	
	Does the latrine have a lid?	Yes	

		No	
D40	What is the general condition? (hint: 1-horrible, 2-poor, 3-ok, 4-good, 5-excellent)	1	Select
		2	
		3	
		4	
		5	
E. Solid waste management			
	Question	Response	Logic
E1	Where do you keep/store your household solid waste?	Containers (plastic, metal)	Select
		Plastic bags	
		Dispose directly/no storage	
		Other (specify)	
E2	Specify		Text
E15	Is there a composting scheme at the household that is in use?	Yes	Select
		No	

After administering the questionnaire, the household will be advised according to performance i.e. if the household does not have a latrine, they will be advised to contract one within a period of two months. If the household does not have a hand washing station, they will be advised to set one up.

3.6 Annex 6: The model household in Luchenza

The model household is basically one household in Luchenza which has crucial sanitation facilities that are recommended in this document. This household has been assisted by the Environmental sanitation planning project to set up facilities that have been recommended in this document.

The aim of having this model household is to serve as a reference point for other households. In doing so, individuals from other households will be able to learn from and adapt to the model household.

The following are the facilities/materials which the model household has:

- ✓ A rain water gutter to harvest rain water
- ✓ A soak pit to drain greywater
- ✓ A Fossa Alterna sanitary facility
- ✓ A latrine lid in the Fossa Alterna
- ✓ A hand washing station near the Fossa Alterna
- ✓ A household composting scheme

The model household is open to queries and is ready to give technical guidance on how to construct or set up any of the above mentioned facilities. The model household also has hand-outs to give to individuals seeking technical guidance freely.

Individuals wanting to visit the model household and see the facilities and seek technical guidance are to ask for an appointment/meeting with the head of the household. The head of the household will then set up the meeting and answer any queries the concerned party may have.

The model household is open to queries and will be ready to give technical guidance on how to construct or set up any of the above mentioned facilities.

Terms for selecting the model household:

- ✓ Permanent resident in Luchenza
- ✓ Living on a plot that is not rented
- ✓ Sufficient land on plot
- ✓ Plot without concrete ground
- ✓ Easily accessible plot
- ✓ Open to queries and ready to give technical guidance on how to construct or set up any of the above mentioned facilities

The model household was identified during the third workshop where the action plan was validated. Participants were notified that the selected model household would be inspected to make sure that the selection criteria has been observed, and if not, another household would be selected.

To identify the model household, each of the 8 groups formed at this workshop nominated one participant and wrote down the name of the nominee on a piece of paper. The 8 pieces of paper containing names were folded and Dr. Elizabeth Tilley made a random pick of one name.

The participant who was chosen as the owner of the model household was Linda Vasco, the chief of Mwarama neighbourhood in Kapiri ward. Other nominees were Christopher Banda, Mercy mapira, Elias Tambwali, Goodson Mweluzza, Christina Semu, Laurence Mollen and Grace Themba.