SFD Lite Report

Meru Town Municipality Kenya

This SFD Lite Report was prepared by WSH- MEDS Team at Bill and Melinda Gates Foundation.

Date of production/ last update: 07/06/2022

1 The SFD Graphic

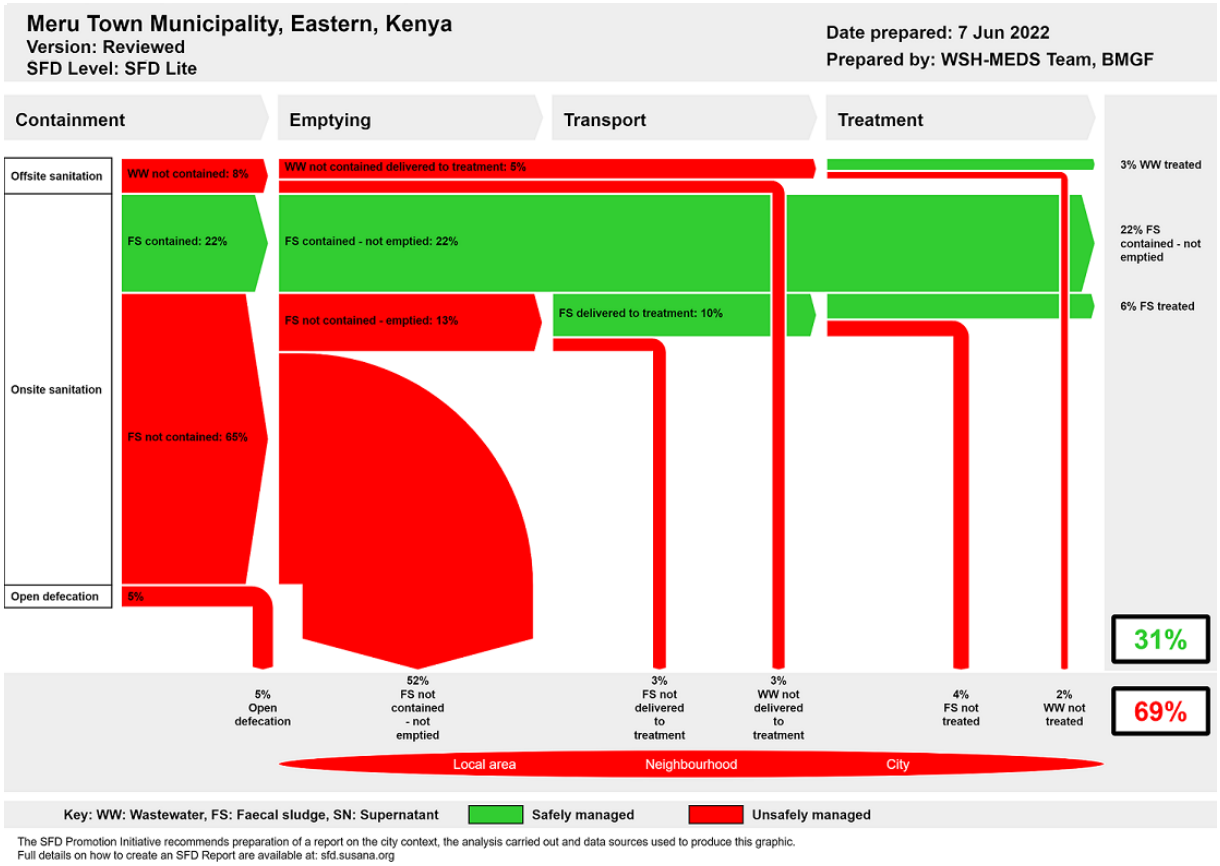

Figure 1: SFD graphic for Meru Town Municipality.

2 SFD Lite information

Produced by:

The Shit Flow Diagram for Meru town municipality was created by:

Kipkoech Oscar Mutai; MEDS Intern 2022 under Water Sanitation and Hygiene department for Measurement Evidence and Dissemination (WSH- MEDS) Team at Bill and Melinda Gates Foundation (BMGF). *City Inclusive Sanitation Assessment study for Meru Town Municipality.*

We also acknowledge the support by Dr. Pippa Scott (i-san), and Radu Ban (BMGF).

Collaborating partners:

Meru Water and Sewerage Company.

County Government of Meru.

Date of production: 07/06/2022

3 General city information

Meru town municipality is located in the Eastern region of Kenya, Meru County, Imenti North Sub County. It is located in the northeastern slopes of Mount Kenya. Meru town was founded in 1911 and it is the current headquarters on Meru County. It is the seventh largest urban centre in Kenya forming a municipality with a population of 240,900 inhabitants (KNBS, 2021). The town is about 1,500 m above sea level and experiences the equatorial highland climate as it is located 8 km north of the equator. The town is surrounded by densely populated urban-rural villages and farms. The town has grown up as an agricultural collection centre, administrative centre, commercial centre and educational centre (Wikimedia Foundation, Inc., 2022).

Water and sanitation services are provided by the country government of Meru through the Meru Water and Sewerage Services (MEWASS). The supply of water currently is at 400 cubic metres per day and the treatment capacity of the system is 6,730 cubic metres (Figure 2). The population currently covered is estimated at 61,000 people living within 38 square kilometres. A population of 34,044 are not served within the area mentioned because of the community water projects present, which do not charge for the service (MEWASS, 2022).

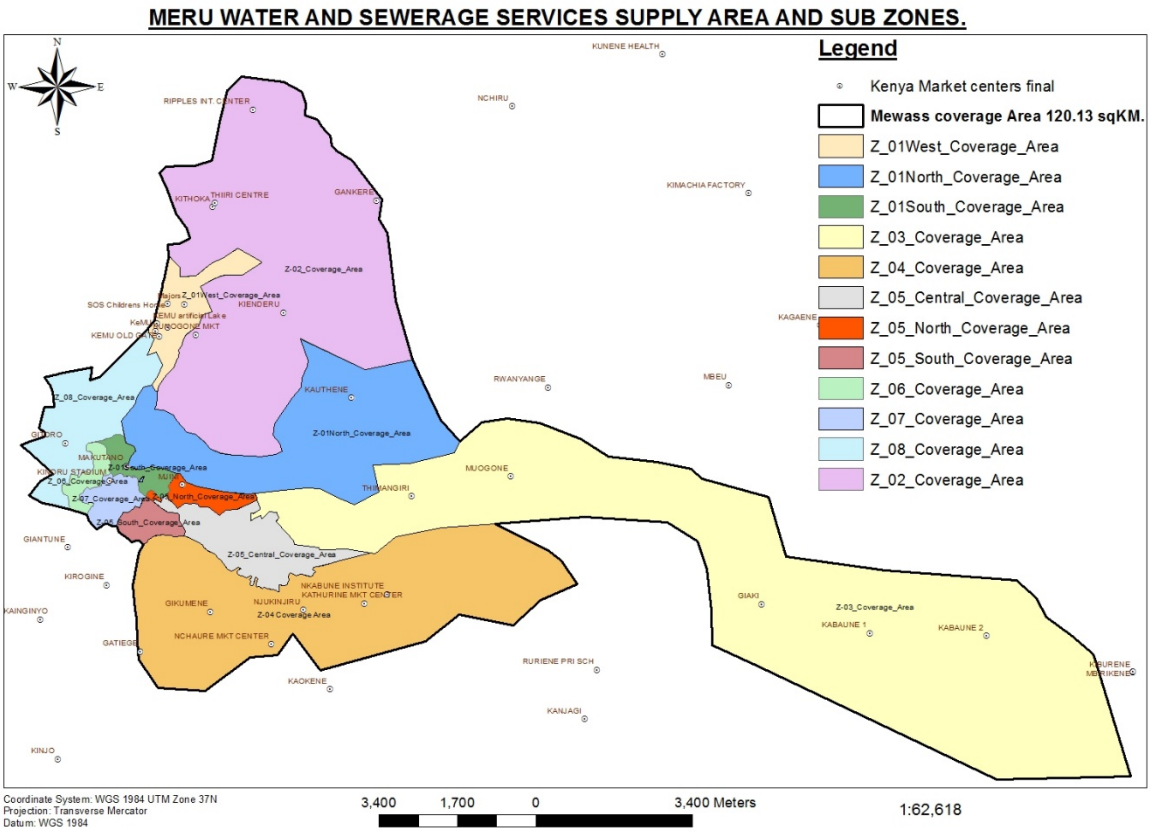

Figure 2: Meru Water supply area and subzones within Meru town municipality. Source; MEWASS.

Table 1 summarizes some key demographic, geographic and sanitation indicators and their value.

Table 1: Meru town municipality key demographic, geographic and sanitation indicators.

Category	Indicator	Value
Demographic	Administrative boundary	The area covered by Meru town municipality is estimated at 150 Km^2. The town is subdivided into 5 wards and each is headed by a member of county assembly. Sanitation services are provided by the Meru County government through Meru Water, Sanitation and Sewerage company (MEWASS).
	Population	240,900 residents
	% of people living in informal settlements.	40%
	% of people living below the poverty line.	National level 16% Meru 18%
Geographic	Location and Topography	The town is situated to the North-east of Mount Kenya at 0.047035 degrees north and 37.649803 degrees east. The altitude is about 1,500 m above sea level. The area is characterized by sloppy terrain with hilly descending ridges. It experiences a subtropical highland climate with two rainy seasons. Kathita River passes across the town.
	Level of ground water	The groundwater table varies with an average of 10 metres across the town. Most households channel their waste water to open drains which end up on the nearby water streams and the river hence contamination the groundwater.
Basic sanitation statistics (2021)	% coverage of sewer networks	8%
	% of people practising open defecation	5%
	% of population relying on onsite sanitation	87%
	Treatment hardware capacity	The sewer plant is currently overloaded and its treatment capacity was projected to be 11,700 people (STAR, 2019).

4 Service outcomes

Table 2: SFD Matrix for Meru Town Municipality.

Meru Town Municipality, Eastern, Kenya, 7 Jun 2022. SFD Level: SFD Lite
Population: 240900
Proportion of tanks: septic tanks: 100%, fully lined tanks: 100%, lined, open bottom tanks: 100%

Containment								
System type	Population	WW transport	WW treatment	FS emptying	FS transport	FS treatment	SN transport	SN treatment
	Pop	W4c	W5c	F3	F4	F5	S4e	S5e
System label and description	Proportion of population using this type of system (p)	Proportion of wastewater in open sewer or storm drain system, which is delivered to treatment plants	Proportion of wastewater delivered to treatment plants, which is treated	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated	Proportion of supernatant in open drain or storm sewer system, which is delivered to treatment plants	Proportion of supernatant in open drain or storm sewer system that is delivered to treatment plants, which is treated
T1A1C6 Toilet discharges directly to open drain or storm sewer	8.0	60.0	60.0					
T1B10C6 Containment (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) failed, damaged, collapsed or flooded - connected to open drain or storm sewer	11.0			20.0	50.0	60.0	50.0	60.0
T1B11 C7 TO C9 Open defecation	5.0							
T1B7C10 Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow	22.0							
T1B9 C1 TO C10 Toilet failed, damaged, collapsed or flooded, connected to sewer, soak pit, open drain or storm sewer, water body, open ground or 'don't know where'	17.0							
T2A2C5 Septic tank connected to soak pit, where there is a 'significant risk' of groundwater pollution	22.0			50.0	80.0	60.0		
T2A6C10 Unlined pit, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	10.0			0.0	0.0	0.0		
T2B7C10 Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	5.0							

4.1 Containment

In the SFD matrix in Table 2, the population that discharges directly to the sewer systems is 8% (T1A1C6). The coverage of the all pits which are not emptied when full and do not have any outlet or overflow is 22% of the population (T2A2C5). 17% of the population rely on system T1B9 C1 TO C10 (toilet failed, damaged, collapsed or flooded, connected to sewer, soak pit, open drain or storm sewer, water body, open ground or 'don't know where') while 11% have the system T1B10C6 (containment (septic tanks, fully lined tanks, partially lined tanks and pits, and unlined pits) failed, damaged, collapsed or flooded - connected to open drain or storm sewer).

A population of 5% practice open defecation (T1B11 C7 TO C9). There is significant risk to groundwater pollution by the septic tanks connected to soak pits from 22% of the population (T2A2C5), from unlined pits with no outlet for overflow from 10% of the population (T2A6C10)

and lastly from pits which are never emptied but abandoned when full and covered with soil and have no outlets or overflow from 5% of the population (T2B7C10).

4.2 Emptying and transportation

The proportion of the faecal sludge emptied from the containment and delivered to sewer treatment plant varied considerably amongst different containment systems. Figure 3 shows a vacuum truck used to empty the onsite sanitation systems in the town. The proportion of wastewater in storm water drains and open sewers which ended up at the sewer treatment plant was estimated at 60% (variable W4c) delivered. For system T1B10C6, the proportion of faecal sludge emptied (variable F3) is 20% and the proportion of faecal sludge and supernatant delivered to the sewer treatment plant (variables F4 and S4e) is assumed to be 50%. For system T2A2C5, the septic tanks connected to soakpits are emptied to a proportion of 50% (variable F3) and 80% (variable F4) of it is delivered to the sewer treatment plant. The population using pit latrines with unlined pits are considered to be not emptied (variables F3, F4 and F5 set to 0%).

All the above-mentioned information was mainly obtained from Key Informant Interviews (KIIs) with the people working at the sewer treatment plant and the drivers operating vacuum trucks for emptying faecal sludge. Focused Group Discussions (FGDs) were also conducted with sampled households to determine the emptying and transportation strategies in the communities identified.

Figure 3: Vacuum trucks emptying faecal sludge to sewer plant at Gakoromone (June 2022).

4.3 Treatment

Meru town municipality has a sewer treatment plant at Gakoromone Market to the eastern side of the town. The projected capacity of the sewer plant was estimated at a population of 11,000 but is currently serving 19,272 people (Figure 4). The sewer plant is currently being overfed with wastewater and the treatment efficiency of the treatment plant was estimated at 60% (variable W5c) according to the KIIs conducted with the technical personnel working at the plant. As all the faecal sludge delivered for treatment is treated at this plant, variables F5 and S5e for system T1B10C6 were also set to 60%. There is an ongoing construction of a new sewer treatment plant at Rwanyange. Once completed, the old plant at Gakoromone will be relocated. The new plant at Rwanyange is expected to cover the municipality and the surrounding areas.

Figure 4: Images taken at Gakoromone Sewer Treatment Plant on June 2022.

4.4 Reuse and Disposal

According to FGDs with the households the reuse of faecal sludge is considerably negligible because of the negative perception on their effects especially on vegetables. The common practice was planting a banana on top of the pit once it is full. Most of the wastewater is disposed of in storm water drains and the open grounds, hence there is a significant risk of groundwater contamination (Figure 5).

Figure 5: An open drain with raw sewage flowing to a river and households discharging wastewater to the roadside.

4.5 SFD Graphic

The SFD graphic clearly illustrates that 31% of the faecal sludge generated is safely managed while the rest 69% is unsafely managed. The population of people covered by offsite sanitation is 8% whereby only 3% of the wastewater generated is safely managed, 3% is not delivered to the treatment plant and 2% of the wastewater delivered to treatment is not treated. The faecal sludge from onsite sanitation which is not contained accounts for 65% and open defecation is at 5%. Faecal sludge contained in pits and septic tanks in areas with no significant risk of contamination to groundwater is 22%, they are not emptied since they are sufficiently treated within the containment systems. The faecal sludge from onsite sanitation systems which are not contained cover 52% of total faecal sludge generated in Meru town municipality. The containments emptied account for 13% of the faecal sludge whereby 10% are delivered to treatment while 3% are not delivered to treatment, 6% of the same are safely treated while 4% are not sufficiently treated before release.

4.6 Groundwater Contamination

The groundwater levels vary from one area to the other across the municipality due to the mountainous nature of the terrain. The published data on the water table distance is not available hence the data used was an average on the water level from boreholes in the municipality which was assumed to be 10 metres after consulting with key informants from county government of Meru and MEWASS company. The risk of contamination of groundwater was more likely in areas near the rivers and lower altitude because of higher groundwater level. In conclusion the risk of contamination of groundwater is high in Meru town because most of the containment systems, specifically the pits and unlined tanks, reached the groundwater levels because most households were likely to dig deeper their sanitation systems to ensure long term use and avoid emptying costs.

5 Data and assumptions

The proportion of faecal sludge in septic tanks, fully lined tanks and lined tanks with impermeable walls and open bottom and all types of pits was all set to 100% (step two of the Graphic Generator).

The population of the inhabitants at Meru town is an estimate given by the Kenya National Bureau of Statistics (KNBS) since the last population census was conducted in 2019.

The proportion of wastewater from storm drains and open sewers which are delivered to sewer treatment plant was assumed to be 60% and the treatment efficiency of the sewer treatment plant was also assumed at 60% (T1A1C6, W4c and W5c) since the treatment plant is currently overfed beyond its treatment capacity and its not working effectively during the rainy season due to overflow as a result of storm water channelled to the plant.

For system T2A2C5, variable F3 and F4 were set to 50% and 80% respectively, after conducting FGDs. Variable F5 was assumed to be 60% since the FS is treated at the same treatment plant as the wastewater.

For system T1B10C6, variables F3 was set to 20%, variables F4 and S4e were set to 50% and variables F4 and S5e were set to 50% after data triangulation with KIIS and FGDs. Variable F5 was assumed to be 60% since the FS is treated at the same treatment plant as the wastewater.

The proportion of unlined pits with no outlet (T2A6C10) which are emptied were assumed to be 0% because most of the households who participated in the FGDs did not empty their pits once they are full, so variables F3, F4 and F5 were set to 0% for this system.

6 List of data sources

Reports, Literatures and website

- KNBS. (2021). 2019 Kenya Population and Housing Census Volume I: Population by County and Sub-County. *Kenya National Bureau of Statistics*. https://www.knbs.or.ke/download/2019-kenya-population-and-housing-census-volume-i-population-by-county-and-sub-county/
- MEWASS. (2022). *Meru Water and Sewerage Services—Infrastucture*.

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- STAR. (2019, December 20). *Residents protest Meru Sh1bn sewerage plant*. The Star. https://www.the-star.co.ke/counties/eastern/2019-12-20-residents-protest-meru-sh1bn-sewerage-plant/
- Wikimedia Foundation, Inc. (2022). Meru, Kenya. In *Wikipedia*. Creative Commons Attribution-

  ShareAlike License 3.0.

  https://en.wikipedia.org/w/index.php?title=Meru,_Kenya&oldid=1081919536

Key Informant Interviews (KIIs) between May 2022 to July 2022

- KII1, June 2022, Interview with Imenti North Subcounty Public Health Officer.
- KII2, June 2022, Interview with technical supervisor MEWASS.
- KII3, June 2022, Interview with site supervisors at Gakoromone Sewer Treatment Plant.
- KII4, June 2022, Interview with the vacuum truck operators (private) at the sewer plant.

Focused Group Discussions (FGDs) between May 2022 to July 2022

- FGD1, June 2022. Discussion with the households at Kooje.
- FGD2, June 2022. Discussion with the traders at Makutano Market.
- FGD3, July 2022. Discussion with households at Gitimbine.

SFD Meru Town Municipality, Kenya, 2022

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This Executive Summary and the SFD Report are available from:

www.sfd.susana.org

SFD Promotion Initiative