



# SFD Lite Report

## Mwanza City Tanzania

This SFD Lite Report was prepared by  
Centre for Science and Environment

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# 1 The SFD Graphic

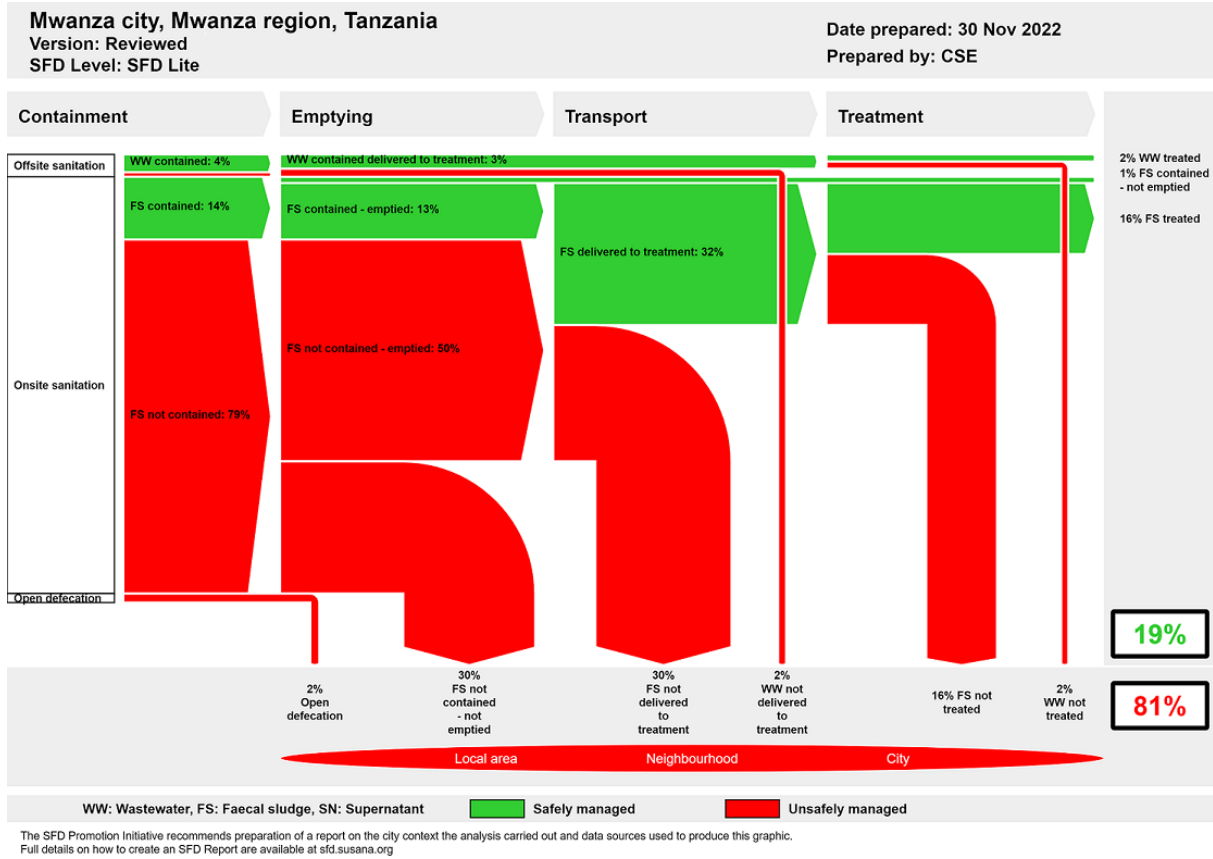


Figure 1: SFD Graphic for Mwanza city.

## 2 SFD Lite information

Produced by:

- Centre for science and Environment, New Delhi, India

Collaborating partners:

- National Environmental Council (NEMC) Tanzania,

Date of production: 30/11/2022

### 3 General city information

Mwanza City, popularly known as “The Rock City”, is situated in the north-west of Tanzania on the southern shores of the Lake Victoria. Mwanza city is the second largest city in Tanzania and is the capital of Mwanza Region. The city covers an area of 256 sq.km, divided into land area covering 173 sq.km, equivalent to 67.6 % of total area and 83.0 sq.km, equivalent to 32.4 % of water area, mostly dominated by Lake Victoria. Local government in Tanzania, usually in urban areas, is comprised of city, municipal and town councils, Ward Development Committees (WDCs), and Mitaa (neighbourhoods). Mwanza city is divided into two districts: Nyamagana and Illemela. Mwanza city council is the administrative body which has jurisdiction over Nyamagana district and Illemela municipal council has jurisdiction over Illemela Municipal council<sup>1</sup> (Figure 2).

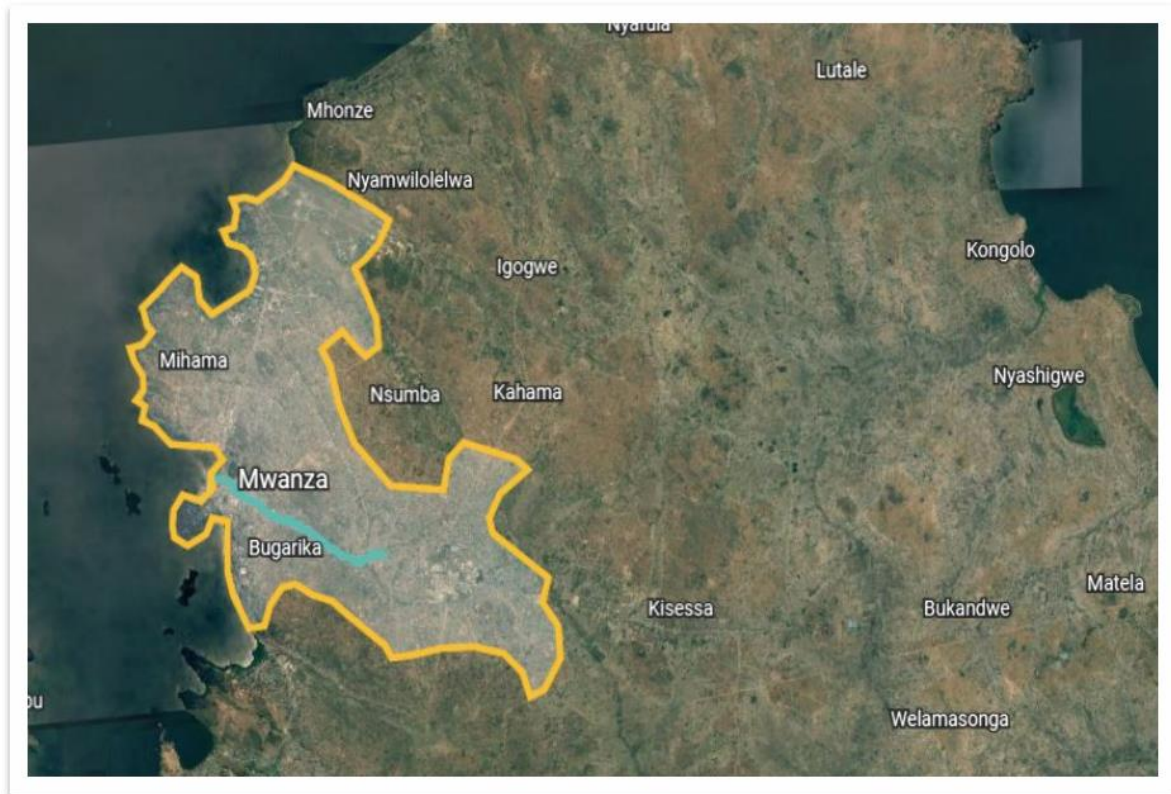


Figure 2: Map 1, Mwanza city boundary (Source: Google maps).

The current SFD is made for Mwanza city. The population of Mwanza city in the current SFD is taken as 1,544,000 persons that reside in 259,000 households with an average household size of 6 persons<sup>2</sup>. The city’s population density was noted to be 945 persons per sq.km in 2002. It increased to 1,402 persons per sq.km in 2012. Currently, the population of the city has seen drastic change where there are approximately 8,000 persons per sq.km.

The decadal population growth rate of Mwanza city is given in Table 1.

<sup>1</sup> Mwanza Strategic Plan, 2021/22- 2025/2026-President’s Office Regional Administration and Local Government Authority

<sup>2</sup> Data received from MWAUWASA

**Table 1: Decadal population growth of Mwanza City (Source: Mwanza Master Plan).**

S.No	Period	Population	Growth Rate (%)	Source/Remark
1	2002	241,923	NA	Mwanza Strategic Plan
2	2012	363,452	5	Mwanza Strategic Plan
3	2021	1,544,000	324	MWAUWASA <sup>3</sup>

Mwanza city lies at an altitude of 1,140 metres above the sea level with mean temperature ranges between 25.0°C and 30.2°C in hot seasons and 15.4°C and 18.6°C in the cooler months (Mwanza Strategic Plan, 2021). The city also experiences the annual rainfall between 700 and 1,000 mm in two fairly distinct seasons, short and long rainfalls. The short rain season occurs between the months of October and December and long rain season last between February and May. The field visit for the current SFD study to collect baseline data was done during the short rain season. The topography of Mwanza city is undulating granites and granodiorite physiographic with isolated hill masses and rock inselbergs. The vegetation cover is typical savannah with scattered tall trees and tall grasses. The soil has sandy loamy nature generated from coarse grained cretaceous (Mwanza Strategic Plan, 2021). The city also has a plateau area which are flat elevated landforms that rises sharply from the surroundings or at least from one side shaped as result of erosion.

At national level, sanitation is primarily the responsibility of Ministry of Water and Irrigation (MoWI), which develops the water policy strategy. Throughout Tanzania, the Urban Water and Sanitation Authorities (UWSAs) manage the reticulated water supply and wastewater systems but they are now in the process of becoming responsible for all on-site and reticulated water and sanitation services in urban areas. Thus, wastewater collection from all urban households now falls under the mandate of the Mwanza Urban Water Supply and Sanitation Authority (MWAUWASA) but only if the household latrine is connected to a cesspit, septic tank or sewerage network<sup>4</sup>. Water and sanitation provision in Mwanza is the responsibility of both the MWAUWASA and the City Municipal Councils. MWAUWASA is the regional body of UWSAs which are semi-autonomous public corporations<sup>5</sup>.

The city is present on the banks of world’s second and Africa’s largest fresh waterbody: the Lake Victoria. It has been world renowned for its ecological variety supportive of socio-economic activities and aquatic species. There are several streams coming from inside Mwanza city that ends in the Lake Victoria (see Figure 3, marked in Blue). Mirongo River which is one of the major rivers of Tanzania is one of the largest of these streams that ends in the Lake Victoria<sup>6</sup>. It has a stretch of around 8 km from most densely populated areas of the city. Currently, the lake is the only source of drinking water in the city. MWAUWASA generates 108,000 cubic metres of water through a water treatment plant installed at Capripoint near the lake. 90% of the population in urban areas is given water supply by means of pipes, water kiosks and tankers (FGD, 2022)<sup>7</sup>. The city has fairly high undulating surface with as many as

<sup>3</sup> Data received from MWAUWASA office.

<sup>4</sup> Report by UN Habitat-Mwanza a case study on political and financial challenges for ensuring improved sanitation.

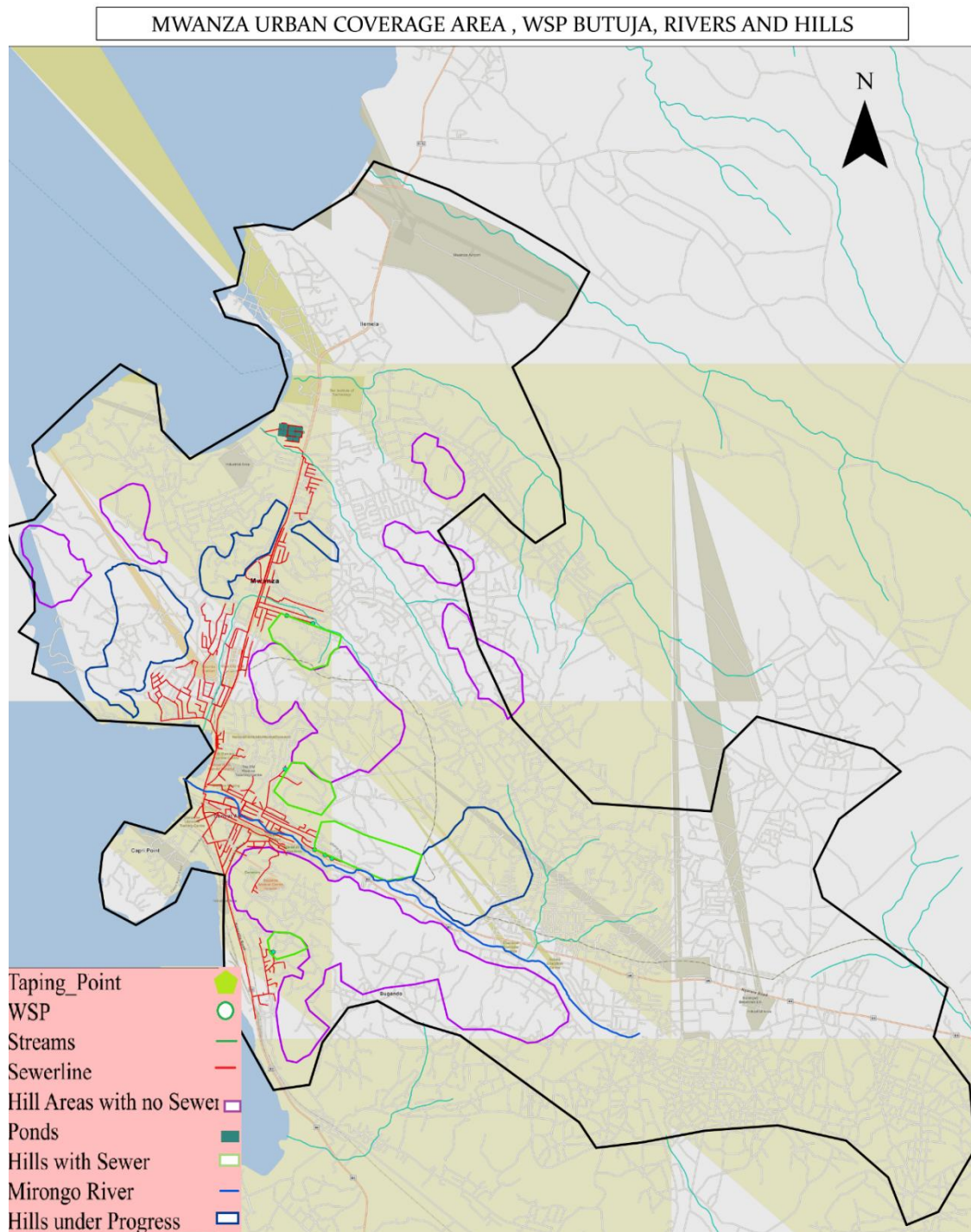
<sup>5</sup> Website: <http://www.mwauwasa.go.tz> accessed on 25 December, 2022.

<sup>6</sup> KII-1, with Solid Waste Expert, Mwanza City Council office.

<sup>7</sup> FGD-4 with MWAUWASA officials.



16 hills inside the urban boundary (Figure 3). The hills have steep slopes but not much height (nearly 100 m to 200 m). It was informed during the Focus Group Discussions (FGDs) at MWAUWASA head office that close to 50 % of the population lives in either the foot of the hills or on them. It makes it difficult to provide regular and efficient sanitation services on the hills<sup>8</sup>.



**Figure 3: Map-2- Showing Urban hills, sewer network, rivers and streams in Mwanza City boundary (Source: MWAUWASA).**

<sup>8</sup> FGD-4 with MWAUWASA officials

## 4 Service outcomes

Most sanitation systems available in the town are classified as onsite systems (93%). The sewer network only covers 4% of the population. The main types of toilet facilities are fully lined tanks connected to a water body, fully lined tanks with no outlet or overflow and lined tanks with impermeable walls and open bottom connected to a water body.

Table 2 summarizes the sanitation systems in use, as well as estimates of the population connected to each system. For the onsite sanitation systems, it shows the proportions of each from which faecal sludge is then emptied, transported to treatment and treated. For the offsite systems, it shows the proportion of wastewater delivered to treatment and treated.

**Table 2: SFD Matrix for Mwanza City.**

Mwanza city, Mwanza region, Tanzania, 30 Nov 2022. SFD Level: SFD Lite

Population: 1554000

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
	Pop	W4a	W5a	F3	F4	F5
System label and description	Proportion of population using this type of system (p)	Proportion of wastewater in sewer system, which is delivered to centralised treatment plants	Proportion of wastewater delivered to centralised 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
<b>T1A1C2</b> Toilet discharges directly to a centralised foul/separate sewer	4.0	80.0	50.0			
<b>T1A1C7</b> Toilet discharges directly to water body	1.0					
<b>T1A3C10</b> Fully lined tank (sealed), no outlet or overflow	14.0			90.0	80.0	50.0
<b>T1A3C7</b> Fully lined tank (sealed) connected to a water body	54.0			50.0	80.0	50.0
<b>T1A4C7</b> Lined tank with impermeable walls and open bottom, connected to a water body	25.0			90.0	0.0	0.0
<b>T1B11 C7 TO C9</b> Open defecation	2.0					

Due to undulating topography of Mwanza city, it is difficult to practice centralized solutions for the management of excreta and wastewater. Adapting to the topography, people have also adopted different methods to manage excreta and wastewater. However, some of the methods observed on the ground were safe i.e. there is low risk of pathogen transmission to the local

environment, whereas some are classified as unsafe i.e. there is significant risk of pathogen transmission to the local environment. The following sections will describe them briefly.

#### 4.1 Offsite sanitation

Mwanza city has a sewerage network of 132.82 km which feeds the domestic greywater and black water of approximately 6,780 households in the city to the 7 MLD (Million Litre per Day Capacity) Waste Stabilization Ponds (WSPs) in Butuja area<sup>9</sup>. This network mostly covers the households and properties residing in plains and valley areas (Figure 3). Currently, MWAUWASA is experimenting a pilot project of connecting approximately 12,830 households in the urban hills to the sewerage network by means of simplified sewers (Figure 4). Around 2,346 households have been given household sewer connections through means of simplified sewers with remaining 10,490 households to receive in coming days. Hence, the total number of households in the city who are connected to sewerage network directly sums up to 9,126 which is representing around 4% of the population. Therefore, 4% of the population is taken under T1A1C2 in the SFD matrix.

Due to leakage from the sewer system at pumping stations and interceptions of simplified sewers at the nodes, it is estimated that only 80% of wastewater reaches the WSPs, therefore W4a = 80% in the SFD matrix.



**Figure 4: Simplified sewer connections to households on hills. (Source: Harsh/CSE/2022).**

During the field visit and household survey in the city, it was also observed that few households especially adjacent to water streams (along the Mirongo River) in the city do not have any connections to sewer system or containment system (field observations). These types of systems are classified as T1A1C7 in the SFD matrix and estimated to be practiced by 1% of the population<sup>10</sup> (Figure 5). Since the streams eventually end in the Lake Victoria, these toilets are understood as connected to Lake. Hence, overall, 5% of the population in the city is understood to be dependent on offsite management of wastewater and excreta.

<sup>9</sup> KII-4 Project Manager, MWAUWASA

<sup>10</sup> FGD with private desludgers and masons





**Figure 5: Household outlet leading to open stream found near Mirongo River (Source: Harsh/CSE/2022).**

## 4.2 Onsite Sanitation Systems (OSS)

### Containments

Based on the household sample survey, Key Informant Interviews (KIIs), FGDs and field observations, it is estimated that around 93% of the population in Mwanza city is dependent on on-site sanitation systems. The two prevalent OSS observed in the city are Fully Lined Tanks (FLT) either sealed or connected directly/ indirectly to a waterbody (T1A3C7 and T1A3C10) and Lined Tanks with Impermeable walls and Open bottoms (LIO) connected to a water body (T1A4C7) (Figure 6, Figure 7 and Figure 8). It was observed during the household survey that, in areas in the bottom of the hills, plains and plateaus, the common containments were FLT with outlets to a water body<sup>11</sup>. The local community assume these type of containments as septic tanks. However, there is no standard design being followed while construction of these tanks, hence they were taken as FLT<sup>12</sup>. Usually, FLT observed were constructed in a square shape with average length of 2.5 metres and depth of 2-3 metres (Figure 7). In the areas which were closed to the sewer network and in urban centres, it was observed the use of sealed FLT (acting just like a collection tank) with no outlets. In the SFD graphic, the percentage of FLT with outlets to



**Figure 6: FLT connected to ground, in Ibungilo area where simplified sewer was being laid. (Source: Harsh/CSE/2022).**

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<sup>11</sup> Field Observations

<sup>12</sup> FLT are closed containments but not septic tanks as they do not adhere to standard septic tanks designs. They may or may not have baffled walls.





**Figure 7: FLT sealed found in Busewelu area. (Source: Harsh/CSE/2022).**

waterbody are estimated to be 54% (T1A3C7) and FLTs sealed with no outlets or overflow is estimated to be 14% (T1A3C10). The estimation is done by taking population in plains and urban hills and removing percentages of population using sewers directly<sup>13</sup>.

Lined tanks with impermeable walls connecting to a water body (indirectly) were informed to present on upper portion of hills. These tanks were estimated to be used by 25% of the population in the city (T1A4C7). These tanks were usually found to be in cylindrical shape with average 1.5 metre

diameter and 2-3 metre depth. At the bottom of these tanks there was no plastering and sealing done<sup>14</sup> and commonly the tanks are fitted with an outlet at the bottom, which can be opened during rains to allow the tank to be drained and emptied, which is considered an unsafe practice.

#### Emptying and transport

MWAUWASA is responsible for giving services of emptying and transport of Faecal Sludge (FS) in Mwanza City<sup>15</sup>. The emptying and transport is done by means of truck-mounted vacuum tankers. MWAUWASA owns two tankers of 10,000 litres and 15,000 litres capacity respectively which provide services all over the city<sup>16</sup>. In addition to government tanks, MWAUWASA has also registered and licensed 5 private desludging operators who have 7 truck-mounted vacuum tankers cumulatively<sup>17</sup>.



**Figure 8: LIO Tanks found in Pasiansi East (Source: Harsh/CSE/2022).**

MWAUWASA has installed GPS monitoring systems in vacuum trucks for monitoring (Figure 10). However, the private desludgers informed that the GPS systems do not work most of the time (FGD-2, 2022). Emptied FS by private desludgers is brought to WSP for disposal usually when the household is in range of 15 km; rest of the times, they put it in agricultural lands or as suggested by owners. The tanks (T1A4C7) on upper hills are never emptied from vacuum machines rather they are opened directly by owners from bottom in rainy seasons<sup>18</sup>. Due to

<sup>13</sup> Calculations are done based on the data received on total population on urban hills, total population using simplified sewers and normal sewers. The data was given by MWAUWASA.

<sup>14</sup> FGD-3 with Hotel staff at Malaika Beach Resort

<sup>15</sup> KII-5, with Managing Director MWAUWASA.

<sup>16</sup> FGD-2 with government desludgers.

<sup>17</sup> FGD-1 with private desludgers

<sup>18</sup> KII-2 Project Engineer MWAUWASA

this practice all the contents from these tanks eventually makes its way to water streams and ends into Lake Victoria (Figure 9)<sup>19</sup>.



**Figure 1: Hidden outlets of Lined tanks with impermeable walls and open bottom. (Source: MWAUWASA).**

minimum period of 3 months and a maximum observed to be 1 year<sup>20</sup>. Hence, emptying percentages for population using T1A3C10 is assumed to be 90% (F3)<sup>21</sup>. Emptying in households using FLT's connected to a water body (directly or indirectly) was reported less in household sample survey and FGDs with desludgers. Hence, emptying percentages for T1A3C7 is assumed to be 50% (F3). The percentage of FS from T1A3C7 and T1A3C10 reaching to treatment is taken as 80% (F4) as some of the emptied FS does not reach the WSP due to large distances or owners requests to put it in agriculture lands (FGD-1, 2022).

Therefore, for T1A4C7 emptying is estimated to 90% (F3) but FS reaching to treatment plant and getting treated is 0% (F4 and F5). On an average 5 trips of faecal load (~ 60KL) reaches the WSP at Butuja in Mwanza city. MWAUWASA charges between USD40 to USD50 for emptying services in the city from government owned desludging tankers. Private desludgers charges around USD45 to USD65 for emptying services. The private desludgers also pay a tipping fee of USD5 for disposing every 6.5 cubic metres of faecal load at the WSP. During household sample survey, it was observed that population using FLT's sealed were emptying them frequently with a



**Figure 10: MWAUWASA owned 15KL tanker observed at Butuja WSP. (Source: Harsh/CSE/2022).**

### Treatment and disposal of FS and Wastewater

MWAUWASA operated 7MLD WSP based Sewage Treatment Plant (STP) is the only source of treatment for domestic wastewater and FS in Mwanza city. Currently, the plant receives an average of 5.5 MLD of wastewater at the inlet<sup>22</sup> which is received from the Main Pumping

<sup>19</sup> Field observations, KII-5, and FGD-3

<sup>20</sup> KII-3 with representative in lower income settlements.

<sup>21</sup> FGD-3 with staff at WSP, Butuja

<sup>22</sup> KII-6 with Assistant Sewer Manager, WSP Butuja



Station (MPS) and distributed equally to Anaerobic Ponds (AP) followed by in a parallel manner. Figure 11 shows the basic flow of treatment of wastewater at WSP, Butuja.

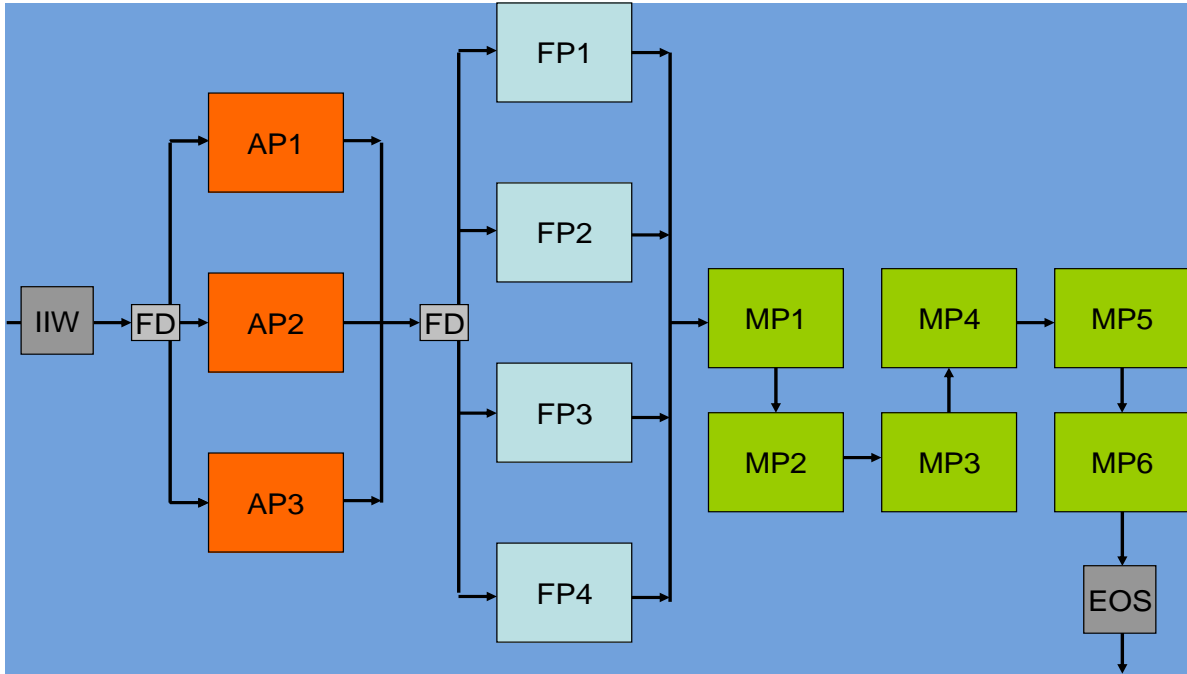


Figure 11: Flow Diagram of treatment of Wastewater at WSP Butuja. (Source: MWAUWASA).

The outlet of the Maturation Pond (MP6) discharges the treated wastewater in a water stream coming from the hills, passing through few informal settlements (Figure 12). The stream further meets the lake after passing through more unauthorized slums or informal settlements, hence mixing the solid wastes of these settlements into the treated water.



Figure 12: Outlet of WSP (MP6) to stream coming from hills and informal settlements (Source: Harsh/CSE/2022).



**Figure 13: AP outlet to Facultative Ponds (FP).**  
(Source: Harsh/CSE/2022).

FS is brought to the plant by government and registered private desludgers and decanted at the inlet made for decanting of faecal sludge which further connects to AP (Figure 14). There was no primary screen for FS observed at the decanting point which was also obvious by visible solid waste in the collection chamber. The staff at the WSP maintains a register for the record of daily decanting at the site<sup>24</sup>. Currently, there are no lab tests for faecal sludge (*E-coli*, *Salamonella* etc) performed before decanting it at WSP nor at the outlet of MP6.



**Figure 14: Private Deslugger decanting at the FS decanting point at WSP Butuja.** (Source: Harsh/CSE/2022).



**Figure 15: Traces of Open Defecation along the Mirongo River.**

### Open Defecation

During the household sample survey and field observations, it was observed that there were several pockets of lower income settlements and urban slums that practice open defecation<sup>25</sup>. The usual practice of defecation in households in these areas is alongside water streams or the banks of the Mirongo River<sup>26</sup> (Figure 15). In the SFD graphic, it is estimated that 2% of the total population is practicing open defecation<sup>27</sup>.

<sup>23</sup> KII-6 with Assistant Sewer Manager, WSP, Butuja

<sup>24</sup> FGD-4 with staff of WSP at Butuja.

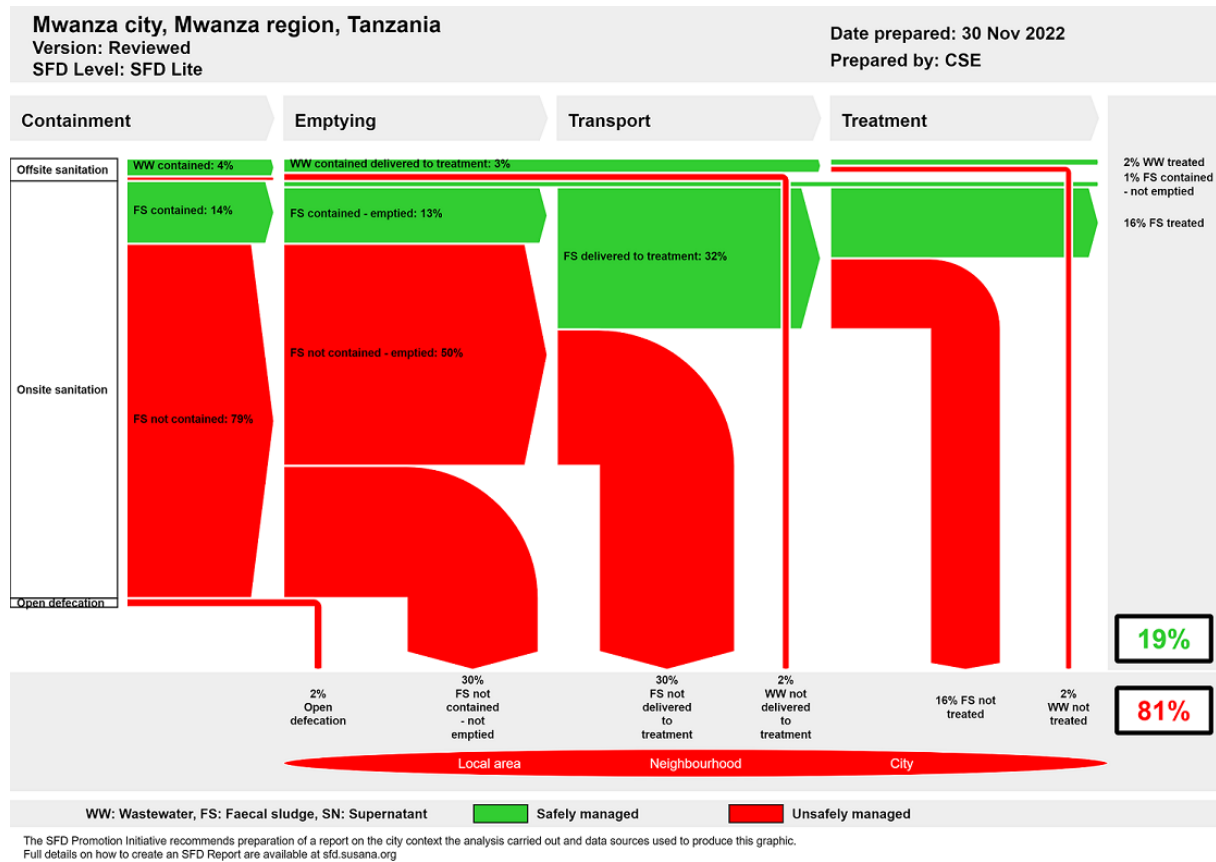
<sup>25</sup> KII-3 with representative of Lower Income Settlement or Urban Slum

<sup>26</sup> Youth led Mwanza city informal settlements Baseline Survey-State of Living, conditions and access, to Urban basic services- Report by Un-Habitat, 2018

<sup>27</sup> KII-3 Representative of Lower Income Settlements.



### 4.3 SFD Graphic



**Figure 16: SFD graphic of Mwanza city.**

The outcome of the SFD graphic shows that overall 19% of excreta flow is classified as “Safely Managed” in Mwanza city whereas 81% of excreta flow is “Unsafely managed (Figure 16). The unsafely managed excreta originate from wastewater not delivered to treatment (2%) and wastewater not treated (2%); FS not contained – not emptied (30%), FS not delivered to treatment (30%); FS not treated (16%) and open defecation (2%). The safely managed excreta come from wastewater treated (2%), FS treated (16%) and FS from contained types of containments which is not emptied but remains in the containments (1%). The groundwater contamination checked while generating the SFD reveals that there is no significant risk to groundwater.

## 5 Data and assumptions

The baseline survey conducted by CSE in November 2022 contains detailed data on different stages of sanitation value chain. The SFD graphic here relies on these data, collected from household sample survey, along with, key informant interviews, and focused group discussions. The data on population and households, households' sewer connections and average inflow of wastewater in WSP is given from the MWAUWASA office. Most of the households with Fully Lined Tanks with outlets connected directly or indirectly to a water body do not know the actual type, size, design of tanks and desludging interval. However, a set pattern of containments was observed in upper portions of the hills, foothills and plains. Though households on plain areas were seen as practicing regular emptying, clarity on whether the emptied FS reaches to WSP or not was not given. Due to all these data gaps, some assumptions have been made to produce the SFD graphic. Following assumptions were made while producing SFD graphic of Mwanza city:

- As per the guidance given in the FAQs in the Sustainable Sanitation Alliance (SuSanA) website, it is assumed that 100% contents of the fully lined tanks and lined tanks with impermeable walls and open bottom is FS.
- The emptying in systems T1A3C7 is assumed to be 50% (F3) assuming 5-7 years as the threshold based on the size of the tank and number of persons dependent on the containment. F4 was assumed to be 80% and F5 was assumed to be 50%.
- The proportion of wastewater conveyed to the WSP (W4a) is assumed to be 80% as some of it lost due to leakages in the systems and pumping stations.
- The emptying in systems T1A3C10 is assumed to be 90% (F3) as these systems were observed to be emptying frequently in small periods as low as 5 months. These tanks are basically used as collection or holding tanks. F4 was assumed to be 80% and F5 was assumed to be 50%.
- The emptying in systems T1A4C7 is assumed 90% (F3) as most of these systems are emptied in rainy seasons by openings at the bottom. Since no FS from these systems reaches treatment, F4 and F5 for these systems is assumed to be 0%.

## 6 List of data sources

### - Reports and literature

- Mwanza Strategic Plan-2021/22-2025/26, by Mwanza City Council (2021).
- Report by UN Habitat-Mwanza a case study on political and financial challenges for ensuring improved sanitation
- <https://unhabitat.org/news/22-mar-2020/un-habitat-and-eib-partnership-on-sanitation-is-changing-lives-in-the-slums-of>, Accessed on 30, Nov, 2022.
- Youth-led Mwanza City Informal Settlements Baseline Survey-State of Living, Conditions and access, to Urban basic services- Report by Un-Habitat, 2018.
- Tanzania National Bureau of Statistics; <https://www.nbs.go.tz/index.php/en/census-surveys/population-and-housing-census/802-matokeo-ya-mwanzo-ya-sensa-ya-watu-na-makazi-ya-mwaka-2022>: Accessed on 25 Dec, 2022.

### - Key informant interviews (2022)

- KII-1 with Solid Waste Expert, Mwanza City Municipality.
- KII-2 with Project Engineer, MWAUWASA.
- KII-3 with Representative of Lower Income Settlement (Urban Slum).
- KII-4 with Project Manager, MWAUWASA.
- KII-5 with Managing Director, MWAUWASA.
- KII-6 with Assistant Sewer Manager, WSP.

### - Focus group discussions (2022)

- FGD-1 with Private Desludgers of Mwanza City.
- FGD-2 with Government Desludgers of Mwanza City.
- FGD-3 with Malaika Beach Resort Staff (local staff).
- FGD-4 with Staff of WSP at Butuja.

### - Field Observations

- Mirongo river at Buzurga.
- Mirongo River mouth to Lake Victoria.
- Waste Stabilization Ponds at Butuja, Mwanza.
- Household sample survey.
- Lower income settlements near Swami Narayan Temple.

Mwanza City, Tanzania, 2023

Produced by:

Harsh Yadava, Centre for Science and  
Environment, New Delhi

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