



Legal Landscape Analysis of Faecal Sludge Management in Tanzania: A Technical Perspective with Lesson Learned from Arusha City

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Abstract

The race of attaining adequate sanitation services by 2030 remains a myth in Tanzania since the faecal sludge management systems lags far behind wastewater management systems. The case should have been vice-versa since massive amount of faecal sludge is generated in urban settings as compared to wastewater. There are several setbacks that lead to the cause but this study explored the relevance of available policies, acts, regulations, guidelines, rules and standards in attaining adequate faecal sludge management in urban settings, taking Arusha city as a reference point for discussion. The review of legally binding document and key informant interviews were the methods used for data collection, that were further analyzed using the Strength, Weakness, Opportunities and Threats (SWOT) technique. The findings revealed that only 13% of the urban population in Tanzania is covered by sewer, leaving 87% under onsite sanitation systems (mainly the pit latrines and septic tanks) that generates massive amount of faecal sludge dislodged to municipal treatment systems. However, the reviewed policies, acts, regulations, guidelines, rules and standards, gives priority to wastewater management and mostly referring faecal sludge in same category as wastewater. This misleads the entire concept as it promotes use of wastewater management interventions which are not adequate in handling the generated faecal sludge. To remedy this, all stakeholders engaged in faecal sludge management from all levels should be convened to review the legally binding documents. Hence, ensure that the faecal sludge management is exhaustively covered, and that the roles and responsibilities for respective stakeholders are well defined to simplify and fasten projects implementations.

Keywords · Faecal sludge management, Policy, Legal framework, Guidelines, Tanzania – Arusha City

1 Introduction

Sustainable Development Goal 6 Target 2 (SDG 6.2) emphasizes achieving access to adequate and equitable sanitation and hygiene for all and ending open defecation by 2030 (Tomoi et al., 2023; UN, 2018; WHO & UNICEF, 2021). Yet, more than 75% of the Tanzanian population has unsafely managed sanitation services, the issue is critical to urban residents who discharge faecal waste into bare land and Water receptors making the urban water bodies unsafe for human consumption (Brandes et al., 2015; Cookey et al., 2020; Jenkins et al., 2014; Jenkins et al., 2015;

Mwamlima et al., 2023; Seleman et al., 2020; USAID, 2020).

Several motives have been done by both the government and the non-government stakeholders to fast-track the achievement of SDG 6.2. Among other motives includes funding the sanitation sector for the construction of sewer networks and faecal sludge treatment plants (Rajendrakumar et al., 2025; Schaub-Jones; 2022; The World Bank, 2025; WHO and UNICEF, 2020). For instance, Arusha city received

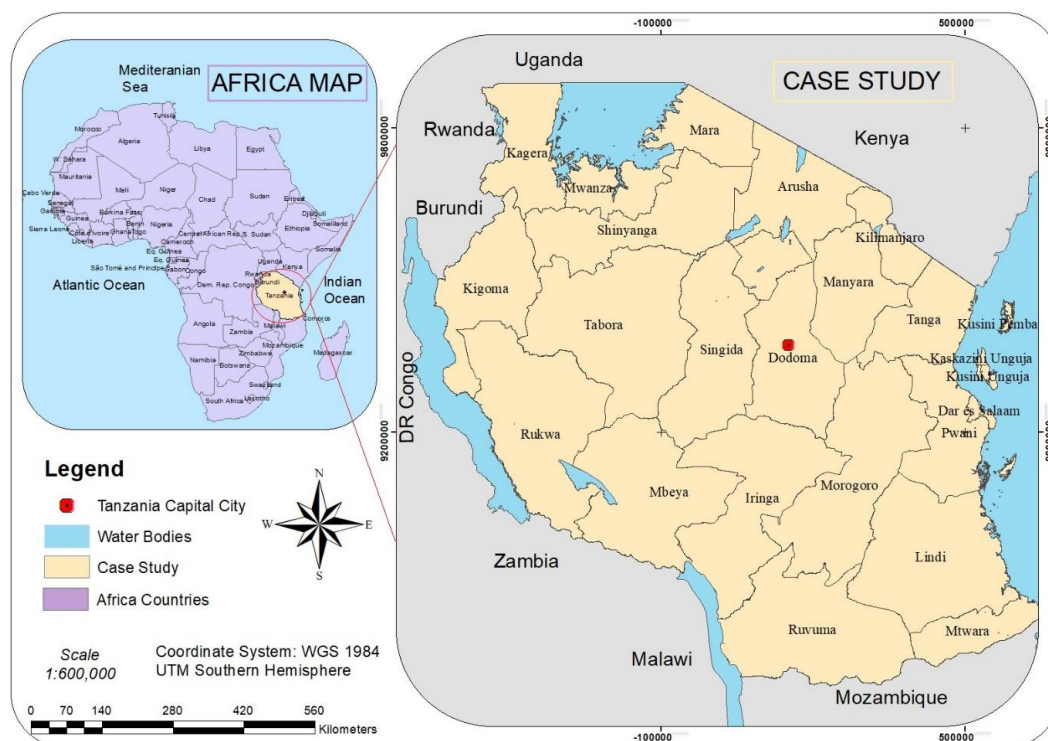


Figure 1. Location map of study focus (NBS, 2022)

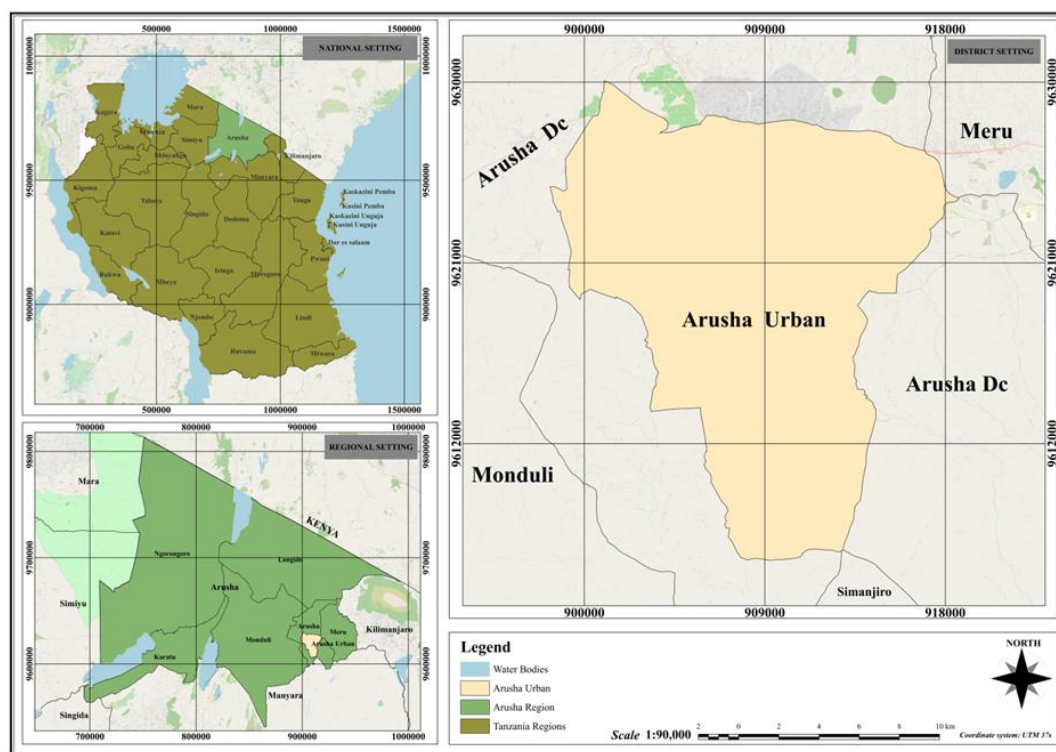


Figure 2. Location of case study area (NBS, 2022)

Development Bank (AfDB) for the implementation of drinking water and sanitation infrastructure, taking into stabilization ponds that have the capacity of treating 22 million liters equivalent to 22,000 m³ of wastewater per

day (African Development Bank, 2022; Takouleu, 2019). Moreover, over 200,000/= dollar funds were used by SNV Netherlands Development Organization in Tanzania under WASH SDG Programme in construction of Muriet faecal sludge treatment plant with capacity of treating about 250 m³ of faecal sludge on daily basis (SNV and Innosolt, 2019). With all that effort, yet more than 70% of the city's residents rely on on-site sanitation systems, generating massive amount of faecal sludge that outpaces the available treatment plant at Muriet ward (Mwamlima et al., 2024a; Mwamlima et al., 2024b; SNV and Innosolt, 2019).

The whole faecal sludge management systems in Tanzania lag far behind available interventions for wastewater management systems, and at some points the two systems are assumed similar, whereby engineers adopt wastewater treatment systems in treating faecal sludge (Desye et al., 2022; Lamu, 2021; Mwamlima et al., 2024a; Strande et al., 2014). Vasty studies have been done that led to introduction of several faecal sludge treatment technologies, all having a dewatering process at a primary stage (Strande et al., 2014). Among others the most promoted technologies for developing countries like Tanzania are sand drying beds especially the unplanted sand drying beds, decentralized wastewater treatment systems (DEWATS) and geotextile especially the Geo-tube technology, this is due to their simplicity in operations and maintenance without demanding electricity (Basamykina et al., 2020; Catherine & Augustina, 2022; El Gohary et al., 2022; URT, 2018a). On the other hand, the belt filter press and centrifuge are majorly used in developed countries, less promoted for use in developing countries like Tanzania due to their associated costs in operation and maintenance that demands reliable electricity on daily basis which presently isn't the case (Kashkovsky et al., 2014; Mwamlima et al., 2024a).

With all these findings, yet attaining adequate faecal sludge management remains a myth in developing countries like Tanzania. There might be several drivers for this setback, but this study focused on investigating the Tanzanian legal coverage in promotion of adequate faecal sludge management in urban settings. The study explored technical coverage and context of faecal

sludge management interventions in relating policies, acts, regulations, guidelines, rules and standards. Arusha city has been considered as a reference point for smooth discussion of the findings.

2 Materials and Methods

2.1 Case Study Area

Tanzania is located in East Africa at approximately 6.3690° S, 34.8888° E, bordered by the Indian Ocean to the east and several Great Lakes to the west and north. In details, the country is found in the eastern part of African continent, it is bordered by Kenya and Uganda on its Northern part, Rwanda, Burundi and Congo on its Western part, Namibia, Zambia, Malawi and Mozambique on its Southern part, and the Indian ocean on its Eastern part (Figure 1). Sanitation sector is still considered a challenging sector of the nation with faecal sludge management tormenting urban settings. This study reviewed all legal binding documents that relates or offers information on faecal sludge management in urban settings. Arusha city council has been selected as a reference case for coverage justifications (Figure 2). Arusha City is located in northern Tanzania at approximately 3.3667° S, 36.6833° E, at the foot of Mount Meru near the Great Rift Valley. Selection of the city in justification is based on the fact that Arusha is considered the tourist hub of Tanzania attracting tourists from both inside and outside the nation. Hence, maintaining its cleanliness is of paramount importance in boosting tourist industry and increasing the cities and national Gross Domestic Product (GDP).

2.2 Study Design

The qualitative method of data collection was employed for this study whereby a critical document review of all legal documents relating to sanitation especially the faecal sludge management were reviewed. First group document review comprised of three policies namely: National Water Policy (2002); National Health Policy (2017); and the National Environmental Policy (2021). Second group document review comprised of seven acts namely: The water Supply and Sanitation Act (2019); Public Health Act (2009); Environmental Management Act (2004); Water Resources Management Act (2019); Urban Planning

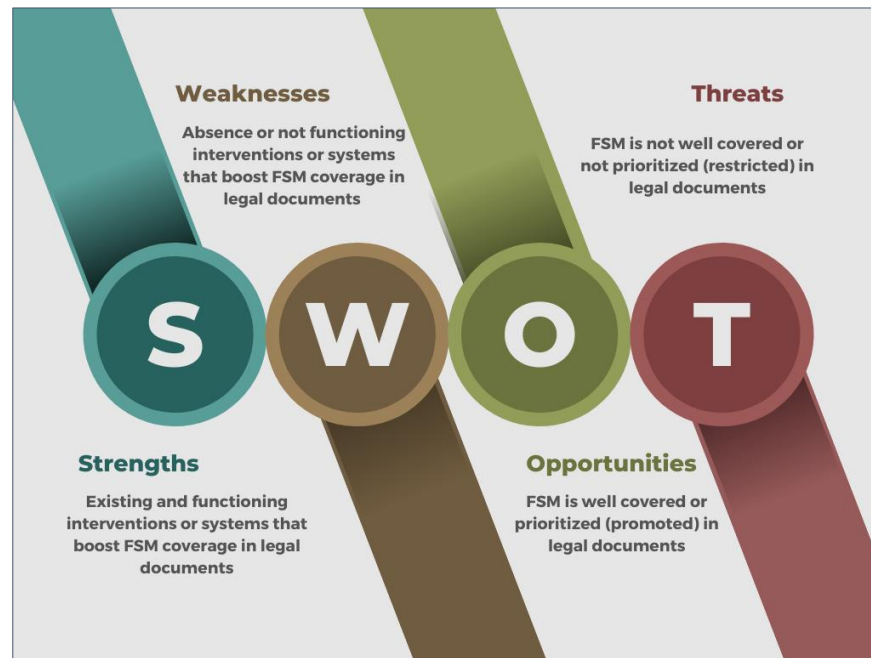


Figure 3. SWOT analysis of legal framework in FSM

Authority Act. CAP. 414 (2020). Third group document review comprised three regulations namely: Water Supply and Sanitation (Provision and Management of Sewage and Wastewater Services) Regulation (2019). (Made under section 73(1)(c)); The Urban Planning Act, (CAP.355). Regulations. Made under section 77(1)(d); and the Urban Planning (Use Groups and Use Classes) Regulations, (2018).

The fourth group document review comprised five guidelines namely: Performance Benchmarking Guidelines for Water Supply and Sanitation Authorities (2022); Guidelines for the Application of Small-Scale, Decentralized Wastewater Treatment Systems. A Code of Practice for Decision Makers (2018); Guidelines for Preparing a Business Plan for Water and Sanitation Authorities (WSSAs) (2022); Water and Wastewater Quality Monitoring Guidelines for Water Supply and Sanitation Authorities (2020); and Guidelines for Onsite Sanitation and Faecal Sludge Management for Water and Sanitation Authorities (2020). The fifth and last group document review comprised two rules and one standard namely: The Energy and Water Utilities

and Sanitation Services (Licensing and Quality of Services) Rules (2020); and Faecal sludge management; permissible limits for use and disposal. DTZS: EMDC 1(257) (2023).

Key informant interviews with sanitation stakeholders in Arusha city and the physical observations were used as data collection methods, complementing document review. The data analysis was done using Strength, Weakness, Opportunities and Threats (SWOT) technique, whereby the collected data were correlated with current faecal sludge management practices in Arusha and Tanzania in general.

2.3 Assessment of Legal Framework in Faecal Sludge Management

In this study the term legal framework has been used to embody the policies, acts, regulations, guidelines, legislations, rules and standards entailing faecal sludge management in Tanzania, Arusha city has been referred as a case urban center enhance review discussions. Data collection was mainly through legal document reviews whereby secondary data were mobilized. Later on, the need for primary data was vital

Table 1. Policy coverage in Tanzanian FSM

Category	Document Name	Section	Phrase/clause	Gaps (black color) and Opportunities (blue color)
POLICY	National Environmental Policy (2021) (VPO, 2021)	1.2.6.1 Inadequate Municipal Waste Management	About 13% of the urban population in Tanzania is covered by sewer	[i] About 87% of the urban population in Tanzania is not covered by sewer, meaning that they generate FS [ii] There is no information on the management of the FS service chain for both urban and rural settings.
	National Water Policy (2002) (Ministry of Water, 2002)	Section III. Urban Water Supply and Sewage, Part 4.5, Goal: Environmentally friendly wastewater treatment systems	[i] About 80% of the supplied water ends up being wastewater that is majorly on-site and managed by septic tanks and pit latrines. [ii] (i) Emphasis on sewage systems and sludge disposal facilities to be constructed and the old ones to be rehabilitated. [iii] (ii) Cesspit emptying services to be established and/or contracted to the private operators, cesspit emptier are required to discharge only at the sewage treatment facilities. [iv] (iii) Discharge of untreated wastewater to the sea shall be through long and deep sea out-fall.	[i] Although the term FS is not mentioned in the document, all the on-site contained referred wastewater is FS. The policy should be reviewed to mention FS instead of wastewater as it is right now. [ii] The Policy is silent on who should be responsible for ensuring the construction and rehabilitation of old sewage systems and sludge disposal facilities. [iii] The policy highlighted the need for link between the private and public sectors (PPP- Private, Public Partnership), however, the policy is silent on the penalties and who should ensure that the cesspit emptier are discharging faecal sludge at the sewage treatment facilities. [iv] The policy allows for the discharge of untreated wastewater to the sea provided that it is through a long and deep-sea out-fall. This has repercussions on the quality of seawater and the health of aquatic organisms if the discharged amount is significant.
	The National Health Policy (2017) (URT, 2017)	Section 2.19 and 5.19: Water, Sanitation, Hygiene and Food Safety	[i] The government has implemented National Sanitation and Hygiene Campaign in the country using the Community Led Total Sanitation strategy hence between 2007 and 2017 use of improved toilets at household level has increased from 13% to 35%. [ii] The community Total Led Sanitation is hypothesized to significantly reduce the faecal- oral route of contamination hence, prevent spreading of water borne diseases.	[i] The policy is silent on the acceptable and hygienic faecal sludge emptying, transportation and treatment techniques, since they also have contribution to spreading of waterborne diseases. [ii] Focusing only on faecal sludge containment origins is promoting onsite management of faecal sludge. However, the sludge is always emptied and transported to treatment plants if not illegally discharged to open environment or water receptors. So, in order to break the faecal oral route of contamination, the whole faecal sludge management service chain from generation to disposal should be considered by the policy (Seleman et al., 2020b).

so, the physical observations and key informant interviews with interlocutors being; Water, Sanitation and Hygiene (WaSH) officer at Arusha city council, Service providers who are the drivers of the faecal sludge emptying trucks, operators of the Muriet faecal sludge treatment plant, sanitation officer at the Arusha Urban Water Supply and Sanitation Authority (AUWSA) was done. The essence of doing key informant interviews and physical observations was to get the on ground faecal sludge management practices hence enable well correlation of the review data to the field practice.

Analysis of the collected data was done using the Strength, Weakness, Opportunities and Strength (SWOT) technique with the aid of Canva Create 2024. The coverage of the legal aspects in Sanitation, especially those based on faecal sludge were clearly discussed. Moreover, the priority level and restrictions by law were identified and analyzed as either accelerators or prohibitors of effective FSM. The assessment was done using drivers in Figure 3.

The strength and weakness analysis helps in realizing the factors that are within custodian institution's ability, however they either support or hinder adequate FSM in urban settings of Tanzanian. On the other hand, the opportunities and threats analysis show the legal factors that are outside institution's capacity, hence they have to either be adopted or avoided in order to ensure that there is adequate FSM in urban settings.

3. Results and Discussion

3.1 Policy Coverage in Faecal Sludge Management

Tanzania is composed of many policies from different aspects of life purposely established to guide the ways of life. However, those that cover directly or indirectly the sanitation sector and specifically the faecal sludge management are: National Environmental Policy (2021); National Water Policy (2002); and the National Health Policy (2017) (Table 1). These policies don't direct mention the faecal sludge management in their phrases and clause, nevertheless they have somehow covered it in the wastewater management.

Based on the interview with key stakeholders in the faecal sludge management in Arusha, to mention the; Arusha Urban Water Supply and Sanitation Authority (AUWSA), City Council, Muriet faecal sludge treatment plant (FSTP) operators, Service Providers unloading the faecal sludge at Muriet FSTP, the Energy and Water Utilities Regulatory Authority (EWURA) and SNV Netherlands Development Organization, the documentation of faecal sludge is gaining interest and at least the coverage is promising. However, there are several policy gaps that need to be addressed. The identified gaps to be filled and opportunities to be taken advantage have well been itemized against each policy in Table 1.

Availability and effectively implementation of the policies that aim to attain suitable sanitation especially the adequate faecal sludge management in urban settings is vital towards meeting the sustainable development goal 6 target 6.2 by 2030. The policies play a major role in ensuring that all the collected faecal sludge from both the planned and unplanned settlements are effectively managed. The reviewed policies refer to faecal sludge as part of faecal sludge, this contracts designers who mostly adopt the domestic wastewater treatment facilities like Waste stabilization ponds and constructed planted wetlands in treatment of faecal sludge, as a result, many treatment units are failing (Mwamlima et al., 2024b). Similar findings have been reported by Okello-Juma et al., (2020), Nanyonjo et al., (2022) and Ekane et al., (2016), that Tanzania have no specific policies that specifically address the faecal sludge management as faecal sludge instead, they incorporate in include in the wastewater management. This brings contractions to planners, designers and implementors of faecal sludge infrastructure because according to Strande et al., (2014), faecal sludge requires different treatment interventions from wastewater with provisions for solid-liquid separation. Moreover, policies guide a wellbeing and code of practice for sanitation workers, hence more efforts should be made to strengthen the inclusion and implementation of the faecal sludge management in the relevancy policies within the country.

Table 2. Acts inclusion in Tanzanian FSM

Category	Document Name	Section	Phrase/clause	Gaps (black color) and Opportunities (blue color)
ACTS	Environmental Management Act (2004) (URT, 2004)	PART IX: Waste Management. Section (c), 123 (1-2), 124, 125 and 126: Management of Liquid waste	[i] [123] The local government authority is given power to issue guidelines on how the liquid waste from domestic and commercial premises should be treated and disposed both within or outside premises. [ii] [124] “The local government authorities shall, with respect to their areas of jurisdictions prescribe, issue guidelines and standards on how sewage from cesspool and sludge from septic tanks is to be collected and transported by specified vehicles for disposal”. [iii] [125] “The local government authorities shall ensure that sewage is appropriately treated before it is finally discharged into water bodies or open land, and that it does not increase the risk of infections or ecological disturbance and environmental degradation”. [iv] [126] “The local government authorities shall designate and ensure compliance with designated disposal ponds, sewage treatment facilities and sewer points”. [v] [127] “Upon completion of construction of the sewerage system, local government authorities shall facilitate the carrying out of initial and subsequent periodic tests to ascertain that the effluent meant for final disposal meet the standard as may be prescribed by Minister”.	[i] The Environmental Management Act (2004), is comprehensive on ensuring that the wastewater is well managed throughout the whole service delivery chain by imposing power to the local government authority to ensure that the faecal waste is managed all the way from generation, emptying, transportation, treatment and safe disposal. However, the Act didn’t mention the word “faecal sludge” instead it generalized it as wastewater. [ii] Moreover, the Act doesn’t promote re-use and recovery of the treated byproducts as an effective technique of ensuring commercialization of faecal sludge. For this study, the Arusha city council is entrusted with power to oversee the faecal sludge management and ensure that the waste doesn’t contaminate the environment. [iii] Furthermore, the Act should be revised to vet power for reference effluent standard from treatment plants to Tanzania Bureau of Standards (TBS) instead of the minister, because the custodian for making standard is TBS.

Category	Name	Document	Section	Phrase/clause	Gaps (black color) and Opportunities (blue color)
The water Supply and Sanitation Act (2019)	(URT, 2019)	Part 1: Preliminary Provisions. CAP 288:		The Act well stipulates the management of sewage system, whereby it states how agreements on use, establishment and control of the sewage system.	The policy is silent on the faecal sludge management system. The policy should be clear on it since water supply and sanitation authorities in urban areas are facing faecal sludge as a challenging issue than sewage. For instance, in Arusha city less than 30% of all houses are connected to sewerage system leaving more than 70% in on-site system, that generates massive amount of faecal sludge that have to be handled by the Muriet faecal sludge treatment plant.
Urban Planning Act (2007)	(URT, 2007)	Part IV: Planning Process. Section 29 (3): Planning consent and environmental impact assessment		“Where in connection with an application for planning consent to develop land and subject to any other relevant law, the planning authority is of the opinion that proposals for industrial location, dumping sites, sewerage treatment, quarries or any other development activity shall have injurious impact on the environment, the applicant shall be required to submit together with the application of an environmental impact assessment report”.	The Act states well that in order to establish a sewerage system there should be an environmental impact assessment. Yet, the Act is silent on faecal sludge management system, as it doesn't offer information on provision and allocation of land for faecal sludge treatment plants, especially during the land planning. This signifies that the municipal/city council like Arusha city council have power to allocate land for treatment of faecal sludge provided there is availability.

Category	Name	Document	Section	Phrase/clause	Gaps (black color) and Opportunities (blue color)
Public Health Act (2009) (URT, 2009a)		Part IV. Section 125 (1) & (2): Interference with wastewater treatment area	[i] The designated areas for treatment of waste water treatment works shall not be built or developed by any person. [ii] Any person who contravenes the provisions of subsection [1] commits an offence and upon conviction shall be liable to a fine not exceeding two million shillings or to imprisonment for a term not exceeding twelve months or to both	[i] This act covered well the need for wastewater treatment facilities. Although faecal sludge has not been mentioned, yet it is included in the cluster of wastewaters from domestic building that are not connected to sewerage systems.	[ii] The safety of sanitation workers who are vulnerable group in sanitation management are not exhaustively covered. There is a need for covering safety aspect of sanitation workers because they are mostly in contact with faecal matter. For instance, DEPORT group in Arusha is using manual faecal sludge emptying methods, with gulpers being the main technology adopted, so they are vulnerable to contamination and water borne diseases like Cholera, Typhoid and Diarrhea.
Water Resources Management Act (2019) (URT, 2009b)		PART VI (2)(iii) & VII (d) (63-68): Protection of water resources & Discharge permits	[i] Discharge of effluent from wastewater/sewage treatment systems shall be allowed provided the discharging person or authority have discharge permit that has been issued in accordance with section 48 and 66". [ii] Polluters shall pay the cost of remedying the damage caused and reinstating the quality of the water, as far as is possible, to the condition that would have existed where the damage was not caused; and to a fine of not less than three hundred thousand shillings or to imprisonment for a term not exceeding one year or to both fine and imprisonment and in case of subsequent conviction, to a fine not less than five hundred thousand shillings or to imprisonment not exceeding two years or to both fine and imprisonment and in case of continuation of the offence, to an additional fine not less than fifty thousand shillings in respect of every day during which the offence has continued.		This Act demands the faecal sludge treatment plants ensure that they lower the pollutant concentrations to the maximum allowable limits before discharging them to water receptors. Moreover, the policy wants the owners and operators of faecal sludge treatment systems to acquire the discharge permit.

Category	Document Name	Section	Phrase/clause	Gaps (black color) and Opportunities (blue color)
The Occupational Health and Safety Act (2003) (OSHA, 2003)	Part X: 99(1)(d) & (e) Miscellaneous Provision	All unsafe or unhealthy practice at work place including non-wearing of PPE shall be reported to the employer or Health and Safety representative of the work place.		[i] The Act is silent on faecal sludge management where by a lot of safety concern are associated with empty, conveyance and treatment of faecal sludge. [ii] Safety issues complain in faecal sludge should be monitored by city council or any other entitled government authority.
The Energy and Water Utilities Regulatory Authority Act. CAP. 414 (2020) (EWURA, 2020b)	Part IV: I (39) Sanitation costs	Criteria used for establishing sanitation charges or costs are; customer survey, cesspit emptying, laboratory analysis and treatment costs of sewage, upkeeping costs of ponds, plant electricity and new sewer connections.		The act is silent on methods for dewatering faecal sludge. Although it considered electricity in operations of sanitation services, yet the unreliability of electricity makes it hard to adopt treatment systems that operates with electricity, unless if there is renewable energy at respective treatment plants.

3.3 Regulations Relating to Faecal Sludge Management

Specific order of ensuring that the waste is managed in urban settings of Tanzania has been detailed by several governments regulatory or executive authorities. For the sake of faecal sludge management, the permissible actions relevant either directly or indirectly with FSM are: Water Supply and Sanitation (Provision and Management of Sewage and Wastewater Services) Regulation (2019); The Urban Planning Act, (CAP.355). Regulations; and The Urban Planning (Use Groups and Use Classes) Regulations, (2018). Based on the urban planning regulation the planners are supposed to leave 5% of the urban land for public services including for construction of wastewater treatment plants. Moreover, the regulations have grouped the faecal sludge as part of wastewater. This grouping might hinder effective implementation of management interventions, by establishing wastewater treatment facilities in place of faecal sludge management systems. The gaps and opportunities from respective regulation has been detailed in Table 3.

Similar findings have been reported by Andy Peal et al., (2014), that faecal sludge management is invisible to policy makers and hence is not mostly included in the regulations. Hence, it always lags far behind water supply management interventions, because it is mostly considered a subset of water supply or health management. According to Strande et al., (2014), it is very important for urban planners to set aside the areas for construction of new treatment plants and for rehabilitation or expansion of the existing treatment systems. However, the Urban Planning Act, (CAP.355). Regulations. Made under section 77(1)(d), is not specific of the planned 5% of the total urban land for public services including open spaces, social services, health services, education services and waste treatment plants. The regulation is completely silent on how much exactly should be left for faecal sludge treatment. It is very important to consider allocation of lands for construction of faecal sludge treatment systems because of rapid urbanization that leads to increase in production of faecal sludge, that outpaces the ability of the available interventions.

3.4 Guidelines Enclosure On Faecal Sludge Management

There are several rules of thumb or suggestions that guide the respective authorities, service providers and other stakeholders engaged in FSM within urban settings on how to behave to ensure effective management of waste. However, the most relevant guidelines are: Performance Benchmarking Guidelines for Water Supply and Sanitation Authorities (2020); Guidelines for the Application of Small-Scale, Decentralized Wastewater Treatment Systems. A Code of Practice for Decision Makers (2018); Guidelines for Preparing a Business Plan for Water and Sanitation Authorities (WSSAs) (2022); Water and Wastewater Quality Monitoring Guidelines for Water Supply and Sanitation Authorities (2020); and Guidelines for Onsite Sanitation and Faecal Sludge Management for Water and Sanitation Authorities (2020). The gaps and opportunities identified from each guideline are detailed in Table 4.

Similar findings were reported by Englund et al., (2019), and Andy Peal et al., (2014), that most guidelines are silent on commercialization of the faecal sludge treated by-products, especially in recycling them to produce organic fertilizer, briquettes, biogas and construction materials. Moreover, Tanzania is regarded as a nation with good guidelines on faecal sludge management, as many guidelines has been adopted from the World Health Organization (WHO), which are regarded as the international standard by all countries that lacks guidelines or who wish to improve them. However, the guidelines are not forcing the designers and planners of the faecal sludge management to promote interventions that call for resource recovery and commercialization of the waste (Englund et al., 2019; Andy Peal et al., 2014; Strande et al., 2014).

3.5 Rules and Standards Coverage on Faecal Sludge Management

There are several strictly provisions made to prohibit the misconduct of people and authorities' power, however the relevant rules and standards relating to faecal sludge management in Tanzanian urban settings are: The Energy and Water Utilities

Table 3. Regulations relating to FSM in Tanzania

Category	Document Name	Section	Phrase/clause	Gaps (black color) and Opportunities (blue color)
REGULATIONS	Water Supply and Sanitation (Provision and Management of Sewage and Wastewater Services) Regulation (2019). (Made under section 73(1)(c)) (Ministry of Water, 2019)	Part II: 4(1) & (2) Provisional of Sanitation	“A water authority shall develop and maintain sanitation work within its jurisdictions” & “Sanitation works to be provided by water authority shall involve infrastructure for collection, conveyance, and treatment of wastewater as well as disposal of effluent.”	Even though faecal sludge hasn't been mentioned, the regulation considers its management by referring to as wastewater. Refer to heading part II titled “Provision of Sewage and Wastewater facilities”. The regulation should be reviewed to include the term faecal sludge.
		Part V: 30 Failure to comply	“A person who operates cesspit empties and fails to comply with operation conditions prescribed under these regulations commit an offence and upon conviction shall be liable to fine of not less than five hundred thousand shillings and not more than one million shillings or to imprisonment of term not exceeding three months or to both.	The penalty claim is general, it doesn't state who is responsible for collecting fines or wrong doer. Moreover, there should be a penalty clause that demands a service provider to surrender the certificate of operations after a certain number of offences (let's say, three offences). Moreover, it brings a contradiction when the authority decides to play as a service provider. For example, in Arusha, the AUWSA are serving as service providers, so will they issue fine to themselves in case of an offense, or will they pay a fine if found liable by another government authority? This should be clarified well in regulations to avoid conflicts of interests.

Category	Document Name	Section	Phrase/clause	Gaps (black color) and Opportunities (blue color)
The Urban Planning Act, (CAP.355). Regulations. Made under section 77(1)(d) (URT, 2018b)	First Schedule (made under regulation 3). Section 6: Uses permitted for public utilities	“Sanitary installations including treatment plants and disposal works, drying beds, solid waste management, shall be planned to be included in the 5% of the total areas, that is reserved for public utilities.		The regulation commands land planners to leave 5% of the total land for public services including allocation for faecal sludge treatment plants. However, the regulation is silent on where should they be located, and what should be done if the 5% of the areas is exhausted in other public service, and a need for constructing faecal sludge treatment system arises. For the case of Arusha city, the matter is left on the hand of the city council to decide location and useability of the land especially those owned by the government or open spaces.
The Urban Planning (Use Groups and Use Classes) Regulations, (2018) (URT, 2018c)	Use Group H – Public Buildings and Places of Assembly	Have provision for public bathing		The regulation is silent on provision for public toilets, and faecal sludge treatment plants. This silence silently promotes open defecation, especially urination on hidden places.

Regulatory Authority (Consumer Complaints Settlement Procedure) Rules, (2020); Water Supply and Sanitation Services (Licensing and Quality of Services) Rules (2020); and Faecal sludge management – permissible limits for use and disposal. DTZS: EMDC 1(257) (2023). Several gaps have been identified from both rules and standards, for instance the standard is not exhaustive as it doesn't mention limits values for all the essential parameters if the treated FS is to be reused, recycled or safely disposed. On the opportunity side the rules offer a provision for freedom of speech and platform for users to express their opinions with regard to FSM in urban settings. However, the main setback of this rule is that the responsible person for evaluating the complaint is the same who have power of revoking it. More details on the identified gaps and opportunities per each rule and standard have been detailed in Table 5. The findings in Table 5 aligns well with the information presented by Englund et al., (2019), Andy Peal et al., (2014), Strande et al., (2014), and Strauss et al., (2002), that availability of strong rules and implementation plans to ensure that there are allowable discharge standards and enforcement of all rules set for violators is essential for adequate faecal sludge management in any urban setting. Yet, for many countries including Tanzania, faecal sludge is still regarded in same category as domestic wastewater and the available standards that dictate the maximum allowable discharge limits misses the resource recovery components. Stakeholders involved in faecal sludge management within Arusha should collaborate to ensure that they set the by-laws and local standards on the recyclable products from treated faecal sludge by-products. The focus should be on the by-laws and standards on safe operation, high production and quality standards for organic fertilizer, briquettes, biogas and construction materials.

3.6. SWOT analysis of The Legal Framework on Faecal Sludge Management

Several interventions have been created to ensure stakeholders involvement in faecal sludge management in urban settings of Tanzania. Although there are authorities responsible for ensuring the faecal sludge is adequately managed. Yet the reviewed

policies, acts, regulations, guidelines, rules and standards doesn't clearly assign their roles and responsibilities so that it becomes easy to point the responsible candidate incase things goes wrong. Moreover, as long as the FSM sector has been covered in the legal binding documents it is a great opportunity for stakeholders to engage and collaborate in strengthening the coverage so that the adequate management is attained in urban settings. More focus is dedicated on the water supply and wastewater management whereby the old management methods are still being promoted; this is a threat to achieving sustainable sanitation for all by 2030. Unless stakeholders revamp the weakness and avoid the threats pointed in Figure 4, adequate faecal sludge management will still be a myth in urban settings.

Based on findings there are several gaps that demands urgent intervention in filling them. Moreover, considering faecal sludge as wastewater might contradict planning, designing and implementation of faecal sludge treatment plants, instead of designing and allowing provisions for faecal sludge management, the planning team might end up adopting the existing wastewater treatment plants. According to Mwamlima et al., (2024b), the dominant wastewater treatment systems like: waste stabilization ponds and the constructed wetland have proven failure in treating faecal sludge unless if preceded by other dewatering facilities like unplanted sand drying beds, geo-tubes or DEWATS (Mwamlima et al., 2024a). Hence, there is an urgent of conveying a national workshop on faecal sludge whereby all stakeholders engaged in faecal sludge management are convened to discuss future of the sector. The inclusion of all stakeholders from all level is vital, the stakeholder should be the; national, regional, district, street, water supply and sanitation authorities, safety authorities, environment management authorities, service providers, research institutions, private companies engaged in sanitation business and the non-government organizations. The workshop should review all the identified gaps and come up with resolution interventions. Moreover, it should establish the support interventions to capitalize on the identified opportunities. The report from this workshop shall

Table 4. Guidelines enclosure on FSM in Tanzania

Category	Name	Document Section	Phrase/clause	Gaps (black color) and Opportunities (blue color)
	Performance Benchmarking Guidelines for Water Supply and Sanitation Authorities (EWURA, 2022b)	Section 6.4.1.2: Compliance to regulatory requirements	Code number CRR6: Faecal sludge management assigned a total score of 10 for compliances to regulatory requirements, which is the lowest score.	It has been highlighted that the water supply and sanitation authorities are not giving priority to faecal sludge management. More than 80% of the water used ends up into either wastewater or faecal sludge. This is dangerous because for instance in Arusha city more than 70% of the whole population rely on on-site sanitation containments generating tremendous amount of faecal sludge. The generated faecal sludge outpaces the available faecal sludge treatment plant at Muriet.
GUIDELINES	Guidelines for the Application of Small-Scale, Decentralized Wastewater Treatment Systems. A Code of Practice for Decision Makers (2018) (Ministry of Water, 2018)	Chapter 3: Concepts of wastewater management. Section: 3.4: Faecal Sludge and Wastewater	The guideline intends to mind shift the experts in faecal sludge management especially those in treatment of faecal sludge to not base on wastewater treatment technologies while designing faecal sludge treatment plants. The two treatment systems cannot be transferred because all faecal sludge treatment plants require separation of solids from liquid and then handling them separately.	Based on this regulation, SNV Tanzania, Arusha office constructed Muriet faecal sludge treatment plant, which is based on decentralization concepts, employing unplanted sand drying beds in separation of solids from liquid. There after the percolate is channeled to the main sewer while the dewatered sludge is further dried and used in production of solid fuel called faecal sludge derived char briquettes. There is more potential in dewatered faecal sludge including production of organic fertilizer and building materials (Gold et al., 2018; Mkude et al., 2022).

Category	Name	Document	Section	Phrase/clause	Gaps (black color) and Opportunities (blue color)
Guidelines for Preparing a Business Plan for Water and Sanitation Authorities (WSSAs) (2022)	(EWURA, 2022a)	Annex C: Definitions of quality of Service and Performance Targets. Section PS16: Percentage of reuse of treated effluent/sludge (%)		Percentage of reuse and recycling of treated effluent /sludge to total treated effluent/sludge calculated as total volume treated effluent/sludge reused over total volume of effluent/sludge treated.	The guideline is silent on how the business is required to be structured by the Water and Sanitation Authorities in order to promote, re-use and recovery of treated effluents. The last page and last section of the guideline pointed out re-use as a performance indicator, while it wasn't prior emphasized. There is potential of earning revenue from re-sue and recycling that can assist in running the treatment plant (Mkude et al., 2022; Mwamlima et al., 2023).
Water and Wastewater Quality Monitoring Guidelines for Water Supply and Sanitation Authorities (2020)	(EWURA, 2020d)	Section 4: Monitoring of wastewater quality		Wastewater effluent quality discharges should comply with the latest Tanzania Standard that prescribes the permissible limits for municipal and industrial effluents discharged directly into water bodies (i.e., receiving water bodies). The proposed parameters for analysis are those pointed out by TZS 860, which are; Ammonium, Biological Oxygen Demand (BOD ₅), Chemical Oxygen Demand (COD), Color, Faecal Coliform, Nitrate, pH, Phosphorus, Total Coliform and Total Suspended Solids (TSS). Moreover, the guideline task the water supply and sanitation authority to prepare Sanitation Safety Planning (SSP) that accommodated disaster as a result of climate change like flood.	The guideline is silent on the type of treatment systems to be adopted for treating faecal sludge, however it well guides the water supply and sanitation authority that they ensure that the effluent quality from any treatment technology adopted aligns with the maximum allowable limits for disposal . Moreover, the guidelines don't offer information on how the faecal sludge byproducts can be re-used or their resources be recovered. For this study, the AUWSA is the custodian entrusted to ensure that the effluent quality at the Muriet faecal sludge treatment plant is below the maximum allowable limits set by TBS.

Category	Document Name	Section	Phrase/clause	Gaps (black color) and Opportunities (blue color)
	Guidelines for Onsite Sanitation and Faecal Sludge Management for Water and Sanitation Authorities (2020) (EWURA, 2020a)	Section 1-7: Faecal sludge management	The guideline is comprehensive, issuing procedures, does and don'ts for faecal sludge management service chain. Whereby the whole service delivery chain is covered, from generation to resource recovery from treated byproducts. Moreover, it has stipulated conditions for adoption of either unplanted drying beds or decentralized wastewater treatment systems (DEWATS).	This guideline is a comprehensive guide for both municipalities (for this case, Arusha city council), water supply and sanitation authorities (for this case AUWSA), and service providers (for this case the DEPORT group, private sector and the AUWSA service providers). However, the guideline doesn't insist on innovation of organic based dewatering Technologies like the use of <i>Phoenix reclinata</i> instead of sand, in order to get high quality dry sludge for production of briquettes and/or compost, while improving both dewatering rate and quality of percolate.

Table 5. Rules and standards coverage on FSM in Tanzania

Category	Document Name	Section	Phrase/clause	Gaps (black color) and Opportunities (blue color)
RULES	The Energy and Water Utilities Regulatory Authority (Consumer Complaints Settlement Procedure) Rules, (2020) (EWURA, 2020c)	Part II. rule 4 (1-8) & rule 5 ((1, a-f) – 4).	[i] [4] provides procedures for individual or group users filling complaints against the service providers or respective authority. [ii] [5] of the same part gives mandate to the Director General to reject a complaint filed under rule 4	These rules offer freedom of speech and expression of satisfaction by users or beneficiaries of FSM, however, it is hard to file a complaint against a person who evaluates and have power over the complaint itself. For instance, residents of Arusha city might file complaints against FS service providers who are private companies and the AUWSA. If the complains are on private companies that becomes easy to handle by the AUWSA but if it concerns themselves there is a worry of not being attended. Keep in mind that the AUWSA are now service providers doing similar business as private companies.
	Water Supply and Sanitation Services (Licensing and Quality of Services) Rules (2020) (URT, 2020)	Part II, 15 (1-4): Obligations of a Licensee	Agreement shall be concluded between water and sanitation authority and the service provider, and be approved by the responsible authority (EWURA).	All FS cesspit emptier are considered service providers in Arusha city and requires license from water and sanitation authority (AUWSA) who is also a service provider within the same city. Hence there is a worry that AUWSA wants to dominate the market place, there might be no fairness. The license is valid for a period of ten years, a financial assessment is needed to see if the provided time is sufficient for private companies to generate reasonable profit.
STANDARDS	Faecal sludge management – permissible limits for use and disposal. (2023) DTZS: EMDC 1(257) (2023)	Sub section 4.1.1: Effluent from faecal sludge treatment facility permissible limits & 4.2: Dried faecal sludge permissible limits	The Standards stipulates the maximum discharge allowable limits for the treated faecal sludge effluents. Moreover, it has set limits for irrigation.	This standard is vital to boost effective treatment and re-use of faecal sludge, especially the percolate. However, information on permissible limits for treated sludge in production of briquettes and organic fertilizer still misses. The standard should focus on recycling, because it is the global interest.

stand as the baseline for planners, designers and implementers of faecal sludge management projects.

4. Conclusion and Recommendations

4.1 Conclusion

The review concludes that FSM in Tanzania lacks comprehensive legal coverage, with most instruments emphasizing wastewater systems. To strengthen FSM

the Energy and Water Utilities Regulatory Authority (EWURA) strengthens regulatory enforcement and monitoring mechanisms. Additionally, the development of reuse and resource recovery standards for faecal sludge products, alongside improved institutional coordination and public awareness, will be essential to ensure sustainable and efficient FSM practices.

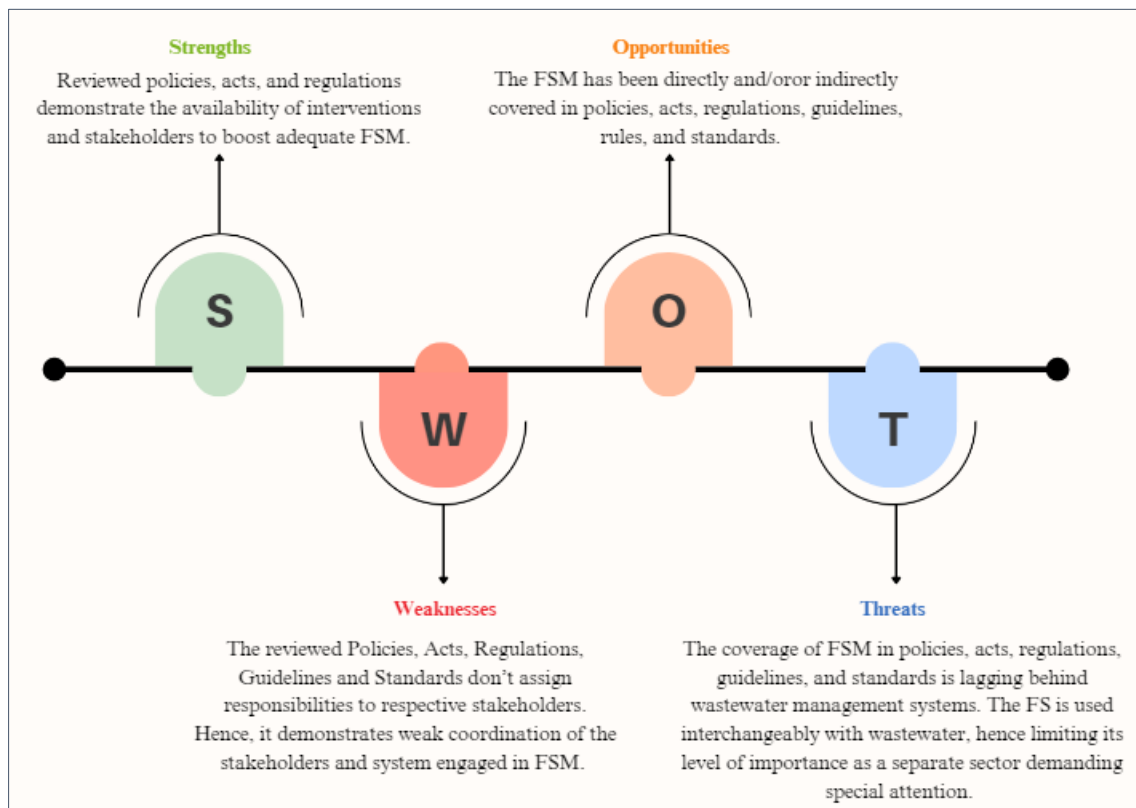


Figure 4. SWOT analysis based on legal documents review

inclusion, all stakeholders should be convened in a national workshop to harmonize and revise policies, acts, regulations, guidelines, and standards. The workshop should also address integration between FSM and wastewater management, ensuring both are treated as complementary components of urban sanitation.

4.2 Recommendations

To enhance faecal sludge management (FSM) in urban areas, it is recommended that national sanitation policies be revised to clearly recognize FSM as a distinct service chain. Urban master plans should allocate designated land for treatment facilities, while

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Conflict of Interest Statement

The author declares no competing interests.

Data Availability statement

All data generated and analyzed during this study has been included in this article. Figures and Tables in this paper are the authors original work, hence no permissions are required.

Ethical Approval

I confirm that the data used for this study was rightfully extracted from open sources and the research permits were granted by the Arusha city council and the Arusha Urban Water supply and Sanitation authority (AUWSA), the permits had reference numbers *AB.27/381/39* and *DB.230/255/01/42*, respectively.

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