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Developing a best-practice model for water and wastewater services in informal urban settlements in Tanzania

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Abstract

This research proposes a model for enhancing the pro-poor water supply and provision of sanitation services in informal urban settlements in Dar es Salaam, Tanzania. The model was developed from semi-structured interviews, a rigorous literature content analysis of best practice case studies and application of the Policy Transfer Framework. Development and adoption of a long-term strategy to mobilise financial resources and guide the water sector to develop pro-poor plans were key recommendations. While not a panacea, it is hoped that adoption of the model would significantly improve the current water supply and sanitation service delivery to informal urban settlements Dar es Salaam.

Keywords: water supply; water policy, WASH; informal urban settlements; urban poor, Dar es Salaam

INTRODUCTION

Recent studies suggest that more than 50% of the population of the fastest urbanising cities in developing countries are low-income dwellers living in informal settlements who have limited access to safe drinking water and improved sanitation services (Akbar et al., 2007a). Many informal settlements in these cities are situated in peri-urban areas that lack conventional centralised systems for the provision of water supply and sewerage services (Mwanza, 2000). In most developing countries, institutional arrangements mandate that public water utilities, local governments and the formal private sector provide water and sanitation services to urban centres, including informal settlements (Njiru, 2004). Case studies suggest that many of these institutions find it difficult to plan and expand conventional infrastructure due to characteristics of the informal settlements (Törnqvist et al., 2008). Ishtiyaq and Kumar (2011) defined informal settlements as unplanned areas that have developed urban features outside officially planned areas of the city. United Nations Human Settlements Programme (UN-Habitat, 2015) noted that the characteristics of an informal settlement include a poor layout, high population density, limited socio-economic activities, high environmental risks, geographical barriers, a lack of land titles and a lack of access to essential services.

A review of relevant case studies revealed that most local urban planning authorities in developing countries do not officially recognise the existence of informal settlements. Consequently, these settlements are often overlooked, and governments are reluctant to provide essential services to these settlements, as there appear to be very few benefits or incentives for doing so (Bocquier, 2008). Typically, informal settlements depend on demand-driven water and sanitation service providers, such as small-scale private providers, non-government organisations (NGOs) and community-based organisations (CBOs) (Kjellen, 2000; Njiru, 2004). Generally, these organisations use low-cost technologies that fit the characteristics of informal settlements to provide their services (Schwartz & Sanga, 2010). However, they cannot provide reliable, affordable and high-quality services to meet demand due to their low capacity, the economy of scale, restrictions on scaling up and a lack of recognition (Kombe et al, 2015).

Cross and Morel (2005) recognised that multiple factors are contributing to the failure to adopt a better pro-poor approach, including: a lack of – or failure to effectively adopt - pro-poor policies and institutional frameworks, an absence of pro-poor tariffs and financing mechanisms, a lack of pro-poor monitoring and regulations and the use of inappropriate technologies. The findings from case studies suggest that some approaches have managed to

develop and implement relatively successful pro-poor approaches in terms of providing water and sanitation services to informal settlements (e.g. Mwanza, 2000). Such approaches can be studied and transferred to other cities facing similar problems. Herman (2011) suggests that policy transfers from other countries provide a valuable source of information that enable different actors to learn how to improve local policies and approaches and to learn what they should and should not do.

In 2015, Tanzania was one of 40 countries that failed to achieve the target for Millennium Development Goals (MDGs) in relation to drinking water. Inadequate access to a potable water supply and sanitation facilities is one of the biggest challenges faced by informal settlements (in which the majority of urban dwellers live) (Smiley, 2019; Kombe et al., 2015). Research has shown that inadequate access to essential services is mostly caused by the lack of a better model for serving the urban poor (GIZ, 2019).

Previous studies conducted in informal settlements in Tanzania identified the barriers to improving services and provided some general recommendations. This research seeks to answer the following research question: How can the lessons learned from the positive provision of water and sanitation services in other countries be applied to improve the services in informal urban settlements areas in Tanzania, such as Dar es Salaam? To answer this research question, this study set the following research objectives:

- to investigate and understand the current approach to providing water and sanitation services to informal settlements in Dar es Salaam and identify the issues and need for policy transfers;
- to identify and understand current successful models for providing water and sanitation services to informal settlements; and
- to evaluate and determine the applicability of the model and its potential applicability to other informal settlements in Tanzania.

Dar es Salaam, the largest city in Tanzania, was selected following a desktop situational analysis (see Supplementary file) that showed it was one of the most populous cities with some of the most poorly managed informal settlements in Tanzania. Additionally, due to the time and budget limitations, the authors chose to focus on one city that would have transferable lessons for other Tanzanian cities.

BACKGROUND

Overview of Global Water and Sanitation

Today, over half the world's population (approximately 55%) live in urban areas (UN, 2018). Further, by 2050, it is projected that more than 68% of the world's population will reside in urban areas (UN, 2018). Cerro (2018) suggests that more than half of the projected additional world population will live in African cities and, to a large extent, informal settlements. Castro and Morel (2008) acknowledge that while African cities have the highest urbanisation rate, the failure of this rate to match the speed of economic growth, urban planning and the expansion of infrastructure will result in an increasing number of cities being dominated by informal settlements. Tsonga et al. (2013) identified population as a determining factor of sustainable development. High population growth that is unmatched by available resources and the provision of social services will likely pose significant challenges for African countries attempting to achieve SDG 6 (i.e., universal *access to safely managed water and sanitation by 2030*).

Access to potable water and improved sanitation has many benefits not only for the people living in informal settlements but also for the general public (Kobel & Del Metro, 2015). The United Nations Children Fund (UNICEF) and the World Health Organisation (2015) suggest that access to potable water and sanitation fosters human development, economic growth, alleviates poverty and protects the environment.

However, despite continued efforts around the world, many people continue to have no access to water and sanitation services. UNICEF and WHO (2015) report that over 663 million people worldwide still cannot access potable water and 2.4 billion people are still deprived of improved sanitation facilities. Studies indicate that 43% of the global population without access to these services live in Sub-Saharan Africa (Dagdeviren & Robertson, 2011) and approximately 60% live in informal settlements (Tsinda et al., 2013). Consequently, the governments of developing countries must adopt new approaches and mechanisms to accelerate the extension of essential services to informal settlements (Kobel & Del Mistro, 2015). To this end, the UN (2019) has called upon governments to formulate and implement urban management policies and practices that manage urbanisation. The UN emphasises that such policies should ensure that everyone has access to necessary services, including access to drinking water and improved sanitation (UN-Habitat, 2012).

Nevertheless, many governments in developing countries have been hesitant to create plans to improve and extend water supply and sanitation services to informal settlements,

resulting in an increasingly higher proportion of people without access to these vital services (Kessy & Obrist, 2008).

Water and Sanitation: Historical trends in Informal Settlements

Today, the critical WASH related challenges in informal settlements centre around the need to develop truly sustainable, "fit for purpose, place and people" approaches to guide the provision of safe and accessible sanitation services (Hegger & van Vliet, 2010). Several approaches to urban planning have been implemented worldwide to enhance the provision of services in urban areas, including informal settlements. Some of these approaches have been developed specifically to improve water and sanitation services. Empirical studies have shown that many approaches have performed comparatively well; however, no single method has proven ideal (Murungi & Blokland., 2016). Findings from a case study review of models to improve water and sanitation services in informal settlements noted that there is limited information regarding the successful implementation of these approaches (Kennedy-Walker, et al., 2015). This section examines the historical trends in global strategies that aim to improve services in informal settlements, which should ultimately guide the answering of this study's research question.

Dagdeviren and Robertson (2011) conducted a critical review of debates in the literature over approaches to improving access to water and sanitation in informal settlements. They found that the approaches had evolved from centralised state-led initiatives to those that emphasise the private sector's participation and community engagement . Abbott (2002) suggests that a centralised approach to improving infrastructure and social services in informal settlements first began in 1950. This approach encourages modernisation via the complete demolition of informal settlements and their replacement by upgraded planned settlements with public structures and centralised utility systems (Kobel & Del Mistro, 2015). Plans for water and sanitation services have been integrated into urban development planning and centrally implemented in the upgrading of demolished informal settlements. The approach was promoted and successfully implemented in Europe, North America and Singapore. Indeed, to a vast extent, these countries have managed to eliminate informal settlements. However, in the 1970s and 1980s, this approach was deemed as inappropriate for developing countries, largely due to its expense (Dagdeviren & Robertson, 2011). In its place, private sector participation by international and multilateral financial institutions was promoted.

The wave of private sector participation in the improvement of water and sanitation in urban areas, including informal settlements, was experienced worldwide and was implemented

in countries located in Latin America, including Argentina and Bolivia, at the beginning of the 1990s (Hardoy & Schusterman, 2000). Subsequently, private sector participation was also promoted in other developing countries in Africa and Asia (Araral, 2009). The hypothesis used to promote the model was that the private sector would provide investment financing, improve efficiency and reduce the burdens placed on governments, as the private sector could generate more revenue and thus improve coverage to informal settlements (Tutusaus et al, 2018). Reviews of various case studies that sought to evaluate the performance of the private sector's engagement in the water sector have yielded mixed results. Indeed, findings suggest that under this model, such services are not being provided to low-income communities (Hardoy & Schusterman, 2000). Thus, there are suggestions that the privatisation model did not meet expectations that it would reach low-income communities in developing countries, as it was characterised by inequality, poor coverage to low-income settlements and unsustainability due to a lack of community engagement (Araral, 2009).

The failure of the centralised and privatisation model to reach the urban poor gave rise to an alternative approach to provide services to low-income communities (Mapunda et al., 2018). Specifically, a decentralised and sector-specific approach was promoted. Under this approach, there was a generally high level of advocacy involvement from the community in collaboration with the private sector, CBOs and NGOs (Kurian, 2007). Various case studies in developing countries suggest that this approach represented the best practice for improving water and sanitation in informal settlements for several reasons. Akbar et al. (2007a) noted that the model encourages community empowerment, reduces government subsidies and uses appropriate technologies that fit the characteristics of informal settlements. However, Baruah (2007) argue that there is not sufficient evidence to support the success of the model and the extent to which it has managed to provide services to informal settlements. Indeed, most of the case studies focused on the challenges that have arisen in expanding and enhancing the services. Tutusaus et al. (2018) identified a number of common challenges, including achieving economy of scale and limited technical and financial capacity. Further, the low economic development in informal settlements was identified as a barrier to raising sufficient revenue for operation and to scaling the model up to the national level.

Hardoy and Schusterman (2000) argue that the developing countries that have better managed to provide water and sanitation services to informal settlements have generally adopted the Integrated Water Resource Management (IWRM) framework. The evidence suggests that models that have been successful in serving the urban poor have adopted the IWRM framework and applied the IWRM's guiding principles. . A study conducted by GIZ (2019) in five African countries, to assess the impact of urban sector reforms and investments,

revealed that water entities with a clear and formal framework for the urban poor were able to provide more access to water and sanitation in informal settlements. Similarly, Heymans et al. (2016) found that entities with pro-poor orientation models managed to provide water and sanitation services comparatively well in informal settlements.

Analysis of Policy Transfer Framework

Public policy literature suggests that most government policies and programmes in one country are common in other countries (Rose, 2004). However, the levels and the types of policy interventions and approaches to a specific problem within a given time and subject to specific conditions might vary from one country or city to the next (Wolf & Baehler, 2018). Similarly, the success and outcomes in the execution of policies and programmes may also vary (Marsden & Stead, 2011). The failure of policies and programmes to achieve an intended outcome in a country can result in policymakers and actors to conduct research and undertake analyses to establish what should be done to improve these situations (Bennett, 1991). Much of the public literature recommends that when such failures occur, actors should first analyse the situations in their own country or city and then try to seek solutions based on experiences from elsewhere (Benson & Jordan, 2011). Such actors can seek alternative solutions from other countries to address the critical challenges and problems that cannot be resolved with reference to available internal experiences (Rose, 2004). Arguably, learning from our counterparts can help reduce the time and resources expended in finding novel solutions and can also reduce uncertainties. Evans and Davies (1999) identified a number of critical factors that lead one nation to turn to the experiences of other nations, including dissatisfaction with present policy, public concerns, perceptions of policy failure, competition and uncertainties. Herman (2011) suggests that policy transfers from elsewhere provide a valuable source of information from which different actors can learn how to improve their local approaches.

To guide the process of policy transfer, some researchers in public policy have developed guidance and frameworks to guide actors seeking experiences from elsewhere and to evaluate the applicability of those experiences to the local country. Further, the framework helps actors to make an informed decision as to what policy or programme to consider and what part of the approach to transfer, implement, adopt or reject. Dolowitz and Marsh (2000) suggest that there are two forms of guidance provided in the literature: 1) the analytical framework; and 2) a series of guiding questions. The authors argue that most of the frameworks focus on the series of questions that a particular study should follow in the process of policy transfer.

To date, very little research has been conducted on specific frameworks for policy transfer. One example, however, is Herman (2011). While Dolowitz and Marsh (2000), Rose (2004) and Bennet (1991) developed general frameworks that use a series of questions to guide actors, Herman (2011) developed an analytical framework, comprising six steps (Figure 1), specifically to share international experiences in water policy and governance arrangements. As such, this study adopted Herman's (2011) analytical framework, as it guides policy transfers in the water sector. One advantage of this framework is that it involves key actors in the policy transfer process (Benson & Jordan, 2011). Benson and Jordan (2011) have identified some of the critical issues that can influence the choice of the source country, including culture, language, constitutional, geographical proximity and economic structure. Arguably, the focus should be on the economic, social, political and ideological perspectives and the selection of a peer country that has a similar level of development.

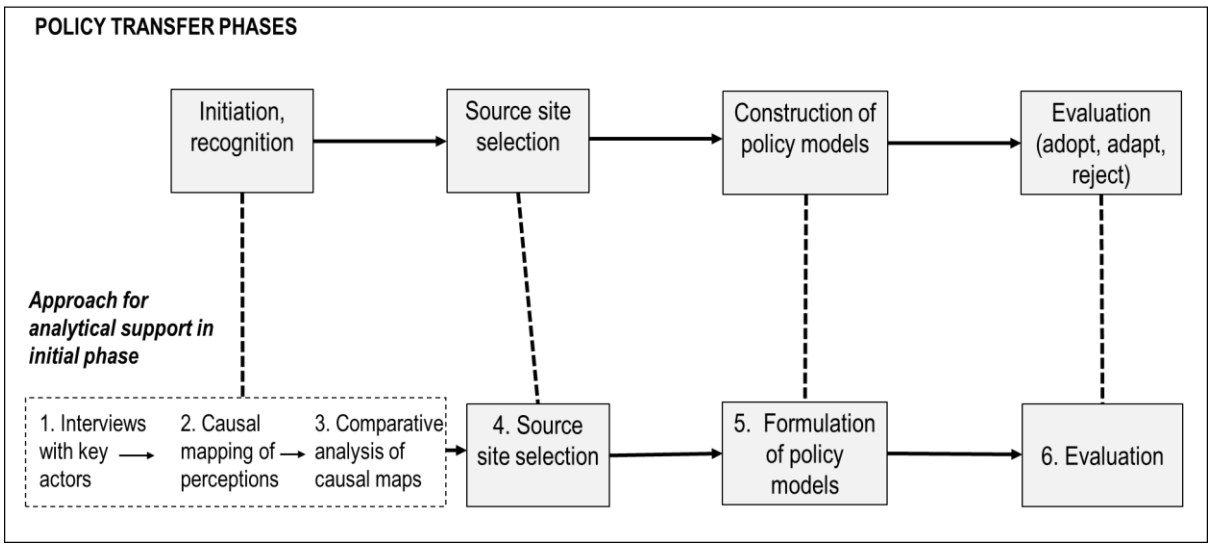

Figure 1. Analytical framework of policy transfer. (Source: Herman, 2011).

One limitation of the framework is that if a process is politically dominated, different decisions might be made at different stages of a policy transfer (Herman, 2011). Additionally, the experiences drawn from the source site might not be implemented. Another limitation is that the framework does not provide analytical support for the final stage, evaluation and implementation of the experiences at a target site; rather, the framework suggests that stakeholders' aspirations be used to guide any evaluations of a transferred policy. Despite these acknowledged limitations, the framework remained the most suitable and applicable policy transfer approach for this research project based on its previously identified advantages and strengths.

METHODS

This study sought to develop a model to facilitate improved water supply and sanitation services to underserved informal settlements in Dar es Salaam using lessons from other developing countries. To do this, Herman's (2011) analytical framework of policy transfer was adopted. The framework comprises six steps:

1. collect data from stakeholders via semi-structured interviews using open questions to ascertain the main problems, their causes and the need for policy transfer;
2. analyse the data and construct a causal map that reflects the perceptions of stakeholders;
3. conduct a comparative analysis to identify the overarching issues that the majority of stakeholders suggest in relation to policy transfers;
4. identify the source sites with positive experiences that provide promising solutions to the problems identified;
5. formulate the proposed model; and
6. evaluate the mechanisms of the model and their applicability to the target site.

The data used were categorised as either primary or secondary. The primary data were gathered directly from stakeholders via on-line, semi-structured interviews, while the secondary data on Dar es Salaam city (desktop situational analysis) and case study reviews of best practices for serving the urban poor in developing countries, were drawn from the literature.

Desktop literature review - Best Practices examples and Case Studies

There were two main components of the literature review. Firstly, to identify best practice examples to subsequently synthesize 'success factors' that could inform questions in the semi-structed interviews and also underpin model development. The second component of the literature review was to focus more specifically on identifying suitable case studies for potential policy transfer to Tanzania (e.g. Dar es Salaam). For both these components, data was gathered from a range of sources including peer-reviewed research articles, census reports, published annual sector reports, Dar es Salaam Water Supply and Sanitation Authority [DAWASA] annual reports and government documents. For a summary of the best practice reviews and detailed success factor descriptions see Supplementary file. Ultimately, two case studies were selected

Semi-structured interviews

Online semi-structured interviews were used to gather primary data using a list of open-ended questions structured to include the 13 success factors identified from the literature review of best practice case studies. The questions were also structured and targeted according to the role and responsibilities of the participants. Thus, not all of the participants were asked to answer all the questions. A list of the open-ended questions was sent to the participants via email before the interviews. The Griffith University Human Research Ethics Committee granted ethical approval to conduct this study (GU/2020/054).

Semi-structured interviews were conducted online via Skype™ in March 2020. Participants were asked for their views on the critical problems and possible solutions to the current approaches to providing water and sanitation services in informal settlements in Dar es Salaam.

Situational analysis

A situational analysis of the city water supply and sanitation systems in informal settlements in Dar es Salaam was conducted to gain an in-depth understanding of the current approach and the critical challenges that need to be addressed. This also helped to inform the interview questions. Dar es Salaam is the biggest city in Tanzania, and the majority of its inhabitants reside in informal settlements. Additionally, the city has a low coverage of water and sanitation services in its informal settlements. Such a situation creates an opportunity to gather data on the limitations and challenges that arise in delivering water and providing sanitation services from the perspective of various stakeholders working in informal settlements. For a summary of the situational analysis, see Supplementary file.

Stakeholder selection

Stakeholder participants for the interviews were identified and recruited based on the primary author's experiences from working in the water sector in Tanzania, as well as the best practices identified in the case studies. A snowball method was used during the interviews to obtain the contact details of other potential stakeholders. The identified stakeholders were sent an invitation letter, asking them to participate in the study and interviews. In total, 11 stakeholders (Table 1) agreed to participate in this study.

Table 1: *List of Research Participants*

Role	Organisation	Code
WASH adviser	Non-government organisation	N1
Senior officer	Ministry of Water	G1
Management staff	Water sector regulatory agency	R1
Management staff	Water Supply and Sanitation Authority (WSSA)	D1
Senior officer	Water sector regulatory agency	R2
Management staff	WSSA	D2
WASH expert	Non-government organisation	N2
Gender adviser	Non-government organisation	N3
Health officer	Municipal council	L1
Director	Small-scale water service provider	S1
Sole trader	Small-scale water service provider	S2

Data Analysis

The gathered data from interviews were triangulated with the findings from the situational analysis in Dar es Salaam and the content analysis from the literature review. The data was thematically analysed to construct a causal map. The causal map represents the opinions of the participants concerning the primary purpose of improved water and sanitation services in informal settlements and the factors affecting these objectives. By applying the insights from the 1) causal map, 2) interviews and 3) success actors identified from the best-practice case study reviews, a conceptual model was then developed and evaluated for its applicability to the Tanzanian context, specifically Dar es Salaam.

RESULTS AND DISCUSSION

Summary of Success Factors from review of best practices

In this study, 15 case studies from developing countries were reviewed and 13 key success factors identified as shown in Figure 2. Success factors relate to *practises and approaches that provide effective and sustainable water and sanitation services* to informal settlements (e.g., the institutional framework, social, economic, financial and technical requirements). Table 2 summarises the best practices for each success factor. The best practices indicate that governments and institutions with formal pro-poor policies are willing to allocate funds and incentives to support the improvement of services in informal settlements in collaboration with other stakeholders (Sinharoy et al, 2019). The review of the case studies, however revealed that there is a gap in knowledge about which pro-poor policies and models are successful, as many interventions in informal settlements have only been implemented as pilot studies and have not yet been scaled up to the national level (Kariuki, 2003). For the purpose of this study, a successful model refers to a model that has managed to provide effective and sustainable water supply and sanitation services to low-income communities by balancing the success factors with the requirements and resources.

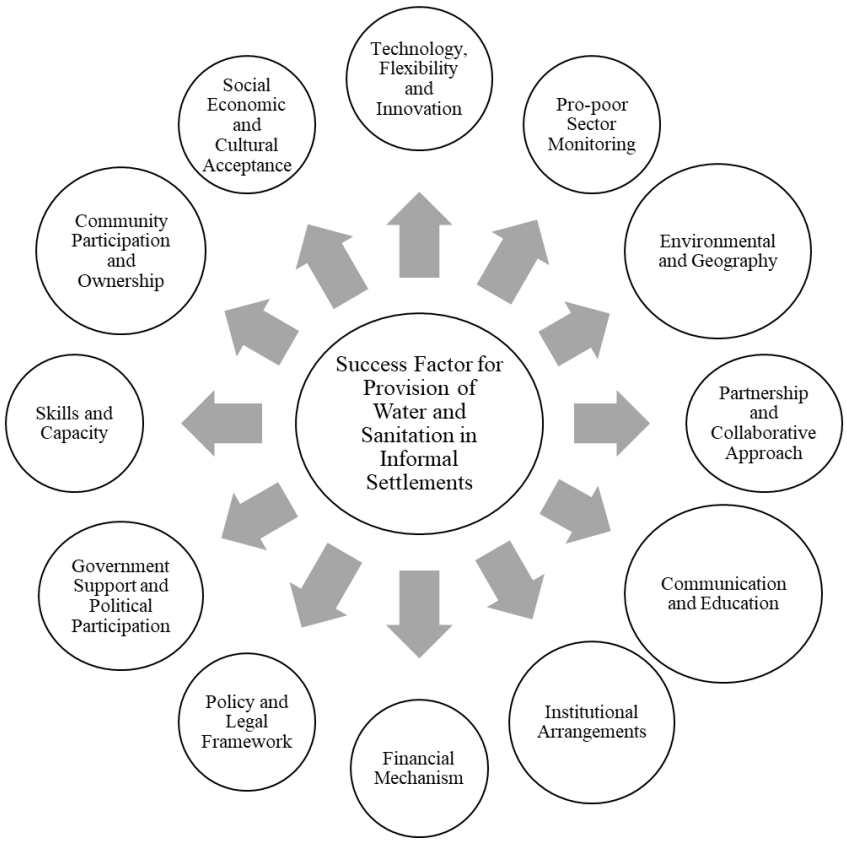

Figure 2: Key success factors for improving water and sanitation in informal settlements.

350 **Table 2:** *Success factors and best practices for improving water and sanitation in informal settlements in developing countries*

Success Factor	Best Practice Examples
Financial Mechanisms	Financing mechanisms dedicated to low-income communities are required. Such mechanisms include government subsidies, special trust funds, cross-tariff subsidies, external support and cost-sharing (Crow & Odaba, 2010; Mwanza, 2000). Both Kenya and Zambia have national water trust funds dedicated to supporting the provision of water and sanitation to informal settlements (Mwanza., 2000).
Community Participation and Ownership	The community should initiate the demand for services and pay or share the capital costs involved in the entire project cycle and those related to the management, operation and maintenance of the system. Additionally, the water committee and CBOs should be accountable to the community (Kurian, 2007). In Dhaka, Bangladesh, the communities operate and manage their water scheme with NGOs and the WSSA, which provide support and build capacity (Akbar et al., 2007b).
Technology, Flexibility and Innovation	The sector's policies and standards should be flexible and promote low-cost technologies and consider the capacity, socio-economic and environmental conditions of the informal settlements. The sector should support and cooperate with research institutions and the private sector to promote local technology and innovation (Schwartz & Sanga, 2010). In Dhaka, Bangladesh, water kiosks were promoted to ensure all informal settlement dwellers have access to clean and safe water (Akbar et al., 2007a).
Policy and Legal Frameworks	The policy and legal frameworks should have a pro-poor orientation that promotes people's right to access water and sanitation services, promotes decentralisation and guides pro-poor tariff regulations and structures. The framework should allow for the creation of an independent regulator to regulate formal and informal service providers (GIZ, 2019).
Strategies and Plans	The sector should implement strategies and plans to create water and sanitation investment plans and programmes to improve services to underserved low-income communities (Schwartz & Sanga, 2010). The Government of Kenya has a five-year national strategic plan that targets underserved informal settlements (Water Sector Trust Fund [WSTF], 2018).
Institutional Arrangements	Institutional arrangements should seek to support a community-centred approach, multi-stakeholder participation and integrate the management of water and sanitation (Gerlach, 2008: WUP, 2018). The Lusaka Water and Sanitation Corporation in Zambia has a unit dedicated to the management of water and sanitation in informal settlements (Mwanza, 2000)
Government Support and Political Participation	A framework should be introduced that encourages local leaders and politicians to participate in the development of projects. These leaders and politicians should be accountable to the community. The government should provide continued support in the form of subsidisation (GIZ, 2019; Mwanza, 2000).
Skills and Capacity	The service providers and stakeholders need to have the appropriate human capacity to develop planning tools to serve the urban poor. The Lusaka Water and Sanitation Corporation's informal settlement unit in Zambia has employed Community Development Officers to build capacity and support the communities of informal settlements (Bashir et al, 2014; Mwanza, 2000).
Socio-economic and Cultural Acceptance	Demand and willingness to pay should be the driving factors in identifying the level of services required by informal settlements. The framework should promote social equity, introduce social tariffs, encourage women to participate (Isunju et al., 2011). In Bangladesh, 95% of the water committee members are women (Akbar et al., 2007b).
Communication and Education	Communication guidelines and programmes should be implemented that reflect the needs of the communities living in informal settlements. These should address short-term reform issues and long-term behavioural changes, such as those related to the payment of services (Lüthi et al., 2011).
Partnerships and a Collaborative Approach	An institutional framework should be introduced that supports partnerships and collaborations that take advantage of the knowledge and experience of stakeholders. The Kampala City Water Corporation in Uganda adopted a city-wide sector approach that brings together all of the local stakeholders and development partners working in the informal settlements (Schwartz & Sanga, 2010).
Environmental and Geography	Technology should be selected that matches the environmental conditions, terrain and accessibility (Kombe et al, 2015).
Sector Monitoring with a Pro-poor Orientation	A transparent pro-poor monitoring system should be implemented with clear targets and indicators (Murungi & Blokland, 2016). The regulator in Kenya (i.e., the Water Services Regulatory Board [WASREB]) established a pro-poor monitoring indicator to measure progress in informal settlements (WASREB, 2019a).

351

352 **Table 3**: Results of thematic analysis: percentage of participants that mentioned the problems

Themes	Sub-themes—Main Problems in Informal Settlements	Participants (from Table 2)	Total
Financing Mechanisms	Lack of targeted financing	G1, R1, D1, S1, S2, R2, LI, N3, N2	82%
	Low revenue of the WSSA	R2, N2, N3, L1	36%
	No financial incentives to invest in the informal settlements	R1, R2	18%
Community Participation and Ownership	Lack of accountability and incentives for the management of the CBOs	R1, G1, N1	33%
	Restricted community project scaling up	N2, N3, LI, D1, D2, R2	67%
Technology and Innovation	No financial incentives to acquire low-cost technology and scale-up	G1, SI, S2, R1, N3, D1, D2	64%
Policy and Institutional Framework	Inadequate legal enforcement instruments	N2, N3, L2	33%
	Inadequate Faecal Sludge Management (FSM)	R1, N3, D1, LI, R1, R2, D2	78%
Regulatory Mechanism	Lack of recognition and regulation of small scale service providers (SSSPs)	N3, GI, LI, R1, R2, SI, S2, D2	73%
	Lack of regulatory incentives to serve informal settlements	R1,G1,D1	27%
Strategies, Plans and Communication	No long-term national sector strategy	S1, GI, NI, N2, N3, LI, D2	64%
	Limited knowledge and awareness of the pro-poor programme	DI, D2, R1, R2	36%
Social-Economic and Environmental Factors	Lack of concerted efforts to upgrade an informal settlement	D1, D2, G1, R2, N3, N2	55%
	No multi-stakeholder approach	N3, S1	18%
Government Support and Political Participation	Reduced government funding in the urban water sector	R2, N2, N3, L1	54%
	Lack of government commitment and willingness to invest in informal settlements	G1, L1, R1	33%
	Limited political participation	R1, R2, D1, D2	24%
Skills and Capacity	Inadequate human resource capacity	G1, D1, N3, L1	44%
	Inadequate management of CBOs	DI, D2	22%
Partnership and Collaboration	No formal partnership between the utility and SSSPs	S1, S2, N1, N3, RI	45%
	Lack of coordination and cooperation among public institutions	N3, D1, D2, LI	36%
Monitoring Mechanisms	Lack of pro-poor monitoring indicators	N1, G1, D1, N2, N3, L1, R1	70%

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354 Identifying the main problems is the first step in the policy transfer process (Herman,
355 2011). The results of the thematic analysis showed that the participants acknowledged the

presence of the problems but held diverse perceptions as to what were the main issues. The majority of participants (82%) cited the lack of sustainable financing mechanisms to support investments in formal infrastructure as the most significant problem. As one participant (G1) stated, the '*lack of sustainable financing mechanisms is the biggest problem and [is] deteriorat[ing] [the [improvement of service[s] as well as contribut[ing] to the increase of poverty'*. Interviewees indicated the reasons associated with the lack of sufficient funds and financing mechanisms, include a lack of dedicated funds targeting low-income settlements and low revenues generated by the WSSA due to low tariffs and high unaccounted for water (48.4%). Approximately 54% of the participants stated that the reduction of government funding negatively affected low-income dwellers, as the utility investment was more focused on middle and high-class members of society.

A majority of the participants (78%) also agreed that inadequate FSM was the second most significant problem. The participants acknowledged the importance of FSM and noted that the sector has no clear guidelines on this issue. One participant (N3) noted that '*currently [the] emptying, collection and disposal of sludge are done informally by the private sector*'.

A lack of recognition and regulation of the SSSPs providing water and on-site sanitation services were also cited as a problem by the majority of participants (73%). Many noted that regulating the SSSPs, especially those without networks, would be difficult; however, they believed that regulatory incentives and services could be improved if such regulations were introduced. One participant (LI) stated: '*There is a need to monitor SSSP[s] to reduce the risks and avoid [the] dumping of sludge in the open environment.* Another participant (SI) stated: '*The company is confident that if regulated, it will provide incentives and an opportunity to expand the business'.* Another participant (R2) acknowledged that the existence of SSSPs is critical and that this needs to be recognised, as SSSPs provide more than 75% of the services in informal settlements. Conversely, other participants (e.g., G1) noted the lack of pro-poor monitoring indicators had prevented sector stakeholders from gaining insights into and improving the services provided to informal settlements. Approximately 70% of the participants agreed that pro-poor monitoring indicators were important. The participants linked the absence of pro-poor monitoring indicators to the lack of a clear definition of informal settlements and no baseline data.

Approximately 64% of the participants cited the lack of financial incentives and a long-term strategy as critical problems. One participant stated, '*[A] lack of subsidisation and tax relief hinders [the] availability of sufficient and appropriate emptying and transportation facilities as well as confidence in investing in sanitation business'* (N3, D2). Another participant (D1) noted that a lack of sufficient equipment has caused people to '*manually empty*

and illegally dispose of sludge in the environment'. Further, the lack of any long-term financial strategy has prevented the sector from developing long-term intervention programmes and prioritising and creating opportunities for funding.

The participants were also asked about their views on the best approach to address the identified problems (see Table 4). The proposed solutions were thematically analysed and classified into appropriate sub-themes. The participants were of the view that local government authorities and the WSSA could not provide adequate water supply and sanitation services to informal settlements in the absence of reliable mechanisms that sought to unite the efforts of the other stakeholders. Generally, the participants' opinions differed; for example, when asked about the importance of developing a dedicated fund to support water and sanitation interventions in informal settlements, the participants suggested a range of options. The majority (64%) suggested that a special fund targeting underserved informal settlements be established; however, other participants (27%) suggested that an innovative tariff structure for subsidisation be introduced while others (18%) suggested that a surcharge on water bills be introduced.

In summary, the thematic analysis showed that all the participants had a clear understanding of the major problems related to water supply and sanitation services in the informal settlements and, importantly, had also identified a number of potential solutions. Despite some varying views about their roles and responsibilities, all of the participants were reasonably aware of the main problems and possible solutions. Herman (2011) suggests that if stakeholders are entirely aware of the problems and needs, this can form the basis to proceed with the process of finding experiences from elsewhere and transferring a model and mechanisms to address the problems.

Case Studies for Policy Transfer to Tanzania

Along with a general review of best practice examples for water and sanitation management in informal settlements throughout the world, a focussed content analysis on specific case studies was also undertaken. The purpose of this was to identify developing countries with promising models and gain an understanding of how these models work, the circumstances in which these models work and the challenges that arise in improving services to informal settlements (see Table 2). Two countries, Kenya and Vietnam, were selected as the primary case study communities for this study.

425 ***Table 4:*** Mechanism to Address the Problems in Informal Settlements

Themes	Sub-themes for Main Problems	Participants	Total
Financing Mechanisms	Innovative tariff structure to ensure full cost recovery	NI, R1, N2	27%
	Introduce a special fund targeting informal settlements	G1, D1, N3, L1, S1, S2, R1	64%
	Introduce a surcharge on water bills	R2, D2	18%
	Allocate funds from the Tanzania Social Action Fund (TASAF)	R1	9%
Community Participation and Ownership	Formal partnerships between the WSSA and CBOs/NGOs	L1	11%
	Provide financial incentives for the management of CBOs	N2, N3, DI, L2, R1	56%
	Adopt a broad and community-centred approach	N1, G1	22%
Technology and Innovation	Incentivise by subsidising low-cost technology	N2, N3, LI, L2, R1, R2	55%
Policy, Legal and Institutional Frameworks	Delegate the management of low-cost technologies to local communities	R1	11%
	Provide community education and training on policies, strategies and programmes	N1, N2, N3, R2, G1, LI	67%
	WSSA and local institutions sign a memorandum of understanding on the local coordination of water and sanitation services	R1, N3, G1, D1	44%
	Formulate a single sanitation policy	D2, L1	22%
	Formulate sector guidelines for FSM	GI, R1, N3, D1, D2	56%
Regulatory Mechanisms	Regulate SSSPs	N3, GI, L1, R1, R2, S1, S2, D1	73%
	Promote the formation of a local water and sanitation enterprise	D2, D1	18%
Strategies, Plans and Communications	Demarcate and map the informal settlements and develop a strategy	DI, D2, G1, N1	36%
	Build capacity to prepare the strategy and plans	DI, D2, N3, N2	36%
	Design communication guidelines and a programme targeting low-income dwellers	S1, S2, GI, R1, R2, N3, LI, DI	73%
Social-Economic and Environmental Factors	Upgrade the informal settlements	D1, D2, G1,	27%
	Adopt a multi-stakeholder approach to provide services	D1, N3, R2	27%
Government Support and Political Participation	Introduce a special government programme for informal settlements	G1, L1, R1	33%
Skills and Capacity	Have the WSSA employ sufficient and appropriate staff	L1	11%
	Build the capacity of the utility and CBOs to manage water and sanitation services	NI, R1, N2, N3	44%
	Cluster a small CBOs to improve the economy of scale	R2	11%
Partnership and Collaboration	Develop a multi-sector collaborative framework	NI, R1, N2, R2, G1	45%
	Develop a partnership agreement framework between the WSSA and SSSPs	S1, S3, D1, D2, L1	45%
Monitoring Mechanisms	Map and gather baseline information	N1, G1, R1, D1, D2, N2, N3, L1	89%
	Establish a monitoring framework	D1, D2, N3, L1	44%

A critical review was conducted of each selected model to establish how that model had been developed and implemented, its effect and any challenges that arose. A summary of the evaluation of each model is provided in Supplementary file. Kenya was selected as a source site for transferring mechanisms related to financing, strategies and plans, FSM, communication and education, local coordination and pro-poor monitoring (Mati & Mugo 2018, WSTF 2018, Claudia 2017, Okoth et al 2017, Mansour et al 2017, Gerlach 2008, WSP 2003). Conversely, Vietnam was selected as source site for its regulations and the scaling up of SSWSPs to provide water services to informal settlements (Susanna 2014, Unwin 2010, Conan et al. 2004, Sinh 2002).

EVALUATION AND APPLICABILITY OF THE MODEL FOR TANZANIA

This section evaluates and discusses the experiences and mechanisms transferred from Kenya and Vietnam by comparing these to: 1) the perceptions and promising solutions suggested by the participants; and 2) the existing framework in Tanzania. The section especially addresses the over arching research question: how lessons learned from the provision of water and sanitation services in other countries can be applied to improve services in informal settlements in Tanzania. A comparison of the promising solutions suggested by the participants and the models in Kenya and Vietnam revealed significant areas of agreement. Thus, in theory, the models from Kenya and Vietnam could be implemented in Tanzania if sufficient government and political support were provided. However, the question arises: What conditions and reforms are required to transfer the models to the Tanzanian context, specifically Dar es Salaam? In answering this question, each mechanism is evaluated and discussed.

Four critical problems are selected for further discussion: financing mechanisms, pro-poor monitoring, formalisation of SSSP and FSM mechanisms. Although the interview respondents considered all the problems identified as essential to moving forward with a more sustainable model, the four that were selected for further discussion represented some of the most consistently raised issues.

Financing Mechanisms and the National Strategy

The lessons learned from Kenya suggest that a WSTF should be established to finance infrastructure and improve water and sanitation services in underserved low-income

communities in Tanzania. Notably, Tanzania has a National Water Fund (NWF) that was established in 2016 under the *Water Act 2009* to support investments in the entire sector. The NWF mobilises resources locally and externally to provide investment support for the provision of water and the management of water resources in both urban and rural areas (URT, 2019). As participant G1 noted, the NWF currently provides funds to support water and sanitation programmes in rural areas; however, low-income communities residing in urban areas, who are facing similar challenges as those in rural areas, lack similar financial support. Under the *Water Act 2019*, the Minister for Water (MoW) can enact regulations and describe the functions of the NWF (URT, 2019). Thus, the MoW could create financing opportunities within NWF and adopt Kenya's financing model; however, this might require the political participation and lobbying of stakeholders. The creation of financing opportunities may represent the best approach to reduce recurrent expenditure and could be less costly than establishing a new institution.

The interviewed participants also suggested that special taxes (surcharges) be introduced to the water bills of connected customers to complement the water fund. Such an approach could be appropriate and could be adopted as an additional local resource. This is not a new idea in Tanzania; at present, all households connected to the National Electricity Grid must contribute an additional 3% of the sum of their electricity bills to support the Rural Electricity Fund (2020). In Cote d'Ivoire, water customers in urban areas contribute an additional 5–36% of the sum of their water bills (depending on the category in which they fall) to support the sanitation fund (Kariuki, 2003). A study was conducted in Kenya of customers of two water utility providers to assess their willingness to pay surcharges on their water bills to support essential services for low-income communities. The results showed that customers were willing to pay an 8% surcharge on their monthly water bill (Owuor & Foeken., 2012). In Tanzania, such a system could be effective in urban areas operated by water utility providers that have metering and computerised billing systems. The MoW, in collaboration with its stakeholders, could consider establishing a surcharge (based on customer categories) that enables customers to contribute to the fund without affecting their willingness to pay and the affordability of the service.

Another lesson learned from Kenya relates to the development of a long-term national sector strategic plan, which is an essential tool in mobilising and accessing financing from the government and development partners. In Kenya, the development of this strategy enabled the Government of Kenya to attract significant funding from its developments partners (WTTF, 2018). In Tanzania, there are no barriers to prevent a similar strategy from being adopted. The NWF could develop a strategy to facilitate the mobilisation of funds and create an opportunity

to obtain funding from international development agencies interested in investing in low-income communities. However, there must be a balance between local and external financing, as best practices encourage local financing options to enhance financial sustainability (Mwanza, 2000). Thus, the Government of Tanzania could use the lessons learned from Kenya to create an opportunity within NWF to support investments in informal urban settlements . Additionally, surcharges on water bills for connected urban customers should be introduced to supplement the NWF. The NWF should develop a five-year national sector strategic plan to attract internal and external financing.

Mechanisms for Pro-Poor Monitoring

The Kenyan model revealed the importance of establishing pro-poor monitoring indicators that should be developed by the regulator and adopted by the WSSA. In Tanzania, the sector regulators are responsible for establishing the key performance indicators for the urban water sector and setting the minimum standards that need be achieved by WSSA (EWURA, 2019). The introduction of a pro-poor monitoring indicator would incentivise water authorities to perform better and extend their services in low-income areas and could also encourage other water authorities to do comparatively better. Water authorities use a computerised information system to submit a report on their performance to the regulator of which the performance indicators are inbuilt in the system (EWURA, 2019). Thus, a new indicator could be developed and introduced to the system and added to the list of key performance indicators used to rank the performance of water authorities. Challenges may arise due to the limited capacity of the WSSA to develop a strategic plan and use GIS mapping in informal urban settlements. In Kenya, the WSTF has helped the WSSA to build its capacity and develop these instruments. A similar approach could also be adopted in Tanzania to address these challenges.

Mechanisms for the Formalisation of Small-Scale Water Service Providers

It will be difficult to regulate and scale-up SSWSPs. Many countries largely ignore SSWSPs despite the fact that SSWSPs play a significant role in providing services to low-income communities (Heymans, 2016). The Vietnam case study showed that SSWSPs with small water networks should be recognised, scaled up and registered upon entering into long-term partnerships with the WSSA. The Vietnam model could easily be transferred to Tanzania, as the *Water Supply Regulations 2019* allow the WSSA to enter into partnerships with private sector businesses, such as SSWSPs (URT1, 2019). The model encourages SSWPs to comply

with water utility standards and grants them tax exemptions. During the interviews, two SSWSP participants (S1, S2) stated that they had a small network of approximately 500 customers each and suggested that a similar approach to the Vietnam model could be adopted in Tanzania. They also noted that forming partnerships with the WSSA and complying with the standards would build trust and confidence in investments, as the SSWSPs would be assured of compensation in the future. One participant (S1) admitted that most of the materials they use, such as the pipes, do not meet the required standards because there is a lack of assurance about the future and a lack of recognition of SSWPs. Partnerships will enable SSWSPs to expand their networks, serve more households, access loans and ensure the quality of their services (Conan et al., 2004). In relation to tax exemptions, the Government of Tanzania has a policy of tax exemptions for the procurement of materials for the construction of water schemes (TRA, 2019). This model should encourage the private sector to invest in water and sanitation services in informal settlements. Under the model, the regulator would also be able to regulate the water prices charged by SSWSPs. Under the *Water Act 2019*, SSWSPs can form associations to submit their tariff applications to the regulator through the water authorities. If this model were adopted, it would support the extension of services to informal settlements and ultimately reduce water vending.

Faecal sludge management mechanisms

The Kenya case study showed that FSM guidelines should be introduced to guide the sector and the service providers in FSM. Tanzania has no FSM guidelines; however, the majority of participants were of the view that FSM guidelines were needed. The Kenyan model also suggests that guidelines should be developed by the regulator in collaboration with the stakeholders. In Tanzania, the water sector regulator is empowered to establish standards and guidelines for the water sector (URT, 2019). Thus, guidelines could be introduced without implications. The Kenya case study also showed that the WSSA should manage faecal sludge across the entire sanitation chain in collaboration with local governments and private sector enterprises. This approach could be transferred to Tanzania, as under the revised *Water and Sanitation Act 2019*, the Government of Tanzania has empowered the WSSA to manage the entire sanitation chain (URT, 2019). However, Tanzania is likely to face some challenges concerning the capacity of the water authorities to finance the provision of infrastructure for a decentralised sanitation system and monitor that system, as most providers do not have staff at the community level. As suggested above, financing opportunities should be created to provide support to the WSSA to invest in facilities and offer financial incentives to households that meet the standards for onsite sanitation. In the case of staff at the community level, the Kenya

563 case study suggests that providers should enter into agreements with local governments to build
564 capacity and engage with the relevant ward health officers, local leaders and community health
565 committees.

566 One participant (N3) suggested that financial incentives should be provided to health
567 officers, local leaders and community health committees to motivate them and improve
568 efficiency. The agreements with local governments will enhance the monitoring of FSM,
569 minimise illegal emptying and dumping and also raise community awareness. Additionally,
570 private emptying businesses should not be subject to economic regulations to increase
571 competition. Un-regulation of private emptier is currently being practised in Tanzania; thus,
572 there will be no implications for any transfer. Notably, guidelines should be developed to
573 enhance the technical regulations for private emptying businesses. The case study also showed
574 that social marketing measures should be introduced to increase the WSSA engagement with
575 local government to build a strong network with key stakeholders.
576

577 **Summary of the Discussion and Evaluation**

578 The discussion and evaluation of the mechanisms used in Kenya and Vietnam revealed
579 many that could be adopted and implemented in Tanzania without the need to review the sector
580 policy and legal framework. A few areas might require review; for example, the NWF
581 regulations might need to be reviewed to create financing opportunities aimed at supporting a
582 water and sanitation investment programme in informal urban settlements. Other significant
583 issues would need to be addressed to establish FSM guidelines, a pro-poor monitoring
584 indicator, partnership agreements between the WSSA and SSWSPs and ensure the
585 implementation of a city-wide approach for engaging local stakeholders. The selected models
586 used the IWRM framework, which promotes the use of regulations to ensure the sustainability
587 and affordability of services. Under the IWRM framework, the models also support
588 decentralisation in the provision of services and encourage the participation of the private
589 sector. The framework also emphasises the importance of conserving water resources, using
590 low-cost technologies, protecting the environment, addressing socio-economic issues,
591 providing sustainable financing and addressing issues of global concern, such as climate
592 change.
593

594 The proposed model is shown in Figure 3 and is based on the best practices and the
595 lessons learned from case studies in other countries with positive experiences. While it is
596 important to recognise that community-specific contexts (social, cultural, geographical, etc)

are critical to successful adoption, there are a number of similar challenges and barriers that have been considered in the model that are applicable to informal settlements in many areas of Tanzania. These include: the overarching financial model for all Tanzanian informal settlements, need to investigate willingness to pay surcharges, better management of faecal sludge and better use of private sector businesses such as small-scale water providers. If adopted for implementation, the model should facilitate the provision and supply of adequate potable water and improve sanitation services in informal urban settlements in Tanzania. It would also promote public health, enhance social equity, improve the financial sustainability of water service providers and have socio-economic benefits for informal urban settlement dwellers.

Limitations of the Study

The number of participants in this research was limited due to the method used for recruitment and engagement (an online method was used during the early stages of the Covid-19 pandemic). This may have also reduced the number of critical problems and solutions identified and thus could affect the acceptability and adoption of the model. Future research should include a broader consultation with stakeholders (including community members and small service providers) to obtain their views on the proposed model before it is adopted or implemented.

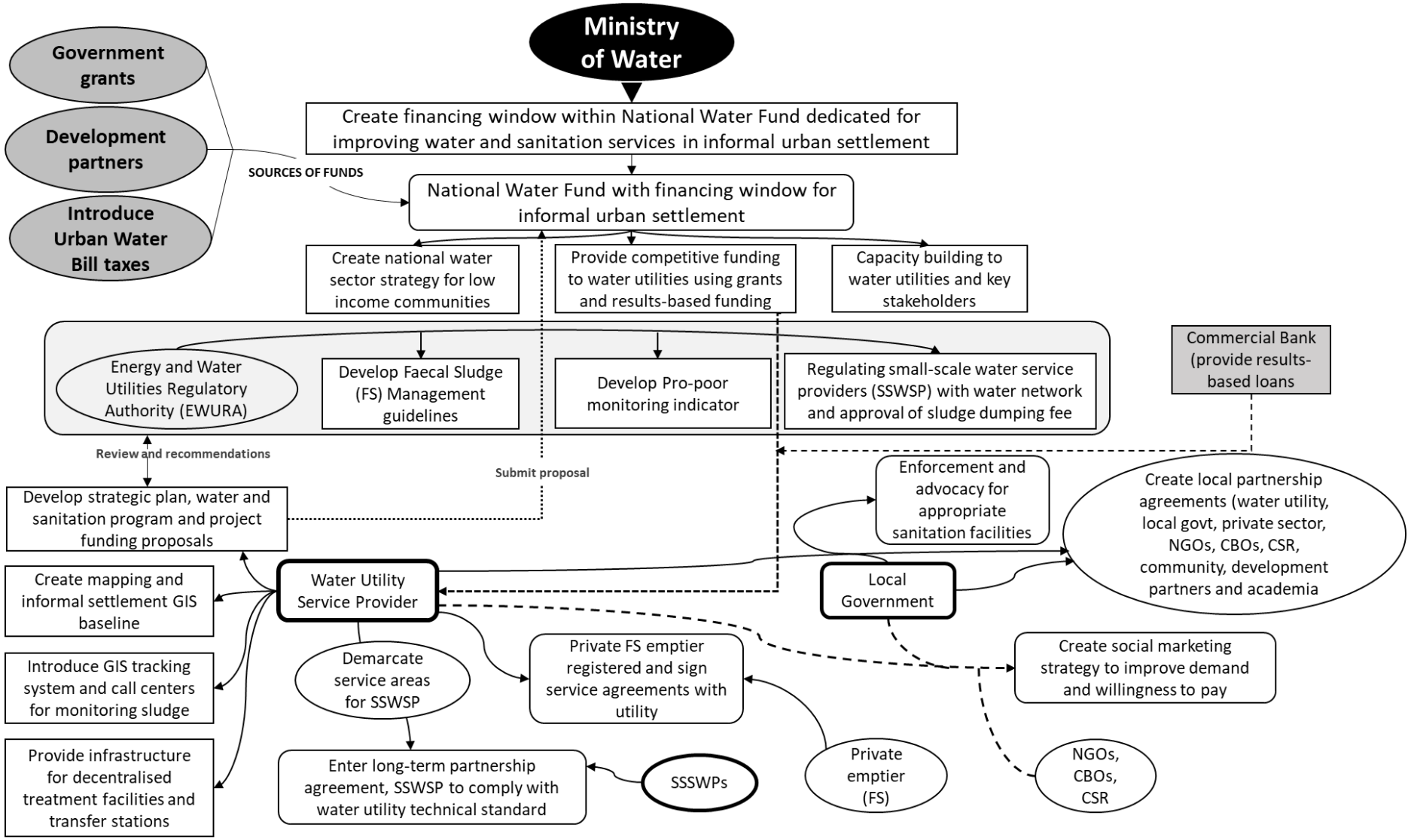

***Figure 3**. Proposed model for improving water and sanitation in informal settlements.*

Conclusions and Recommendations

This study sought to develop a model to facilitate improved water supply and sanitation services to underserved informal settlements in Tanzania using lessons from other developing countries. Dar es Salaam, the largest city in Tanzania, was selected following a desktop situational analysis.

The model's acceptability and application would depend on the Government's decision to review the regulations and develop the proposed guidelines, strategy and plans. However, this could be achieved via the mobilisation and involvement of key stakeholders and political parties. It may be necessary to change the model's mechanism during implementation; however, the underpinning principle of the model would remain the same. Notably, the model cannot solve all existing problems; however, it would improve water supply and sanitation services to informal urban settlements in Tanzania significantly.

The following recommendations are based on the research findings and the proposed Tanzanian model for water and sanitation services in informal settlements:

- revision of the existing regulations (under which the National Water Fund was established) to create financing and investment opportunities for programmes dedicated to improving the water and sanitation services provided to informal settlements;
- The NWF should develop and adopt a long-term sector strategy to guide the sector to develop pro-poor plans and programmes and mobilise financial resources;
- Establishment of FSM guidelines by the water sector regulator to guide the sector and service providers in the provision of services and finance and the implementation of standards, regulations and monitoring;
- Water authorities in Tanzania to recognise small-scale providers with water networks and enter into long-term partnerships to improve water service coverage and quality in informal settlements;
- Collaboration and cooperation with local stakeholders operating in the informal urban settlements of Tanzania (e.g., by entering into partnership agreements) and a memorandum of understanding to be established;
- The WSSA to design and implement an education and communication programme that focuses on low-income communities residing in informal urban settlements to

raise awareness, increase education and enhance behavioural changes around managing water and sanitation systems (e.g. to reduce health hazards associated with household sanitation and water storage etc.);

- As the proposed model is new, the Government of Tanzania should conduct a pilot study to identify any barriers and challenges that might arise in the implementation of the model, which in turn should increase the sustainability and the scaling up of the model.

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