



Enhancing livelihoods of the urban poor through productive uses of utility-supplied water services – Evidence from Kampala, Uganda

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ABSTRACT

Slums, one of the main faces of urban poverty, are escalating in Sub-Saharan countries and other developing countries. Achievement of the overly ambitious Sustainable Development Goals will require cross-sectoral interventions. A good example is the Multiple Use water Services (MUS) framework, a livelihood-centred approach that is implemented in rural areas of over twenty countries, where water supply primarily designed for domestic or irrigation purposes is also used for productive uses (e.g. animal husbandry) to improve householders' livelihoods. This paper reports on a study conducted in 2017/18 in Kampala (Uganda) which adapted the existing rural-based MUS framework into a slum-specific framework. The study found that using utility-supplied water for productive uses was predominant in the slums, albeit unrecognised by the water utility. Implementation of the slum-specific MUS framework will be effective only with the water utility's recognition/support, probably as part of its philanthropic portfolio. Livelihoods-based NGOs could provide further 'software' support.

1. Introduction

UN-Habitat (2016) estimated that the proportion of the world's population living in urban areas increased from 43% in 1990 (2.3 billion) to 54% in 2015 (4 billion), most of the increase being in developing countries. One of the key negative effects of the escalating urban growth in developing countries is the unprecedented increase in city residents living in slums or informal urban settlements. A slum household is defined as a group of individuals living under the same roof, in deprivation of basic infrastructure services such as basic piped water services, improved sanitation, enough living area, and security of tenure (UN-Habitat, 2003). Although recent estimates provided by UN-Habitat indicate that the proportion of urban population living in slums in the developing regions has reduced from 46.2% in 1990, to 29.7% in 2014, absolute numbers have increased to over 880 million in 2014, compared to 689 million in 1990 (UN-Habitat, 2016). Furthermore, global and regional statistics mask extreme disparities between countries and cities. For instance, UN-Habitat estimated that in mid-2012, the urban slum population in Sub-Saharan Africa was about 62% (UN-Habitat, 2016).

Slums are one of the main faces of poverty, inequality and deprivation in many cities of developing countries. Slum conditions are

characterised by overcrowding, lack of land tenure, unemployment or underemployment, widespread insecurity – including violence against women and children, poor water, sanitation and health services (Muchadenyika & Waiswa, 2018; Water and Sanitation Program, 2009). Hence, improving the lives of slum dwellers will make a significant contribution to the global goal of ending poverty, as highlighted by the Sustainable Development Goals [SDGs] (UN-Habitat, 2016). Achievement of targets for SDG 6 on water, sanitation and hygiene will have direct links to and will reinforce the achievement of targets for achieving SDGs on ending poverty [SDG 1]; ending hunger [SDG 2]; ensuring healthy lives [SDG 3]; equitable and quality education [SDG 4]; gender equity and inclusion [SDG 5]; promoting sustainable economic development [SDG 8]; and making cities inclusive, safe, resilient and sustainable [SDG 11] (Parkinson, 2010; UN Water, 2019).

This paper presents findings of a study carried out in 2017/18 to explore how improved utility water services in slums could contribute to enhancement of slum dwellers' livelihoods, through productive uses of water. A livelihood has been defined as comprising of capabilities, assets (including material and social resources) and activities that jointly determine the type of living gained by an individual or a household (Carney, 1988; Chambers & Conway, 1991). The next section provides an overview of water service provision in low-income urban

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settlements; Section 3 presents extant literature on multiple uses of water, and highlights research gaps. Section 4 provides the objectives, methodology and study setting; Section 5 presents the research design; and Section 6 the findings of the study. Finally, Section 7 provides a discussion and conclusion.

2. Provision of water services to the urban poor

The most recent (2017) update on drinking water service coverage by the WHO/UNICEF Joint Monitoring Programme shows that access to at least a basic drinking water source in urban areas of least developed countries improved from 77% in 2000 to 83% in 2015. However, over 448 million urban residents received water services that are *not* categorised as ‘safely-managed’, with 162 million lacking even ‘limited’ drinking water services (WHO and UNICEF, 2017). Safely-managed water services are obtained from an ‘... improved water source which is located on premises, available when needed and free of faecal and priority chemical contamination’; while limited drinking water services are from ‘... an improved source where collection time exceeds over 30 minutes for a roundtrip to collect water, including queuing’ (WHO, 2017). Most of the urban residents *without* acceptable levels of drinking water services are those residing in slums where extension of piped water services by the service providers is difficult, and who are assumed to have a low ability to pay for piped water services (Adams, 2018; Isoke & van Dijk, 2014).

The increasing number of slumdweller amidst poor governance and weak institutions has posed a daunting challenge for national and municipal governments in the developing countries (Adams & Zulu, 2015). Poor infrastructural service coverage in urban informal settlements has been attributed to several constraints, which could be categorised as (i) rapid urbanisation; (ii) physical-technical; (iii) economic/financial; (iv) institutional; and (v) structural/legal/socio-cultural. An overarching constraint is the poor state of urban infrastructure in most developing countries that is outstripped by the escalating urbanisation. Physically, most informal settlements are in parts of cities with difficult terrains, which sometimes require unconventional service delivery technologies. These technologies are costlier to the service providers and usually unaffordable to consumers in slums, especially in terms of start-up/connection fees and costs. Institutionally, municipal governments and other service providers do not have adequate institutional capacity to deal with complexities to provide sustainable services to these high-density informal settlements. Lastly, issues of property rights, land tenure problems and the legality of the informal settlements provide difficulties for the service providers (Adams, 2018; Isoke & van Dijk, 2014; Kayaga, 2013; Padowski, Carrera, & Jawitz, 2016). Access to water supply services and other infrastructure services is further constrained by climate change (Roberts, 2008).

Many developing countries achieved the Millennium Development Goal (MDG) target for drinking water supply in urban informal settlements by providing a shared water facility, either in form of public standpipes/kiosks connected onto a piped water supply, or vendor-operated water supplied from alternative water sources such as boreholes, springs and wells (Dagdeviren & Robertson, 2009). For the post-MDG era, these water sources are categorised by the WHO/UNICEF Joint Monitoring Programme as a *basic* level of service i.e. ‘drinking water from an improved source provided collection time is not more than 30 min for a roundtrip including queuing’ (WHO, 2017). When located in slums, most of these sources do not necessarily provide safe drinking water as (i) they are highly susceptible to groundwater contamination, given a combination of poor sanitation facilities and the high density; (ii) the low water quantities obtained from these sources compel the slum residents to rely on multiple water sources, including unprotected sources; and (iii) water collected from sources away from the premises are highly susceptible to recontamination during handling and transportation (Dagdeviren & Robertson, 2011).

Analysed data from the most recent UN-Habitat (2013) report on

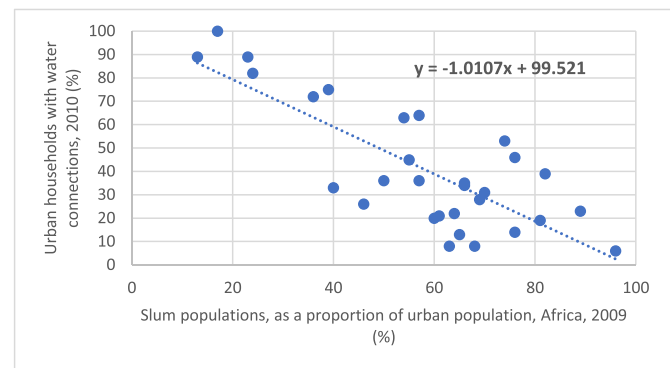


Fig. 1. Slum population and urban access to water in SSA.

[Source of data: UN-Habitat, 2013]

the state of world cities support the above assertion that advances in access to improved water sources in informal settlements of cities in developing countries was accomplished mainly through installation of public or communal water points. Fig. 1 shows a scatterplot of proportions of urban households in 30 African countries connected to private water connections in 2010 plotted against percentages of slum populations in 2009. The graph shows a significant negative correlation between the two attributes: the lower the slum proportion, the higher the proportion of households with private water connections. It should be noted, however, that the association depicted by the trendline in the graph has not considered other significant factors such as inadequate distribution networks in expanding well-planned built areas of cities and the declining condition of infrastructure in areas where the formal network exists (Dagdeviren & Robertson, 2011).

Public water utilities lack resources, obligations or incentives for extending services to the urban poor (Hunt & Tremolet, 2006; Sansom & Bos, 2008). One school of thought which dominated the late 1990s and early 2000s was that urban water utilities required to work with specific non-state providers (NSPs) for service provision, depending on the operating environment. NSPs in the water and sanitation sector may take the form of informal private providers, civil society organisations supporting community-based management, or private operators providing services under a public-private partnership (Sansom & Bos, 2008). Hence, various scholars suggested that NSPs should be supported to build their capacity for delivering quality of services to the urban poor, leading to their integration into the formal water sector (Conan & Paniagua, 2003). However, this approach may work only as a stopgap measure - it will not sustainably deliver safe drinking water services to slum residents: water and sewerage networks require huge sunk investment costs, which cannot easily be financed through cost-plus pricing in developing countries dominated by households with a depressed ability-to-pay (Dagdeviren & Robertson, 2011).

This paper takes the position that professionalised water utilities are in the best position to deliver, in the long run, sustainable water services in cities of developing countries. Ultimately, challenges in the delivery of services to low-income urban settlements will be overcome through infrastructure investments and institutional capacity development of the water utilities (Dagdeviren & Robertson, 2011; Kayaga, Mugabi, & Kingdom, 2013). Some public water utilities in developing countries have built their institutional capacity to improve basic services to low-income urban settlements, to a service level that supports implementation of water-dependant productive activities. Two examples from the East African region stand out: the Nairobi City Water and Sewerage Company (NCWSC) of Kenya and the National Water and Sewerage Corporation (NWSC) of Uganda.

In Nairobi, as of 2016/17, the Informal Settlements Department of NCWSC had extended over 330 km of piped network in urban informal settlements and was providing water services to over 210,000 slum

dwellers (Water & Sanitation for the Urban Poor, 2018). Similarly, by 2017, Uganda's NWSC had installed over 20,000 manually operated public standpipes and over 1600 prepaid meters in low-income urban settlements in Kampala (Kanyesigye et al., 2018). This article takes the position that such progressive water utilities have the capacity to supply extra amounts of potable water to support other productive uses of water, on top of requirements for cooking, washing, sanitation and other household chores; leading to improved livelihoods for the urban poor. The next section explores the concept of multiple-use water services.

3. Multiple-use water services

There is increasing documented evidence of positive impact of improved water supply, sanitation and hygiene (WASH) services on health and social outcomes. For instance, a recent study undertaken by Sanitation and Hygiene Applied Research for Equity (SHARE) consortium found that WASH potentially has strong positive impact on diarrhoeal reduction, nutrition, maternal and new-born health, complementary food hygiene, menstrual hygiene management, school attendance, female psychosocial stress, violence, oral vaccine performance, and neglected tropical diseases (Mills & Cumming, 2016). The Multiple-Use water Service (MUS) concept, which is part of a customer-oriented philosophy, seeks to extend the benefits of water services to productive uses of water. The MUS approach ensures water security for health and productive activities, which enhances social equity and reduced poverty (Moriarty & Butterworth, 2003). Water sector professionals have increasingly been exposed to the need to go beyond their sectoral boundaries and take a multi-disciplinary approach to solving developmental issues. Their mandates to deliver water services for a single end use, such as domestic consumption, irrigation, livestock or fisheries does not match with the realities faced by their customers, or their needs and aspirations (Van Koppen et al., 2009).

Since the early 1980s, professionals in the WASH and irrigation sub-sectors have realised that infrastructure designed for single use, such as domestic water supplies or irrigation, were in practice being used for other non-planned uses. Domestic water supplies were used also for livestock rearing, small-scale enterprises or homestead gardening. Likewise, irrigation schemes were used for also some of these activities, in addition to domestic chores (Moriarty & Butterworth, 2003; van Koppen, Smits, Rumbaitis del Rio, & Thomas, 2014). Initially, water professionals and managers in both sectors considered these extra activities as illegal and endeavoured to stop the users, but these measures proved ineffective (van Koppen et al., 2009). With time, some water professionals started to realise the value of the livelihood benefits of the unplanned uses of domestic water supplies and irrigation schemes (van Koppen et al., 2014).

The MUS 'movement' was spearheaded in early 2000s by organisations in the irrigation (e.g. the International Water and Management Institute) and domestic (e.g. IRC International Water and Sanitation Centre) subsectors. MUS is defined as 'a participatory, integrated and poverty-reduction focused approach in poor rural and peri-urban areas, which takes people's multiple water needs as a starting point for providing integrated services, moving beyond the conventional sectoral barriers of the domestic and productive sectors' (Van Koppen, Moriarty, & Boelee, 2006). The MUS concept is grounded in the livelihood-centred approach to water services delivery, which enables the WASH sector to broaden its focus to include productive water use, hence contributing more to poverty reduction. Furthermore, the livelihoods-based approach reinforces WASH specific initiatives such as demand-responsive approaches, improved cost recovery, rights-based approaches and the integrated water resources management paradigm (Moriarty & Butterworth, 2003).

Implementing the MUS approach contributes to attainment of the SDG targets in various ways (van Koppen et al., 2009, 2014): (i) it minimises extreme poverty by improving food production and incomes

for households; (ii) it reduces the burden on children of fetching water for water-based enterprises, hence releasing them to attend school; (iii) it promotes gender equality by the reduced water burden and opens up opportunities for productive ventures near the homestead; (iv) child mortality is reduced through safe drinking water and better nutrition, which are correlated to higher disposable income; and (v) it contributes to environmental sustainability through improved efficiency of using water sources for multiple purposes, with potential for water re-use. The benefits listed above reinforce each other in a virtuous circle, which enables households to climb out of poverty (van Koppen et al., 2009).

Piloting of the MUS approach has been accomplished through three main entry points: (i) the domestic-plus modality, in which the priority set by policy makers and water professionals is for domestic uses, but promotes higher levels of services to allow for productive activities such as livestock, home-based enterprises and backyard gardening; (ii) the irrigation-plus modality, in which water professionals prioritise crop irrigation, but also promote non-irrigation uses, mainly through designing for add-ons such as cattle troughs, washing steps or diversions for laundry; and (iii) MUS-by-design, whereby water professionals provide water interventions without any predefined priority uses, leaving the beneficiary communities, through a participatory planning process, to prioritise technology design and water allocation (van Koppen et al., 2014). The MUS approach has been successfully piloted in rural and peri-urban areas of over 20 low- and middle-income countries in Asia, Africa and Latin America. MUS projects have been successfully accomplished by international NGOs in countries such as Ethiopia, Ghana, Honduras, India, Nepal, Niger, Tanzania, Bolivia, Colombia, Zimbabwe, South Africa, Ghana and Burkina Faso (Adank, van Koppen, & Smits, 2012; van Koppen et al., 2014).

A conceptual framework for implementing MUS was developed based on experiences from these pilot projects and discussions held in various fora by the global MUS group. As shown in Fig. 2, the MUS implementation cycle is comprised of six basic phases. In the first phase, the group championing MUS should gain understanding of the context and raise the interest of the users, service providers and other potential supporting organisations. This engagement will enable the stakeholders to appreciate the potential benefits and limitations of the MUS concept. In the second phase, a more elaborate situational analysis is conducted about the current and projected water resources situation, water infrastructure, current water use and projected demand. In the third phase, the potential beneficiaries should be led into agreeing on a common vision and development of a strategic plan for multiple-use water service provision, taking account of social equity issues within the community. The fourth phase involves working out the financial requirements and identifying the source of funding for implementing MUS interventions. Next, the strategic plan is implemented, which may be done incrementally where necessary. Finally, it is important that post-construction support is provided to the service providers and the beneficiaries in terms of capacity development, technical assistance and provision of an enabling environment (Adank et al., 2012).

As earlier mentioned, the MUS framework shown in Fig. 2 has been developed and tested in rural and peri-urban areas where households have land as one of their natural assets. Furthermore, households in rural and peri-urban areas have an option of exploiting several water sources for self-supply water services, which can easily be designed for multiple-use water services. These opportunities may not be available for residents of high-density low-income urban settlements. The 'Livelihoods from Enhanced water Access for the Poor in Slums' (LEAPS) study reported in this paper sought to adapt parts of the conceptual framework shown in Fig. 2, to low-income urban settlements. Only three steps of the MUS framework shown in Fig. 2 were validated, due to the short duration of the LEAPS project. The next section presents the specific objectives and methodology of the study.

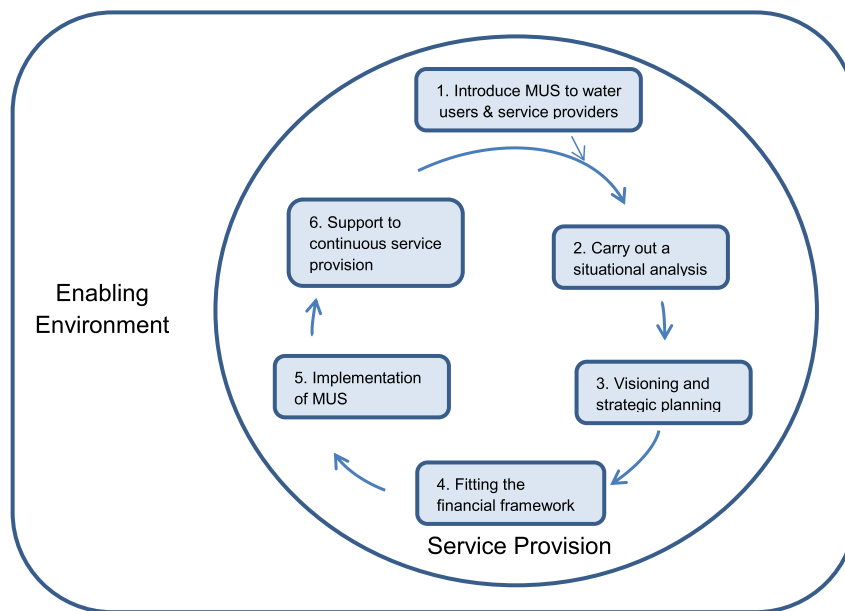


Fig. 2. Conceptual framework for implementing MUS.
(Source: Adank et al., 2012)

4. Objectives, methodology and study setting

The ‘Livelihoods from Enhanced water Access for the Poor in Slums’ (LEAPS) study was jointly carried out by the Water Engineering and Development Centre (WEDC) of Loughborough University (UK) and the National Water and Sewerage Corporation (NWSC) of Uganda from November 2016 to January 2018. Key specific objectives of the study were to:

- (i) Analyse opportunities for application of MUS concepts in low-income urban settlements.
- (ii) Work with relevant key stakeholder organisations and community groups to develop and validate the draft slum-specific MUS framework.
- (iii) Explore collaborations for implementing the slum-specific MUS framework.

The corresponding research questions were:

- (i) How could the improved water supply services provided to low-income urban settlements by progressive urban water utilities in developing countries be exploited to enhance the livelihoods of slum dwellers?
- (ii) How could the first three steps of the MUS framework already validated in rural and peri-urban areas be adapted for application in low-income urban settlements?
- (iii) How could the relevant stakeholder organisations involved in uplifting livelihoods of slum dwellers work with urban water utilities to implement a slum-specific MUS framework?

For the study, we used a case study methodology, which was considered suitable for answering the above exploratory questions; and enabled us to collect data in the real-world context (Yin, 2009). Using Kampala, Uganda as the study setting, we engaged with communities living in eight slum areas situated in three city divisions. These study sites were purposely selected to represent low-income urban settlements where NWSC the urban water utility has made deliberate interventions to improve water supply services. The selected zones were Kisenyi III, Kitti and Kiguli in Central Division; Ndeeba Parish, Kayanja, Nsike I, Nsike II and Mutawe zones in Rubaga Division; and Kibuye I,

Nkere and Nabisalu in Makindye Division. We also engaged with government and non-state organisations that are involved in service provision and supporting the slum communities to improve their livelihoods.

5. Research design

Rather than re-inventing the wheel, we proceeded to adapt the MUS framework developed for rural and peri-urban areas, as documented in the literature, and outlined in Fig. 2. We took into consideration different conditions that exist in high-density low-income urban settlements. The key differences are (i) the predominant source of water is the urban water utility, with few households having independent sources of water; (ii) households lack land, an asset that is usually utilised for productive uses of water in rural and peri-urban areas; (iii) space around the households in the slums may not be adequate for setting up some water-based enterprises; and (iv) there may be fewer opportunities to carry out community-based ventures for productive uses of water, as the community cohesion in low-income urban settlements is weaker than in the rural areas.

As the main water source in the slums is utility-supplied services, the first activity of the study was to gain support from the top management of NWSC, the urban water utility. We then carried out a stakeholder analysis to identify key organisations and civic leaders that have an interest in, and which could influence the outcomes of the study. Based on the scores of the stakeholder analysis (refer to Table 1), key organisations were invited to send representatives to a participatory learning alliance platform, which guided and supported the research process, taking into consideration local problems and needs (Butterworth, McIntyre, & da Silva Wells, 2011). The learning alliance group met quarterly to provide guidance to the study activities. Furthermore, quality assurance for the study was overseen by a steering committee comprised of two senior staff representing Loughborough University; two senior managers from NWSC; Town Clerk of one of the Kampala Capital City Authority's (KCCA) divisions where the study is being conducted; and the Country Director of WaterAid (Uganda).

At the start of the study, on 12 January 2017, we carried out an inception workshop attended by 27 representatives of key stakeholder organisations and civic leaders; and introduced to them the MUS framework. Based on the initial views from the inception workshop, the

Table 1
The developed slum-specific MUS framework.

Stage	Activity	Pre-requisites	Stakeholders involved
1. Introduction to MUS	Introductory meetings with Senior Management of the water utility	The utility is already providing basic pro-poor services	Initiating organisation and water utility's top management; utility's championing officers; organisations working for uplifting livelihoods of slum dwellers; the relevant city authority departments; civic leaders; community leaders.
	Mobilisation of key stakeholder organisations and civic leaders	Utility's top management's agreement to participate in the MUS initiative	
	Inception workshop	Willingness of the utility's top management & other key stakeholder organisations to drive the MUS initiative	
2. Stakeholder Analysis and Problem Identification	Stakeholder Analysis	Basic understanding of important actors and knowledge of local context	Households; all the above plus community groups; and other community teams involved in livelihoods/ development initiatives such as Water Point Management Committees; Village Health Teams; and Municipal Development Forums
	Rapid baseline assessment	There are no pre-requisites per se, though a familiarity with or a strong connection within the local context would be highly beneficial. The water utility plays an important role.	All the above
	Fostering interest of water-dependant productive activities, within households and/or community groups in the target areas	Basic understanding of local context and vision for MUS approach	All the above
	Engagement with, and enrolment of potential participants	Knowledge of, and interest in MUS approach	All
3. Detailed Situational Assessment	Assessment of actual water use and barriers to accessing water services in the project areas	Before carrying out these assessments it would be important to have created interest of some households and/or community groups in the water-dependant productive activities and carried out a stakeholder analysis and pre-feasibility study.	The urban water utility; the targeted households and/or community groups; the city/town authority; relevant community-based organisations and NGOs; local private entrepreneurs
	Assessment of MUS potential in the project area		
	Assessment of water demand for Domestic-plus MUS		
	Assessment of water supply capacity in the project area		
	Scanning of business opportunities	This needs to be done, based on the aspirations of households and/or community groups that have shown interest in carrying water-dependant productive activities	
	Assessment of the Enabling Environment	Data collected through assessments above.	
Assessment of MUS feasibility			
4. Implementation, Monitoring and Evaluation	Visioning and strategic planning	Feasibility of water-dependant productive activities in the targeted areas; water-dependant productive activities should be mainstreamed in the utility's policy framework; joint agreement between potential participants (individual households and community groups) and the water utility on the modalities of implementing water-dependant productive activities	The urban water utility; the targeted households and/or community groups, with the support of relevant city/town council departments and relevant community-based organisations and NGOs
	Fitting the financial framework		
	Acquire funds and carry out infrastructural improvements		
	Implementing the strategic plans		
	Continuous support		
	Dissemination and advocacy		
Monitoring and Evaluation			

learning alliance group meeting brainstormed and developed a draft slum-specific MUS framework. The proposed framework was developed based on the following key assumptions:

1. The quantity and quality of water supply services in low-income, high-density urban settlements have been improved to a threshold for supporting health and other domestic chores, plus water-dependant productive activities (van Koppen et al., 2014); and
2. The water service provider is willing and able to improve the quality of service in terms of intangible features for enhancing water-dependant productive activities.

Based on the study findings, the learning alliance team

progressively updated the draft slum-specific MUS framework, which evolved into one presented in Fig. 1.

To validate the slum-specific MUS framework, we consulted with community members using a variety of methods. First, we held community meetings in each of the study zones, attended by a total of 312 community members (118 males and 194 females) – these were held in July 2017. Next, we conducted eight focus group discussions (FGDs) with 111 selected community members (68 females and 43 males); and one group interview with 15 representatives of water-related community-based productive ventures – these were held in July, August and September 2017. To gain further understanding of issues raised in the FGDs, we carry out follow-up household interviews with 42 heads of households (25 female; 17 male) in the eight study areas – these were

held in October and November 2017.

In the meantime, during the months of July and August 2017, we carried out interviews with 23 informants from major stakeholder organisations involved in service delivery and NGOs/CBOs supporting livelihoods enhancement programmes for slum dwellers. Additionally, while conducting fieldwork in the study areas, researchers were asked to carry out observations to 'validate' some of the water-based enterprises in the communities. Finally, towards the end of the short study, on 9 November 2017, we carried out a stakeholders' workshop attended by 62 participants representing community members/groups in the study areas, plus key stakeholder organisations, in which we validated the results of the study.

Guides for key informant interviews, household interviews and FGDs were designed by the research team based on tools developed by the MUS Group (Adank et al., 2012). The various tools were pretested with staff of NWSC and piloted with a few household heads in two of the study areas. The final research instruments were subjected to checks and approved by Loughborough University's Research Ethics (Human Participants) Sub-committee. Data collection was then conducted by a combined team comprised of researchers from Loughborough University and NWSC. Since the collected data were not so numerous, we used Microsoft Word to analyse the qualitative data, as recommended by La Pelle (2004). The Microsoft Office tables were used to format the transcripts, code the data, and create themes/patterns that were utilised for analysis.

6. Findings

6.1. Stage 1: introduction to MUS framework

As earlier stated, the first activity in the study was to engage with top management of NWSC and gain their agreement to participate in the MUS initiative. This was easily accomplished through the local research team, who acted as champions for the MUS initiative within NWSC. Meetings were scheduled with NWSC's top managers, in which the LEAPS team articulated the strengths of MUS, and need for NWSC's commitment, if the MUS concept is to be adapted to slums serviced by NWSC. Participation in the LEAPS study was approved by NWSC top management, who seconded the Director of Business and Scientific Services and General Manager, Kampala Water to the membership of the steering committee for the LEAPS Project.

Having secured the support of NWSC, we co-organised an inception workshop and introduced the project to representatives of key stakeholder organisations and civic leaders of communities in the study areas. An overview of the existing MUS framework was presented, and ideas received from the participants on how it could be adopted in slum locations of cities in developing countries such as Kampala. These ideas were incorporated into a draft slum-specific framework developed by the learning alliance.

6.2. Stage 2: stakeholder analysis and problem identification

6.2.1. Stakeholder analysis

One of the first activities of the study was carrying out a rapid stakeholder analysis to identify organisations with a high importance, interest and influence in the implementation of the MUS approach. Table 2 shows an abridged version of the stakeholder analysis matrix.

The second column is about the level of importance the stakeholder organisation attaches to the implementation of MUS in slums. The third column on 'influence' is concerned with the power the stakeholder organisation has over the implementation of MUS, or the level of influence they can exert which affects the implementation positively or negatively. NWSC is considered to have a high level of influence, followed by KCCA, by virtue of their responsibilities for providing services to slums. Regarding 'importance', NSDFU and Actogether scored highest, given that they directly represent the potential beneficiaries,

the slum dwellers. Others considered to attach a high level of importance are KCCA, CIDI, SSA: UHSNET and WaterAid Uganda. Water for People and IRC Water International were considered to have a moderate level of both importance and influence, given the fact that they do not work directly in slum areas in Kampala. We used the results of the stakeholder analysis to set up the Learning Alliance platform to provide ideas and guide the research. The stakeholder organisations with a combined score of over 6 were invited to be part of the Learning Alliance platform, which met in January, April, July and October 2017. The Learning Alliance platform was composed of representatives from:

- Loughborough University, the principal investigator;
- NWSC;
- KCCA;
- Actogether;
- NSDFU;
- SSA: UHSNET;
- CIDI; and
- WaterAid Uganda.

6.2.2. Rapid baseline assessment

The main water source is utility-supplied water, delivered through prepaid public standpipes, conventional public standpipes, or, to a smaller extent, house connections. All participants stated that they prefer piped water because it is clean and safe. However, piped water is unreliable in the low-income urban settlements and considered costly by some residents. Hence, most residents supplement piped water with other sources such as springs, wells, and harvested rainwater. In Rubaga division, residents also have access to *Kabaka's Lake*, a small inland lake that has clear signs of eutrophication. In follow-up household interviews, it was stated that piped water in the household is earmarked for health-related household chores such as drinking and cooking – alternative water sources are used for house chores that do not need potable water.

Participants prefer to use prepaid public standpipes that use tokens mainly because:

- There are no connection costs;
- The cost of prepaid water is lower than that from conventional water connections;
- It is safe and clean;
- It is closer to them; and
- It can be easily accessible by all people.

Water from pre-paid meters, public standpipes and private connections is widely used in slums for livelihoods activities, including laundry services, restaurants, making beverages and juices for sale, boiling and selling drinking water, washing bays, saloons, rearing poultry, washing carpets and shoes, brick and briquette making, making liquid soap and shampoo, making tie and die cloth materials, recycling bottles and plastics. Both individuals and groups are involved in these activities. Some small businesses employ porters to fetch water from existing water points, for which they may pay up to UgX 400 (about 11.2 US cents) per 20 l of water, including transport, which is 16 times more than the pro-poor tariff of UgX 25 (about 0.7 US cents) per 20 l. In spite of the shortcomings, preliminary findings of the rapid assessment undertaken by the research team indicated that community members already involved in water-based micro-enterprises were looking to scaling them up; and many more community members were considering starting water-based productive activities.

6.3. Stage 3: detailed situational analysis

6.3.1. Multiple water Use Services (MUS): participants' perceptions and current practices

Participants in the community meetings, focus groups and

Table 2
Stakeholder analysis matrix.

Organisation	Scores: 5 = highest; 1 = lowest		Notes
	Importance	Influence	
National Water & Sewerage Corporation (NWSC)	3	5	NWSC is the main drinking water service provider in the study areas. It has a pro-poor department, which works towards reducing water losses and increasing revenue. NWSC is a member of the Kampala Urban Water Forum (KUWF) and supports poverty reduction through its corporate responsibility portfolio.
Kampala Capital City Authority (KCCA)	4	4	KCCA has a department in charge of welfare of slum dwellers. It issues byelaws for regulation of businesses and works towards enhancing tax revenue from businesses.
National Slum Dwellers Federation of Uganda (NSDFU)	5	2	NSDFU is a national NGO, to provide capacity development and solicit for funding, given as start-up loans for livelihoods activities carried out by organised groups.
Actogether (Uganda)	5	3	ACTogether a national NGO, is a KUWF member whose mission is to build capacity of NSDFU to improve NSDFU members' livelihoods and enhance their access to land, housing and basic services.
Community Integrated Development Initiatives (CIDI)	4	3	CIDI is an indigenous NGO that focuses on actions that directly improve the lives of the poor, vulnerable and marginalized people. It is also a member of the KUWF
Shelter & Settlements Alternatives: Uganda Human Settlements Network (SSA: UHSNET)	4	3	SSA: UHSA is a network organisation comprised of civil society organisations, communities, individuals, professional institutions and the private sector, coming together with the common interest of lobbying, advocating and sharing information for better policies, programmes and practices towards sustainable improvement of human settlements.
WaterAid Uganda	4	3	WaterAid Uganda has sound experience in pro-poor WASH services, is a member of the water sector steering committee and KUWF, and so well placed for advocating for policy changes
Water for People (WfP)	2	2	WfP works for improvement of WASH, mainly in rural areas. It sits on the WASH sector steering committee.
IRC International	2	2	IRC is an international NGO that works for resilient WASH systems from the grassroots level. It is also a member of WASH sector steering committee.

household interviews were explained about the MUS concept and asked what their views were about it; if there were any participants involved in water-dependant productive activities; whether these activities were carried out individually or in groups; how much water was used for each of these activities per day; and which activities were more profitable than others. Participants pointed out that MUS activities were predominantly practiced in slums. On the importance of water to livelihood activities in slums, one key informant said, ... *I am struggling to think of a livelihood activity that does not involved water*. Participants were ecstatic about the possibility of NWSC the service provider recognising and embracing the MUS concept. If water points could be distributed having MUS entrepreneurs in consideration, it would lead to a more reliable water service, and reduce their transportation costs, hence making their businesses more efficient. Socially, viable home-based MUS businesses would reduce absences of spouses from their homes, minimise suspicions between couples, hence improving family

relationships.

Table 3 shows water-dependant productive activities practiced by community members at the time of the study. As indicated in the table, although not all activities have an exclusive gender assigned to them, certain roles are predominantly female and others male. Men tend to wash cars or second-hand shoes; make ice cream; run saloons and public toilets. Women, on the other hand, tend to be occupied with washing and laundry services; washing and recycling bottles; making charcoal briquettes; selling juices; running eating places and grocery shops; and breeding chickens and livestock. A range of water usage is indicated, with the highest being car washing, restaurants and water retailing. The smaller scale operations such as animal rearing, bakeries, juice and briquette production use significantly less water in general.

Water required for these activities is mainly drawn from pre-paid public standpipes, usually at a price higher than that prescribed by NWSC. Activities that were considered most profitable were washing

Table 3
Current water-dependant productive activities by the research participants.

Activity	Group (G) or individual (I)	Daily water usage range (litres) ^a	Predominant responsible gender: male (M) female (F)
Washing clothes/dobby	G/I	10–600	F/M
Washing/recycling used bottles	G/I	10–160	F
Car washing	G/I	1000–3000	M
Second-hand shoe washing	G/I	40	M
Charcoal briquette production	G/I	120	F
Domestic & commercial water sales	I	40–2400	F
Juice, and beverage production	I	20–200	F
Ice cream production	I	Not stated	M
Baked goods	G/I	20–200	M
Restaurants/tea shops	I	20–3000	F
Running lodges & hotels	I	80	M
Saloons	I	20–60	M/F
Grocery shop	I	5	F
Public toilets and bathrooms	G/I	120	M
Liquid soap/shampoo production	G/I	40–200	F
Chicken breeding	G/I	200–300	F
Urban animal rearing	I	> 40	F
Drip irrigation farming	G/I	> 60	F/M

^a These volumes were estimated by participants of the community and group discussions, and so they may not be accurate.

used bottles, trading beverages, washing cars, running restaurants, and chicken rearing. Other water-dependant productive activities known to be common within the low-income urban communities are carpet washing; cleaning; tie and dye cloth production; handicrafts; building and construction; brick and paver making; and paint mixing. It was also stated that alternative water sources are used for some activities which do not necessarily require high water quality.

Many water-dependant productive activities are implemented by groups of slum residents organised into Savings and Credit Cooperative Organisations (SACCOs), most of which are supported by NSDFU, which is in turn supported by Actogether (Uganda), and are registered by Kampala Capital City Authority. The support is mainly in terms of capacity development, organisation, advocacy and soliciting for grants/loans nationally and internationally. NSDFU operates in 15 urban centres of Uganda, has over 38,000 members, with 377 community groups organised as SACCOs. Examples of NSDFU-supported SACCOs involved in productive uses of water were Kiti Youth Group (car washing), Kisenyi 3 Women Group (handicrafts); Workers at Leisure (crafts/shoes, motorcycle seat covers) and Kisenyi Development Team (bottle recycling). In the past, some SACCOs have received grants and/or loans from government livelihoods programmes such as Community Development Programme, Youth Livelihood Fund and Uganda Women Empowerment Programme.

6.3.2. Limitations and challenges for water-dependant productive activities

There was unanimity among the study participants that slum-specific water-dependant productive activities have a big potential to improving the livelihoods of slum-dwellers. However, participants identified several challenges to scaling up of the water-dependant productive activities. These have been categorised into technical, legal/institutional and social/economic issues.

a. Technical issues

Alternative sources of water such as springs are heavily polluted and cannot be used for most water-dependant productive activities. So piped water is the main source for water-dependant productive activities, mainly delivered through prepaid public standpipes (PPS). However, the number of PPS are insufficient, and residents walk long distances (e.g. 300 m for some participants) to fetch water – some water-dependant entrepreneurs incur extra costs for carrying the water. For PPS managed by caretakers, they are usually not accessible to the public at night. In some cases, caretakers completely deny residents access to the standpipes. Furthermore, tertiary pipelines were frequently being cut during road reconstructions, leading to water shortages in the area. These pipe breakages are partly responsible for intermittent flows, low pressure and poor physical-chemical quality of water productive activities.

Many traditional public standpipes in the low-income settlements are disconnected for a long time, due to non-payment of bills. For PPS, there are few places to buy tokens. Also, PPS frequently break down and there are delays in repairing them. In some locations, PPS are susceptible to being damaged by children. Also, PPS may be removed if the land in which they are located is being redeveloped. Residents also complained about the lengthy process of acquiring tokens and loading credit. Sometimes there are IT software issues with tokens – they fail to load credit, or the dispensed water is not equivalent to the credit loaded. Furthermore, tokens can easily be lost/stolen.

b. Legal/Institutional Issues

Lack of land ownership prevents many households from acquiring PPS, which in turn limits the number of PPS in the low-income settlements. Community members were unhappy that NWSC the service provider had relocated some PPS for various reasons such as (i) ongoing evictions and demolitions; (ii) conflicts over land ownership; and

(iii) caretakers denying other residents to draw water from the water points. There were also people not registered as caretakers vending water at the PPS. Participants pointed to inadequate communication and sensitisation on the part of NWSC about household tariffs; the use of PPS; and where to obtain tokens from. They also complained about inadequate notice in the case of planned water supply disruptions.

It was also reported that the government's ban on the use of some types of polythene papers had affected entrepreneurs involved in packaging water sachets. There was reportedly also a restriction on the use of recycled bottles. In some areas, NWSC struggles to get tenants willing to house PPS on their land.

c. Social/economic issues

Issues of insecurity and heightened risks were commonly cited, with respect to children who carry water over long distances. Participants also pointed to the increasing cases of theft of tokens among the residents. Yet the tokens are costly to replace, costing UgX 15,000 (about US\$4.2), and the process of replacing them is not clear to community members. Water drawn from non-automated public standpipes or neighbours' yard-taps is significantly more expensive, ranging between UgX 250–500 (US cents 7–14) per twenty-litre container, compared to UgX 25 (US cents 0.7) through a prepaid token, at least ten times cheaper. Participants pointed out that although water rates through yard-taps and house connections is theoretically affordable, the main barriers are lack of land tenure and the costs/charges of obtaining a new connection.

6.4. Stage 4: implementation, monitoring and evaluation

6.4.1. Visioning: how water-dependant productive activities could be enhanced in the slums

As stated in the earlier sub-section, participants were excited about the prospect of water-dependant productive activities being recognised by NWSC the service provider. They were positive that subsequent dialogue with NWSC would lead to resolving bottlenecks in the service delivery. Issues that they would like sorted by NWSC include:

- Provision of more public standpipes, particularly PPS, taking consideration of the needs of MUS entrepreneurs;
- Resolving issues related to denied access to PPS;
- Improving the reliability and water quality of the PPS;
- Improving the design of specific public standpipes to cater for the needs of some MUS entrepreneurs, e.g. boosting to the required pressure for the specific water-dependant productive activity (such as for car-washing), by providing a small overhead tank;
- Reducing the price of tokens and make their acquisition easier;
- Improving response times to technical faults of PPS; and
- Improving customer care for slum dwellers.

Participants requested for support in sourcing start-up capital for water-dependant productive activities. This is mainly in the form of easing of preconditions for applying for loans/grants from banks and other funding agencies. Examples of source of funding include (i) increased grants from various KCCA funding sources such as youth development fund, women development fund, gender and community development department; (ii) Uganda's central government welfare facilities such as Operation Creation Wealth; (iii) NGOs such as SDFU, Actogether, Environmental Alert, SSA: UHSNET, Uganda Water and Sanitation Network (UWASNET); (iv) soft loans by commercial banks that support community groups, e.g. Finance Trust Bank and Centenary Bank; (v) local SACCOs; (vi) international micro-finance institutions such as BRAC; and (vii) philanthropic grants from NWSC and other organisations.

Incentives could be given to those already carrying out water-dependant productive activities. An example cited in community meetings

is provision of subsidised prices to MUS entrepreneurs with high water consumption. Another suggestion was sourcing of market for MUS entrepreneurs. Above all, they requested for government to build their capacities in MUS entrepreneurship and small business management. On their part, participants stated that they could enhance water-dependant productive activities within their communities by (i) sourcing for more start-up capital for water-dependant productive activities; (ii) providing land/space for the activities; (iii) paying for the water bills on time; (iv) exploring potential for more MUS activities; (v) identifying markets for the products; (vi) instilling the culture of saving; (vii) providing space for installation of PPS; (viii) providing security for the PPS; and (ix) organising more groups for implementing water-dependant productive activities, including sensitisation of other residents.

6.5. Final validation of the slum-specific MUS framework and prospects for implementation

As stated in the 'Research Design' section, the draft slum-specific MUS framework was incrementally co-developed by a learning alliance team, based on findings from community consultations. The resultant framework was then presented to a joint meeting of representatives of community members and stakeholder organisations, held on 9 Nov 2017. Following inputs from this meeting, a final slum-specific MUS framework was developed, as presented in Table 1. It should be noted that for the one-year LEAPS project, only the first three stages shown in Table 1 were validated with the community members in the slums of Kampala. Although the fourth stage (shaded grey) was substantially discussed by the learning alliance group and presented to the final stakeholder meeting in November 2017, only the first activity of this stage -visioning, was validated or piloted within the case study setting. However, various stakeholders made useful comments on the viability of other activities in the fourth stage.

Stakeholders that attended the validation workshop suggested minor changes to the draft framework presented, and were positive that activities listed in Table 1, when implemented could lead to scaling up of water-dependant productive activities in slums. We then held detailed discussions with representatives of key stakeholder organisations on their capacity and willingness to implement/support the fourth stage of the proposed MUS framework. Firstly, we talked to several senior managers of NWSC the urban water utility, some of whom attended the validation workshop. They were positive that the MUS framework could be adopted by the senior management team as part of their corporate social responsibility remit – there is a set procedure for initiating the process. A suggestion was made by several NWSC managers that for implementation of MUS, it would be easier to deal with groups, rather than individuals.

There were also positive outcomes from discussions with other stakeholder organisations. NSDFU suggested user participation as an important ingredient if water-dependant productive activities are to be effectively implemented. NSDFU, whose major remit is to organise slum-dwellers into savings groups, offered to mobilise and sensitize its members; and facilitate the participation process. On the other hand, Actogether could contribute through (i) gathering information on current and potential water-dependant productive activities, the drivers and barrier of implementation; (ii) providing training and capacity development of community groups; (iii) encouraging community members to adopt a saving culture; (iv) soliciting for start-up finance for registered community groups; and (v) advocating for MUS recognition through Municipal Development Forums. KCCA offered to train community members on MUS implementation, and guide eligible community groups on financing opportunities available from the central and local governments. Other organisations willing to support MUS implementation included CIDI, WaterAid (Uganda) and SSA:UHSNET.

7. Discussion and conclusion

7.1. Opportunities for application of MUS in slums

Achievement of the SDG 6 for water, sanitation and hygiene would have reverberating positive contributions to the achievement of SDGs 1 (ending poverty); 2 (ending hunger); 3 (ensuring healthy lives); 4 (equitable and quality education); 5 (gender equity and inclusion); 8 (sustainable economic development); and 11 (inclusive, safe and resilient cities). The Multiple water Use Services (MUS) approach has been successfully tried in rural areas since the early 2000s to exploit water supply services for productive uses, hence enhancing consumers' livelihoods.

This study explored the potential to extend the implementation of the MUS framework to slums - locations with more challenging physical, institutional and socio-economic characteristics. The drive to implement the MUS framework in these slums arises from the fact that some slums are receiving water supply services of enough quantity and quality to support water-dependant productive activities. For examples, as shown in Table 3, slum-dwellers in Kampala are already using water for various productive water uses, even though NWSC the service provider does *not* officially support the extra uses beyond household chores. The study also showed that many more community members would be willing to get involved in productive uses of water, as it was considered a main channel to livelihoods enhancement.

Official endorsement and recognition of MUS by the service provider confers legitimacy, which would enable the creation of a more effective communication channel between MUS entrepreneurs and NWSC. Through constructive dialogue with the service provider, MUS entrepreneurs would negotiate for optimum service levels they desire for the productive uses. Many challenges affecting MUS implementation were considered technical and socio-economic in nature, most of whose resolution needs the water utility's direct intervention. Community members pointed out that they have the capacity to raise start-up capital, through household savings and grants/loans from existing welfare funds being disbursed by various state and non-state agencies and development banks. However, community members would need 'social collateral', which could be provided by NWSC or welfare organisations active in the slum, to access the grants/loans. Notwithstanding all the challenges highlighted in the study, the participants pointed out that the key driver to MUS implementation in slums is due recognition by the service provider. Even for other challenges considered as legal/institutional, they could easily be resolved with the water utility's involvement.

7.2. Development and validation of the slum-specific MUS framework

Building on an existing MUS framework for implementation in rural areas (Adank et al., 2012), a slum-specific MUS framework was adaptively co-developed, together with representatives of slum community members and key stakeholder organisations. The latter were constituted into a LEAPS Project Learning Alliance, which met on a quarterly interval, and brainstormed the full range of the proposed framework. Consultations with community members was accomplished through community meetings, focus group discussions and household interviews. Ideas were iteratively bounced between the two stakeholder groups, until the evolution of a final draft framework that was presented to the community validation workshop. However, owing to the time and other resource limitations of the one-year LEAPS project, the fourth and final stage on 'implementation, monitoring and evaluation' was not validated nor piloted in the case study setting.

A slum-specific MUS implementation framework should take account of the fact that the urban water utility is the main reliable water source in low-income urban settlements. Hence, the urban water utility should support the implementation of MUS, probably as part of their philanthropic social outreach (i.e. for activities outside their water

services remit), for MUS activities to scale up. In addition to external MUS champions, there is need for internal champions to initiate changes within the organisation and precipitate a process for mainstreaming MUS within the utility's policies, strategies and plans – this process could take a considerable length of time. Concurrently, key relevant stakeholder organisations could be engaged and asked to support MUS implementation in terms of mobilising and organising community members, building their capacity, and assisting them to access finance for start-up capital.

An important concept that reverberated during the study was the need for the community members to participate in the whole process, if MUS implementation is to be sustainable. The respondents' emphasis for community participation disproved the study assumption that MUS implementation in slums did not need as much participation as in the rural areas. Hence activities in the stages for problem identification and detailed situational analysis (shown in Table 1) need to be carried out with a high level of community participation.

7.3. Potential collaborations for implementing slum-specific MUS

As emphasized throughout this paper, slum-specific MUS activities will be sustainably implemented only with the buy-in by the urban water utility. Whereas progressive water service providers such as NWSC may be at high maturity levels of technical operations (Kayaga et al., 2013), they may not have adequate 'software' competences to effectively engage with slum dwellers, such as community mobilisation, capacity development and organisation. Hence, the water utility could collaborate with organisations whose core activities is upliftment of livelihoods for slumdwellers. For the Kampala case study, these include governmental organisations like KCCA and Ministry of Gender and Social Development; as well as non-state providers such as NSDFU, Actogether, CIDI and SSA: UHSNET. All these organisations were willing to support NWSC, the service provider to implement the slum-specific MUS framework in Kampala slums.

Activities where the urban water utility needs support include mobilisation, organisation and sensitization of potential slum-specific MUS entrepreneurs; data/information sharing; training and capacity development; and soliciting for start-up finance for the MUS activities. In the Kampala case study, all the relevant stakeholder organisations specified the requirement of community members to form viable groups before they could engage with them. The context in Kampala conforms to this requirement: the main remit of NSDFU is to organise slum-dwellers into savings groups, while ACTogether's mission is to build capacity of slumdwellers in Uganda, mainly through supporting activities of NSDFU. This situation may be similar in many other cities, given that Shack/Slum Dwellers International (SDI), to which NSDFU and ACTogether are affiliated, '...is a network of community-based organizations of the urban poor in 33 countries in Africa, Asia, and Latin America', operating in 224 cities (SDI, 2019).

7.4. Recommendations for policy, practice and further research

Using a Kampala case study, the LEAPS project has developed a slum-specific MUS framework, which can easily be adapted for implementation in slums of cities in other developing countries, to raise the livelihoods of slumdwellers through productive water uses. Water-dependant productive activities in slums will thrive when urban water utilities buy into the MUS concept and (i) plan for and supply domestic-plus water requirements; and (ii) develop systems and procedures for handling and supporting water-dependant entrepreneurs, possibly with collaborations of other relevant stakeholder organisations. Policy makers at the national level could create an enabling environment for MUS implementation by minimising silos between development actors, and actively supporting urban water utilities to implement the MUS framework.

On the educational level, local universities and colleges could

include the MUS framework in the curricula of relevant courses. At the water utility level, internal champions (e.g. the LEAPS project team in the case of NWSC) could push forward the agenda for mainstreaming water-dependant productive activities within the service provider's policies, strategies and plans.

Research should be carried out to explore further the most suitable financial framework that could sustain the implementation of the MUS framework. Furthermore, given the contextual differences in slums of different cities, the suggested slum-specific MUS framework should be validated in different cities.

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