SNV Urban Sanitation Learning Event

Informed Choice in Urban Sanitation Investments

Lusaka, Zambia, October 1-4 2018

Learning Event Report

SNV Netherlands Development Organisation

LUKANGA WATER & SEWERAGE COMPANY LIMITED

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Disclaimer

The views expressed in this report are those of the authors and do not necessarily reflect the views of SNV Netherlands Development Organisation.

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Abbreviations

AFDB	African Development Bank
BCC	Behaviour Change Communication
CDC	Community Development Committee
CDO	Community development Officer
CLUES	Community-Led Urban Environmental Sanitation planning
DEWATS	Decentralized Wastewater Treatment System
D-group	Online discussion group
FS	Faecal sludge
FSM	Faecal Sludge Management
FSTP	Faecal Sludge Management Plant
MWDSEP	Ministry of Water Development, Sanitation and Environmental Protection
NGO	Non-Government Organization
NWASCO	National Water and Sanitation Council
OD	Open Defecation
ODF	Open defecation free
OHS	Occupational Health Safety
O&M	Operation and Maintenance
PPE	Personal Protective Equipment
PPP	Public Private Partnership
SDG	Sustainable Development Goals
USHHD	Urban Sanitation and Hygiene for Health and Development (SNV)
WB	World Bank
WSUP	Water and Sanitation for the Urban Poor
ZABS	Zambia Bureau of Standards
ZEMA	Zambia Environmental Management Agency

Introduction

This report provides a synthesis of the Urban Sanitation Learning Event on the theme **"Informed Choice in Urban Sanitation Investments"** held in Lusaka, Zambia from the 1st to 4th October 2018. The learning event was organised by SNV Netherlands Development organization in collaboration with Lukanga Water and Sewerage Company. The four-day learning event brought together over 40 SNV staff and their national and local government partners and other counterparts from Bangladesh, Nepal, Indonesia, Tanzania and Zambia.

The purpose of this report is to provide a reference for participants as well as other practitioners, managers, local government and other actors involved in SNV's Urban Sanitation and Hygiene for Health and Development (USHHD) program. It aims to capture the key content presented by experts, sanitation status and challenges from the participants' countries, as well as key discussions and reflections. It is hoped that this report will also serve as a resource for the broader WASH sector.

Background to USHHD

This learning event is part of SNV's USHHD program which aims to improve access to sanitation and hygiene, and promote a healthy living environment for urban populations in 19 cities Nepal, Bangladesh, Zambia, Tanzania and Indonesia. SNV also supports improved approaches to urban sanitation in Kenya, with a focus on resource recovery and in Ghana, with a focus on financial services. The USHHD is implemented in partnership with the government agencies in each country and includes the following five key components:

1. Sanitation behaviour Change Communication (BCC) and awareness
2. Safe and affordable sanitation services
3. WASH governance, regulation and enforcement
4. Smart finance and investment
5. Treatment, disposal and re-use

Figure 1 – SNV USHHD Programme components

In addition to the above, there is also a 6th component for analysis, dissemination, and learning. This learning activity consists of the preparatory online discussion (D-group), the learning event presented in this report and in-country follow up. The learning activities are not limited to SNV programs but intended to promote discussion about best practices in urban sanitation and hygiene among partners.

This learning event on "informed choice in urban sanitation investments" and the preceding D-group on the same topic, enable the exchange of ideas and to deepen our understanding of change processes in urban sanitation. The learning component of the

USSHD program is supported by the Institute for Sustainable Futures at the University of Technology Sydney (ISF-UTS).

This event follows from previous urban sanitation learning events in:

- 2013 Lampung, Indonesia: Urban sanitation - Citywide Planning and Financing.
- 2014 Khulna, Bangladesh: Urban Upgrading and Emptying of On-site Facilities.
- 2015 Manila, Philippines: Urban Sanitation – Professionalization of sludge emptying services.
- 2017 Khulna, Bangladesh: Catalysts for change in urban sanitation

Introduction to the 2018 Learning Event

Day 1 - Presentation by Antoinette Kome, Learning Event Facilitator and SNV's Global Sector Coordinator for WASH

This learning event focused on informed choice in urban sanitation investment, including an analysis of the informed choice process and investigating the aspects of planning and decision, mapping and equity, technology choice including treatment and reuse. The key objectives of this event were to:

- Broaden the understanding of how sanitation infrastructure investments can be fitted better within city-wide services to achieve outcomes in health, dignity, environment and economic development.
- Explore approaches to infrastructure investment decision-making
- Discuss equity implications of infrastructure investment decisions
- Share and further develop the use of zoning and priority setting for investments

The learning event included five key event topics spread across the four days, a detailed program is included in Appendix 1.

Figure 2 – Event topics and program

Note: In this learning event the focus is on sanitation as it relates to the management of human faecal waste, not solid waste management or drainage.

Official Opening

The learning event was officially opened by the Assistant Director of the Ministry of Water Development, Sanitation and Environmental Protection, with official welcome also by SNV Zambia Country Director and the Managing Director of Lukanga Water and Sewerage Company.

Official Opening by the Assistant Director of MWDSEP Engineer Oswell Katoka (Presented on behalf of the permanent secretary ministry of water development, sanitation and environmental protection Bishop Dr. Eddy Chomba).

- Noted that the government has prioritized the provision of clean and safe water and adequate sanitation for all the people of Zambia in line with Vision 2030 and recognises the important role the water sector plays in the development agenda.
- The vision was also included in the Seventh National Development Plan (7NDP) which stressed the need for improved access to water and sanitation to enhance human development, improve public health and contribute to poverty reduction.
- The government made significant water policy reforms which led to the creation of Ministry of Water Development, Sanitation and Environmental Protection as the lead ministry to propagate and coordinate all water sector policy matters and programme implementation in the country.
- This ministry was facilitating the approval of water supply and sanitation and solid waste management policies as well as the revision to the water supply and sanitation act No.28 of 1997.

Opening Remarks by the SNV Country Director - SNV Netherlands Development Organization Marjon Tuinsma

- Highlighted that SNV Netherlands Development Organization has been supporting the Government of Zambia since 1965 and is also active in more than 30 countries in Asia, South America and Africa.
- SNV works with and through governments, national and international development partners, knowledge institutes and low-income communities across three sectors: agriculture (including nutrition sensitive agriculture), energy (renewable energy, access to energy) and water, sanitation and hygiene (WASH).
- Priority areas of WASH to be addressed in Zambia were identified by the baseline survey and include: Open defecation; low rates of handwashing; unsafe menstrual hygiene management (MHM) practices; unsafe solid waste management; inaccessible or unlined containment (pit latrines) and infrequent emptying.
- Highlighted the importance of improving sanitation, in particular due to the effectiveness of investment. Research has shown that for every $1 spent on improving sanitation $9.1 is saved in health, education, social development and other areas.

Opening Remarks: Managing Director Lukanga Water and Sewerage Company (LgWSC)**, **Mr. Ngafise Kapusana.

- Recognised the work of the Government of Zambia, through the MWDSEP, in launching a new urban onsite sanitation and faecal sludge management framework to accelerate sanitation improvements in Zambia. This framework will be expanded to also cover on-site and rural water supply and sanitation.
- This new scope will require LgWSC and other water utilities to make informed choices on the most appropriate technologies and management approaches, not only for improvements to sewerage but also to build capacity in on-site sanitation and stronger linkages with the private sector, community based service providers
- Recognised that Lukanga water has the lowest sanitation coverage, about 43%, although has made progress through a new master plan and aims to improve health and hygiene as a whole.

Expectations of Participants by Country

Participants from each country introduced themselves and shared their expectations of the learning event, as summarised below:

Table 1 – Participant expectations

Country	Expectations - to learn about:
Bangladesh	- Technology practices that can be used for densely populated countries - Inventory models (infrastructure and social) - Investment models from each country.
Nepal	- How to integrate sanitation and hygiene with urban infrastructure and planning. - Good sanitation and hygiene practices. - How to make informed decisions regarding urban sanitation and hygiene. - How to adopt different opinions, ideas and information technology regards to sanitation and hygiene
Indonesia	- How to make informed choice with limited data and political pressure - How to deal with rapid urbanization and ensure safely managed - How to increase capacity and coverage to 40% - How Zambia manages their sanitation and hygiene
Tanzania	- The role of water sanitation utilities in on-site sanitation service delivery. - How to bridge the gap between sewerage and on-site sanitation. - Sludge treatment and management technologies. - Different business models along the sanitation chain. What works and doesn't work, where and why? - Successes and failures from others
Zambia A	- How sanitation has been developed as a business - Experiences of household investment vs subsidies - How household investment in sanitation and on-site sanitation services have been done in other countries.
Zambia B	- To share experience from Zambia and hear strategies, approaches and various sanitation options practiced in other countries - Strategies and how other countries have accessed funding to implement identified interventions after baseline study.
Europe	- The challenges faced in countries - How to make the right choice in selecting treatment technologies - What are the different approaches to begin implementation post data collection.

Block 1 - Pieces of the Puzzle

Block 1 focuses on decisions and informed choice and includes the following activities:

i. Summary of D-group discussions on informed choice
ii. The Puzzle – many pieces of urban sanitation
iii. Country group activity to share the typical approaches and challenges found in their country

Summary of D-group discussions

The D-group discussion was an online email forum running over three weeks prior to the learning event receiving over 30 contributions from 14 countries. It included three topics:

1. What do we mean with informed choice?
2. Informed choice in the context of limited data and capacity
3. Informed choice in the context of limited funding and political pressures

A summary of the discussions is presented below.

Informed choice in urban sanitation infrastructure decision means:

- ✓ Consulting the right people
- ✓ AND using the right information
- ✓ AND choosing the right options (technical)
- ✓ AND within an overarching framework
- ✓ AND decision making by the designated authority

While we recognise the importance of informed choice since resources are scarce, needs are large, we want to make progress towards safely managed sanitation with solutions that are sustainable, in practice, **informed choice does not always occur**. This can be due to:

- A lack of clear macro-level plans to guide investments
- Local authorities not always aware or feel the autonomy to deviate from such plans
- Occasionally macro level plans are outdated, no longer applicable, do not clearly include sanitation or only consider sewage.
- Disconnect between planning, construction and management.
- The private investment which does not follow a broader/government focused plan.
- Cities end up with different pieces of the puzzle which do not even fit together or don't fit with the available management capacity.

Even if there is alignment between macro level plans, private and public investment, **informed choice remains difficult** because:

- Use of outdated information and/or lack of resources to collect the right information
- Absence of good rules-of-thumb in urban sanitation
- Lack of clarity about who makes the decisions and who should be involved
- De-facto decision-making by consultants, engineers, INGO's or donors.
- Lack of interest/ capacity of local authorities to engage
- Early focus on a single option, without considering a choice of scenarios.
- Tension between sanitation being a public-good and the private interests of individual households and other stakeholders.

The D-group discussion participants identified key paths forward in a context of limited data and capacity including:

- Almost every city will have a mix of solutions (on-site, decentralised, and maybe centralised), and this should be considered in design.
- More than one option (scenario) should be compared for cost-effectiveness, technical suitability as well as other criteria, such as institutional capacity and fit within the larger vision of city-wide services.
- Important factors for the choice of a location included: topography, geography, risk of inundations, accessibility. However, as land is difficult to find in and around urban centres, the available site location(s) often dictates available options.
- A phased approach is strategic, especially in the light of limited demand. While a step by step approach sometimes means a double investment, but this almost inevitable.
- Lower standards can be acceptable if there is a time-based "plan to comply". Additional monitoring is required for lower quality solutions to minimize risk.
- Extra effort should be made to ensure that decision-makers can understand the information and options presented.
- Management responsibilities, finance and asset ownership should be clear upfront, and the scale of management does not need to fit the scale of the technology
- Re-use should be considered, but not always pursued.

The Puzzle

Citywide safely managed services require the integration of different sanitation solutions:

- ✓ Along the sanitation value chain
- ✓ Spatially reaching all parts of the city
- ✓ Socially reaching all groups of people in the city.

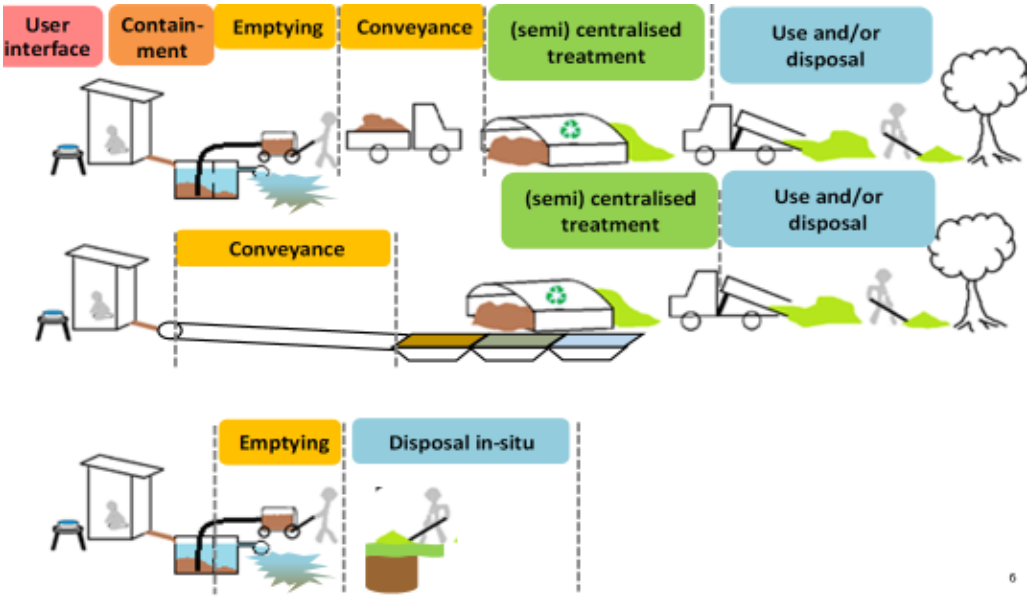


Figure 3 – Service chain for different sanitation options (SNV)

In addition, there are different service model solutions that can be applied to different parts of the city. Below is an example of the range of user groups, steps in the service chain and possible service solutions that could be implemented for each.

Market segment	User interface	Contain-ment	Emptying----- Transport		Treatment	Disposal – and/or re-use
City centre	HHs	Sewerage Utility				
On-site sanitation in low income areas	households		Private emptiers bring to transfer station	City trucks	Treatment site management concessionaire?	
Areas with DEWATS	HHs	DEWATS committee	City trucks?		Treatment site management concessionaire?	
Market	Public toilet care taker?		City trucks?		Treatment site management concessionaire?	
Areas with community toilets	Community management committee		Private emptiers bring to transfer station	City trucks?	Concessionaire?	
On-site sanitation in accessible areas	households		Private trucks?		Concessionaire?	

Figure 4 – Possible actors for different parts of the service chain and user groups (Kome, SNV 2012)

Country group activity – current and future services

Country groups selected a city were the USHHD program is implemented and shared their perspectives on sanitation infrastructure investments to inform others of some typical approaches and challenges found in their country.

Participants were tasked to identify and discuss the current market, the type of current services and how they would like to see it develop in short and long term.

Country groups identified alternative scenarios/service options and assessed whether they were constrained or guided by existing high-level planning and what would they suggest as priority infrastructure investment.

Nepal - Birendranagar

Market Segment	- Core area + planned urban area (households/offices/institutions) including Dense Area (Hospital, School University); planned area (House/Offices); flat land slum area; rural/hilly /forest area
Current Situation	- 100% ODF, using on-site sanitation - Demand for emptying service is high but not all timely emptied - Dump in land fill site is 8 km from city centre - Empty 80% of rural area
Containment	- Urban use holding/septic tank. Rural area uses soak pit
Emptying / transport	- 2 private sector operators in agreement with municipality to empty core/ planned area using mechanical (vacuum tanker) - Self-emptying by rural households and dispose in pits
Short term expectation	- Increase awareness for emptying for planned/core/rural - Improve service of private sector/municipality partnership (efficiency, people-centric, affordability(poor-rich), serve whole city) - Regulation for emptying for all - Survey for core area sewerage - Slum area awareness campaign

Long term expectations	- Landfill treatment re-use facility - Construction of sewerage for all - Resettlement plan for slum areas

Q&A

1. How is the waste disposed in a land-fill site? There is one designated area which is a multi-treatment site. It will be changed to a faecal sludge management area.
2. In line with current SDG's ladder is Nepal 100% ODF? What is the date and source of data? It was declared in December by municipality based on a survey at ward level. SNV baseline survey included new households, 98% had toilets.

Indonesia – Banda Lumpang

Current Situation	- 1 million people, 5000 people/km - No off-site systems, 100% on-site - Emptying services exist but use rate very low and only 39% of emptied sludge reaches the designated site. - Treatment plant exists but is not functional (overflows)
Short term expectation	- Make the treatment plant operational - Build a second treatment plant (but land unavailability is an issue) - Build a temporary storage (transfer station)
Long term expectations	- Increase emptying use rate through demand creation - Improve safety and quality of emptying service - Increased integration and coherence of the different services and stakeholders - Use population density to choose the location of off-site investment
National guidance and its constraints	- National targets (100% ODF by 2019) and SDG 6 at national level - Standards for effluent, standard frequency of emptying and standard for septic tank design at national level. - City sanitation strategy (2017-2022) and city spatial planning (2010-2030) - Constraints with enforcement of existing legislation and budget. - Challenges with political awareness, willingness and multi-stakeholder coordination (within government, with private sector) - Low demand from communities
Priority Infrastructure Investment	- Upgrade non-standard septic tanks. - Rehabilitation of existing sludge treatment plants and construct a second sludge treatment plant. - Temporary/transfer storage - Propose communal systems (DEWATS) for slum areas

Q&A

1. What guides planning? A 20-year plan by the city planning agency, proposing treatment and sewerage systems
2. Why is the uptake very low? No infrastructure is being built.
3. How do you strengthen the enforcement / compliance? There are no national regulations therefore no mechanism for enforcement, there is a lack of resources, and people are not aware of the plan/legislation to demand it.

Tanzania - Arusha

Market Segment	- Households: Urban wards (Planned) and Peri urban Wards (Unplanned) - Schools, Health Facilities, Businesses
User interface and containment	- 19% Cistern, 62% Poor Flush, 19% open pit, 2% OD - 4% No own toilets/shared toilets within the neighbourhood. - 45% use septic tanks
Emptying/ Transport	- A City council truck and 20 private operators with trucks - Informal manual emptying (Themi river. Storm drain, On-Site disposal, oil and salt in to pit)
Disposal	- Disposal to existing Waste stabilisation Ponds 3km from city
Re-use	- Effluent used for irrigation, Dried sludge used as manure
Strategy	- ODF by end of 2018, 30% sewer by 2020 - Increase emptying use rate to 17% - New treatment to be built 30km away

Q&A

1. How do you prevent the contamination of groundwater contamination for households with wells/boreholes? There is a special office monitoring boreholes, although contamination is still prevalent.
2. How do you manage the risk to contamination of water supplies? Wastewater disposal is direct into the semi-river and manual emptiers will be formalized.
3. How do you increase sewer connections? Advocacy and awareness campaigns and we will impose by-laws to enforce people to connect to the sewer
4. Where there is no regulation, how do you encourage connections? We sponsored 500 connections and intend to impose regulations for connection in all areas.

Bangladesh – Jhenida

Market Segment	- Residential (Non-Slum and Slum) - Educational; Health; Public Toilet (e.g. gas station); Market place
Containment	- Septic tank 90%/ Pit 60% - Manson Sanitary enterprise
Emptying/ Transport	- Service providers include: Manual emptiers, local government, NGO
Treatment Disposal	- Operated by a local government/NGO/private sector partnership
Strategy	- Planning and implementation of Bangladesh National Building Code for on-site containment - Implement national Institutional Regulatory Framework on FSM - City Sanitation planning by Local government - Target SDG 6.2

Zambia - Kabwe

Market segment	- Population 221.069 - OD 17%, Unimproved 22%, Basic 14%, Toilet Improved + fly management 10%, Environmentally safe 38%

Containment	- On-Site facilities 72% (Septic +Latrines), Sewerage 22%
Emptying/ Transport	- One Vacuum tanker empties the septic tank - Septage (liquid waste) transported to the ponds for treatment
Re-Use	- No re-use
Strategies	The project has three components - Component 1 - Sewerage Improvements: Rehabilitation of sewerage treatment plants, dilapidated sewer network and sewer pumps. Connect 1000 HHs to sewer; procurement of tools and equipment for operations (vehicles, compactor) - Component 2 – On-site sanitation (FSM): Design and construct FSM treatment plant ($200,000); procure and install 1000 toilets ($1000,000); Procure a 3-ton light truck for emptying and a vacuum tanker - Component 3 - Capacity building and community engagement: conduct sensitization, health and hygiene training;

Zambia - Kasama City

Market segment	- Urban, Peri- Urban, Public Places, Institutional
Current Situation	- Total population is 380,000 - 45% Environmentally safe latrine, 20% sewer/drainage, 14% basic latrine, 23% unimproved latrine, 5% OD
Short term expectation	- Sanitation marketing - Improve latrines (lining + fly management). - Registration of emptiers (manual). - Improve coordination off relevant stakeholder and capacity building - Data collection for public places. - Campaign on solid waste management to stop disposing in toilets. - Investment on transport management (vacuum tanker). - Improve existing systems.
Long term expectation	- Policy framework and initiation of by laws. - Formation and capacity building of DEWATS (decentralized).
Strategies	- Priority infrastructure development is to construct treatment plants and invest in emptying transport (Vacuum tankers)

Q&A

1. Where do manual emptiers dispose waste? To drains
2. What are the challenges of containment? Awareness programmes, training engineers and low emptying rates
3. What is the long-term development plan? Charging tax for sanitation purposes; Planning of making a new treatment plant

Block 2 - Lusaka sanitation programme

Block II looked at the overall Lusaka Sanitation Programme (LSP) commencing with a presentation from the Lusaka Water and Sewerage Company (LWSC), followed by three groups visiting the LSP sites. Another group travelled to Kabwe to visit Lukanga Water and Sewerage Company. This section includes details on:

- Background of the Lusaka Sanitation Project
- Background and objectives of field visit
- Field visit reports from 4 groups

Background of the Lusaka Sanitation Project

Presentation by Eng. Jilly Chiyombwa from Lusaka Water and Sewerage Company.

Background: need for project

- Every year, deadly water borne diseases like cholera, typhoid, and dysentery affect the city of Lusaka. Most recently including a cholera outbreak in 2017 and dysentery outbreak in 2016.
- Currently only 15% of the population have access to sewer services.
- Groundwater quality is an issue and water treatment is not enough, there needs to be additional measures to protect the groundwater from contamination.
    - 50-52% Lusaka's water supply is from bore holes and wells.
    - Land-use activities such as uncontrolled settlements and the high use of on-site sanitation are responsible for significant groundwater pollution in urban and peri-urban areas.

LSP overview:

- A five-year initiative by the Lusaka water and sewerage company, supported by the government of Zambia, and financed by the European Investment Bank (EIB), Kreditanstalt fur Wiederaufbank (KfW), the African Development Bank (AfDB) and the World Bank (WB).
- The Lusaka Sanitation Program (LSP) is one of the the first steps of the Lusaka Sanitation Master Plan which aims 100% coverage of sanitation by 2030. The LSP aims to benefit 500,000 Lusaka residents.
- Through investment in sanitation, it aims to improve the quality of life by increasing access to sanitation service in selected areas of Lusaka and strengthening LWSC's capacity to manage sanitation services.

Project components divided in alignment with financing:

- Component I: Construction of 520km of new sewer lines and building or upgrading treatment facilities including the Chunga (2000m^3/d) and Manchichi (36,000 m^3/d) treatment plants and rehabilitation of 5 sets of treatment ponds in Lusaka.
- Component II: On-site sanitation: Including construction of household toilets in Chawama, Kanyama and George, public toilets in East and West Lusaka, and improving faecal sludge emptying services. The programme will decommission many boreholes due to high contamination with nitrate, nitrite, ammonia and faecal bacteria.

- Component III: Institutional Strengthening. Which aims to strengthen the capacity of LWSC to manage sanitation services; build institutional capacity for implementation and sustainability; and capacity building and awareness raising campaigns

Q&A

Q. Does the financing consists of loans, who will pay the loans and what model will be used? A. Finance is mixed: 38% of finance is a grant, 17% has been given to LWSC by the government. The government has borrowed from the World Bank and EIB, consisting of 80% as grants and 20% as a loan.

Q. What is the design criteria for the 12,000 household latrines proposed? A. The design by local authorities will be used. Households are expected to contribute to the costs and household selection criteria includes technical and social considerations and groundwater risk.

Q. What measures are being taken to ensure sustainability and maintenance of structures and how are you going to meet the ZEMA standard requirements? A. Through strengthening asset management and developing the company's monitoring and maintenance.

Q. How are private organizations being included within LWSC programmes? A. The community emptiers are being engaged and LWSC are developing a business module which includes the private sector.

Q. Why is the spending more for sewers than on-site sanitation? A. On-site sanitation is new line of business for LWSC.

Q. Who is responsible for implementing the master plan? A. Government implements sub-projects and are considering PPP and commercial loans.

Q. How does the cost sharing work and how is it progressing, especially for the poor? A. The project supports the sub-structure (containment, connection) and the household must finance the super-structure.

Field Visit Background

Objective and locations of field visits

The objective of the field assignment was to engage participants to explore the process of informed choice around sanitation investment and to understand how it can work in practice.

Participants were divided in to four mixed country groups for field visits on Tuesday 2nd October, visiting the following sites:

- **Group A** visited Kabwe the provincial city of central province 135 km from Lusaka. The visit included Lukanga Water and Sewerage Company; manual pit emptiers; sewer network and pump stations; wastewater treatment plant; and pond.

Groups B, C and D started at Lusaka Water and Sewerage Company, where they were welcomed by the Managing Director Eng Jonathan Kampamba and received a presentation by the Peri Urban Manager Yvonne Siyeni. Following the presentation, they visited various project sites:

- **Group B** visited Kayama water trust (KWT) a community-based operator, a faecal sludge treatment plant, and household pit emptying with the Dream Team.

- **Group C** visited Chazanga FSTP, meetings with Chazanga Community Based Water Trust, manual pit emptiers (Miracle Team) to view the emptying process, households to discuss customer satisfaction in emptying services; and the community leaders to discuss engagement and sensitization activities for emptying.
- **Group D** visited Mtendere/ Kalingalinga Sanitation Marketing project. The group had meetings with various stakeholders from the water trust, operators (LWSC), local councillors/WDC, San Mark suppliers and other contractor.

Figure 5 – Photo of meeting with LWSC

Field Assignment

Participants conducted the field visits in groups and worked together to report back on their field visits by preparing: a PowerPoint presentation, a photo diary, a testimony from someone they interviewed during the field visit and a summary 2-page case study. Please note all photos were provided by the group participants. A summary of the case study and presentation is provided below, and the interviews are in Appendix 2.

The groups presented their findings and recommendations to an expert panel on Day 3. The panel included:

- The Managing Director for Lukanga Water and Sewerage Company Mr. Kapusana;
- Technical Manager: Mr. Nicolas Mwape;
- Building Inspector from Kabwe Municipal Council Mr. Speedwell Nkhoma;
- Ms. Mwansa Mukuka and Mr. Patrick Katurami from LSP;
- Mr. Reuben Sipuma from WSUP.

Field Visit Reports

Group A: Kabwe

Background

Kabwe was founded as a mining citing and now the headquarter for Zambian Railways and the administrative centre of Central Province. The south-east part of the city is under the city council jurisdiction and the north-west under the mine authority. The Lukanga Water and Sewerage Company has operated since 2007 with the mandate and responsibility to provide water supply, sewerage and sanitation services to the urban and peri-urban population in the Central Province.

Sanitation situation:

- 17% open defecation, 22% unimproved toilets, 14% basic latrines, 9.5% basic latrines with fly management and 37% environmentally safe latrines.

Group A: Kabwe

- 22% households are connected to the off-site/sewer system (with a target of 50% by 2030). On-site facilities include septic tank (35%) and pit latrines (5%)
- Lukanga WSC has one vacuum truck, five sewerage pumping stations and a wastewater treatment plant. The sewerage network and wastewater treatment plant are in poor conditions.
- Emptying fees vary: domestic customers pay K550 (46USD), non-domestic K750 (63USD) per trip.

Sites visited and key insights

The field visit in Kabwe included the following meetings

1. **Meeting with commercial utility at Lukanga Water and Sewerage Company Limited**
   - **Feasibility and Pre-feasibility studies:** Conducted in 2015 the feasibility and pre-feasibility studies provide the basis for application of funds from the NUWSS.
   - **Strategic Plan 2017-2020.** Key objectives:
     Water: By 2020 aim to: reduce non-revenue water (NRW) from 46% to 25%, achieve and maintain 24 hours water supply and 99% water quality compliance; improve water coverage from 24,622 to 32,000 households and sanitation/sewerage from 11,200 to 13,000 households. by 2020.
     Institutional: To achieve high level of sustainable Operational and Financial effectiveness, efficiency and viability; achieve a high level of Customer Care and Stake holder satisfaction; and to add value to the organization's internal structures, systems and processes
   - **Financing approach:** Two types of customers, with metered water who are charged a 2.5% sanitation surcharge, and non-metered. In addition, a sewer fee is charge at 25% water consumption fee for domestic and 35% water consumption fee for non-domestic customers.
   - **Financial performance:** Billing and collection efficiency increased from 2014-2016 along with a drop in operation and maintenance costs. However, they still operate at a loss and no funds for expansion.
   - **On-site sanitation and faecal sludge management framework** released in June 2018, it allocates responsibility to the LWSC who now need to build capacity and translate into practice. The initial feasibility study did not include on-site sanitation.



Photos: Rehabilitation and upgrade of sewerage system (left), broke sewer (right)

2. **Tour of Katondo Wastewater Treatment Ponds and two pump stations:** Treatment plant was built in 1970's and is not functioning well and over capacity, with most flows bypassed. The sewer network also has issues, many pipes damaged, and some pump stations dilapidated.

Group A: Kabwe

3. Meeting with the emptiers of Kabwe and visit to school using Eazi Flush Toilet;

- Group of septic tanks emptiers explained their emptying method and work practices: they empty 2-3 septic tanks per week, more in rainy season. It takes 3-4 people to empty and 3-4 hours, using manual methods (shovel, bucket, rods) and sometimes use lime/salt.
- They don't report any accidents or health hazards, have glove and don't eat during work.
- They charge about K1000 (USD84) but it depends on size of pit.

Photos: Manual emptying equipment (pipes transported on bike) and emptier interviewed

Key Findings/Observations

1. Feasibility study focused more on water and less on sanitation
2. On-site sanitation is a new sector and needs capacity building
3. Finance remains a major challenge for Lukanga WSC despite reduced operational costs and improved collection rates
4. SA co-promoted the Eazi flush toilet however the affordability and easy to manage is questioned.

Recommendations

1. Greater attention needed for on-site systems due to lack of capacity (human resources and financial)
2. Need to align the strategic plan to comply with the new urban onsite sanitation and FSM framework
3. Need to invest in institutional capacity building to improve service management as well as strengthen the planning and management to sustaining the existing sewerage network and WWTP
4. Need to mobilize resources to achieve strategic plan
5. Toilet options (Eazi-Flush) need to match local needs and affordability levels

Feedback/Clarifications from Panel

- Lukanga Water and Sewerage Company finished the baseline survey and is about to the begin project with SNV, starting with the development of a hybrid action plan
- Revised strategic plan was done in 2017, although at this stage there was not yet the requirement to be involved in on-site sanitation. 30% of the budget is deducted for sewerage.
- Currently targeting to get finance for the strategic plan.
- Currently issues with the conditions of the sewer pipes and wastewater treatment. While the one vacuum truck is also inadequate for the eight areas it needs to serve.
- Private sector conducts emptying and desludging main sewer-lines, although hygiene isn't prioritized.

Group B: Kanyama

Background

Kanyama is a peri urban area in the city of Lusaka. Previously farm land, the area is now home to approximately 300,000 people with the vast majority low-income and a large proportion of rental households. Kanyama's water table is very high and the area is prone to flooding during the rainy season. Cholera outbreaks still occur, the last event ended in May 2018. Contamination of the water source with faecal matter from overflowing toilet pits is a key cause of the outbreaks.

To tackle the cholera problem and improve the sanitation and hygiene conditions in the area, in 2013 the Lusaka Water and Sewerage company (LWSC), with the technical support of Water and Sanitation for the Urban Poor (WSUP), established a faecal sludge management (FSM) service in Kanyama.

Sanitation situation:

- Most people have access to a pit toilet and sharing is very common, often between 3 to 4 households (approximately 15 people). Open defecation still observed.
- When the latrines are full most landlords choose to bury the sludge nearby, contributing to the contamination of open areas and shallow ground water.
- Most latrines/pits have high content of solid waste.
- Due to the challenging geology and risk to water supply, sewerage was not seen as suitable and LWSC instead improved FSM services with over 50% of residents expressing willingness to pay for formal pit emptying services.
- The case was strengthened by the presence of the Kanyama water trust (KWT), a community-based operator serving 167,000 customers under a delegated management arrangement with LWSC.

Sites visited

Following the initial meeting with LWSC, Group B visited the following sites:

- **Kanyama Water Trust:** A community-based operator under the management of LWSC.
- **Dream team emptying and community visit:** discussed emptying with households and observed emptying, conducted by a group of formal operators marketed as (Dream Team) using localized modified tools. The Dream Team has been set up and supported by WSUP and have proven effective in helping the community FS emptying.
- **Faecal sludge treatment plant** (FSTP). Developed based on the sanitation appraisal study which indicated that there was no formalized FSM service provision.

Key Findings/Observations

1. **Choice of emptying technology** was based on testing of both manual (crocodile, scooper etc.) and mechanical (gulper) options. The mechanical options were not suitable due to the amount of solid waste; therefore the scooper was chosen by emptiers. The Dream Team has only one truck for transporting FS which limits its ability to scale-up.
2. **Improved image of manual emptiers:** The Dream Team look professional with logos and use of PPE (personal protective equipment). However, the stigma associated with the profession remains, including from emptiers' families. Despite the PPE, other aspects of safety are still a concern, with the truck not clearly that it is carrying faecal waste and no secured perimeter around the work area.

Group B: Kanyama



Photos: Latrine emptying process using the scooper by the Dream Team and disposal in treatment

3. **Land ownership/presence of landlord** impacts both the frequency of emptying and quantity of solid waste disposed in the pit. Toilets in a compound where the landlord/landlady also lives, tend to be better maintained and less frequently emptied. Whereas, rented plots without landlord/landlady present, tend to be more problematic, with a higher likelihood of solid waste in the pit and more frequent emptying. Some households use ash in pits to increase drying, however this makes it difficult to empty.
4. **Illegal manual emptiers** are still being used in Kanyama despite being more expensive (charge K700 compared K350 by the "Dream team") and typically discharge emptied sludge in to nearby trenches.
5. **Choice of treatment /disposal/ re-use** is based on design options from consultants with ultimate decision by LWSC (WSUP provided technical advice and lessons from Kenya).
6. **Timing of demand creation campaigns** for emptying services was an important part of the business model. Peak demand for emptying coinciding with the rainy season between October and February. Therefore, February was chosen as the main month for awareness raising when demand starts to drop, in order to increase business in the low-season.



Photos: Separation of solid waste from sludge, Covered and uncovered sludge drying beds

7. **Separation of solid waste and faecal sludge** during the emptying of barrels at the treatment plant involves the use of substantial quantities of water. LWSC stated this is effluent water being reused.
8. The performance of **covered and uncovered drying beds** was tested, with sludge in covered beds drying faster (5-6 weeks instead of more than 9 weeks). However, the drying beds are not being used since there is a nearby borehole that supply water in Kanyama hence there was concern of potential for risk of contamination. The site was chosen as it was some distance away from the residential area to avoid bad smell and to be accepted by the community. The FSTP is not securely closed and children gain access to the compound to use water tap, in close proximity to sludge emptying area.

Group B: Kanyama

Challenges

- Illegal manual emptiers are still being used
- Stigmatization of pit emptiers from community members continues.
- Solid waste in pit latrines complicates work, as does addition of ash to dry sludge making it solid. There is inadequate coordination between local authorities and community-based enterprises in collecting garbage.
- Only one truck is inadequate, and limits scale up.

Recommendations

1. Explore the possibility of piloting scheduled desludging along with on call emptying to potentially increased the revenue predictability and frequency of emptying of all households in Kanyama.
2. Consider introducing sensitization campaigns for triggering emptying demand in the months leading up to the rainy season to encourage emptying before the season starts therefore avoiding pit overflows (in non-scheduled desludging scenario)
3. Sensitization campaigns aiming to reduce dumping of solid waste into pits is needed, in conjunction with setting up a solid waste collection scheme.
4. LWSC/Water Trust to invest further efforts in promoting the professionalism and importance of emptying services (especially in preventing cholera outbreaks) to reduce stigma associated with it.
5. Strengthen the Dream Team's marketing strategies and skills to promote their more affordable and safer service, to increase their business viability and reduce the use of unsafe illegal emptying
6. Provide Dream Team with equipment to secure a perimeter around the emptying site in order to keep away children and onlookers. Provide a sign for the truck to indicate it is carrying hazardous waste.
7. Potential for improved safety of drying of solid parts at treatment plant by using a dome net or greenhouse option to limit both smell and spreading of germs (flies)
8. Future designs should consider the building of drying beds at the same location as the rest of the treatment to reduce transport costs

Questions from Panel/Audience:

Q: *How can the FSTP be made more secure to not let children enter?* **A:** The security personnel must be stricter to ensure the place is secured.
Q*: The truck can be used for other purposes and not purely for transporting human waste. Is the truck branded and licensed by ZEMA?* **A:** Yes, is registered and licensed by ZEMA

Clarifications from Panel

1. Recognised that there are weak links between local authorities and local based enterprises who collect the solid waste from house and transport to the dumping site.
2. Agree on the benefit of branding the vehicles, it would also market the service. Plans are under way with LSP to engage the private entrepreneurs to take up the service and do the branding.
3. The reason why the number of pit emptiers reduced is not due to stigmatization but rather because of the cost and the number needed to perform the job.
4. Illegal emptiers should be embraced and considered as partners. They need to be trained in service delivery and we (LWSC) should provide good working gear and all necessary requirements.

Group C: Chazanga

Background

Chazanga is one of the 36 peri-urban areas in Lusaka and is under Mpulungu Ward with a population of about 200,000. LWSC is the main service provider for water and sanitation, working with the Chazanga Water Trust as a delegated function. LWSC, WSUP and the Water trust are working together to establish on-site sanitation and faecal sludge management services in Chazanga,

Sanitation situation

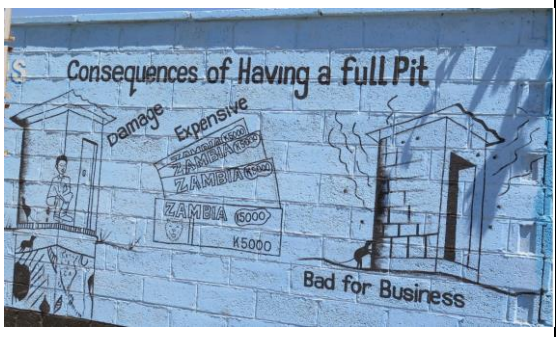
- As the area was unplanned, there is shortage of water and sanitation in Chazanga community and water supply only covers 68% of the area. Groundwater is the main source.
- Sanitation is mostly on-site, and 93% of toilets are pit latrine and 7% are septic tanks.
- When the latrine is full, the faecal matter is typically buried by digging holes next to the filled latrine.
- A FSTP was recently built with a capacity of 4m^3/d, however the current daily collection is about 7.7m^3.

Sites visited and key insights

Following the meeting with LWSC, the team met with the Chazanga Water Trust manager (employed by LWSC) and interviewed a community leader, a manual emptier, household and visited the FSTP.

Interview with Community Leaders

- Leaders are non-partisan and elected by the community to represent them at the WDC. They are involved in any development work in the community, including awareness raising through door to door campaigns and PA systems. Neighbourhood health committees (NHCs) are also involved in dissemination of information.
- Community leaders were responsible for the identification and acquisition of land for the FS treatment. They visited the Kanyama plant to learn about FSM, which built support to develop the plant in their community.
- They reported that emptying and transport is inadequate due to the long time to attend to already paid customers.



Promotion material on toilet block

Interview with the manual emptier: The team leader of the "Miracle Team" explained that they were under contract by the Water Trust to provide de-sludging services in Mpulungu ward. Before being engaged as emptiers they had theoretical and practical training. He described the emptying process: including a general assessment to determine the condition of the latrine and identification of an access point to empty the tank. They also provide information to households on how to maintain their toilets including preventing disposal of solid waste in the pit. They receive a 60% commission for every job executed. The Water Trust also provides bi-annual medical examinations, covers medical costs if they get sick and a pint of milk each day. In conclusion, he said they were happy with the income and job.

Group C: Chazanga

Photo: The emptying process within the community

Interview with a Household: The owners present on site during emptying reported that: Six households used one pit latrine and that the property landlord was responsible for paying the emptying service. After emptying they show the solid waste to the household and warn them there will be an extra charge if there is the same situation next time. They were happy with the service that the emptiers were doing.

Faecal Sludge Treatment Plant: the WSUP project engineer explained the FSTP process:

- Screens: separate the inorganic substances (solid waste i.e. plastics, bottles, blankets etc.) from the faecal waste from the pit latrines or septic tanks. Solid waste typically constitutes about 22% of the waste from pit latrines. They have contracted a firm of hazardous waste management personnel to collect and dispose the solid waste.
- Sand Trap: Since most pits are not lined, parts of the inner walls tend to collapse into the pit and sand is emptied together with the waste. Sand is not trapped in the screen therefore is removed in the sand trap to prevent it entering the biodigester. Sand constitutes 4-8% of the waste from the pit latrines. Silt accumulation is a big challenge in the plant.
- Bio digester: The organic waste discharges to the underground 50m^3 dome shaped digester, where bacteria breaks down the organic compounds in a process called anaerobic digestion.
- Anaerobic Baffled Reactor & Gravel Filter: Further anaerobic digestion to reduce the BOD.
- Drying beds: Secondary treatment of the sludge by drying to reduce pathogens. Aiming for a moisture content as close as possible to zero before it can be sold off as a soil conditioner.
- The daily collection (7.7 m^3) exceeds the FSTP design capacity (4 m^3). However, 20-30% of the collected sludge is usually solid waste and should be removed prior to treatment.
- The location of the FSTP was decided based on the recommendation of the community. The community leaders were involved in the project from the start.

Lessons learnt

1. Community buy in is essential, the visit of the community leaders to the Kanyama was valuable.
2. The outbreak of Cholera helped increase demand for emptying services. As is the lower cost of emptying compared with building a new toilet. There is high demand for the service from Chazanga and also from surrounding communities.
3. BCC interventions are critical to increase demand for emptying, solid waste management and constructing toilets that can be emptied.
4. Locating land for the FSTP close to the market makes business sense.

Group C: Chazanga

5. Cheap transport is not always efficient and cost effective (push carts vs. trucks for carrying FS). Although LWSC recognised the limitation of push cars and said they are getting a small vacuum tanker to improve time and efficiency.
6. Continuous improvement process by constant monitoring, evaluation and redesigning when needed.
7. The sanitation project made the emptying business an appealing job because of the good payment and the impact it has on the community.

Challenges

- High amount of solid waste and grit from unlined pits makes mechanized emptying difficult forcing manual emptying. It also creates challenges for treatment.
- Emptiers lack eye protection/mask and the transport isn't identified as carrying hazardous material. LWSC noted they were provided with tropical EEP masks, but they weren't used since too heavy.
- Overwhelming demand against limited service (only one truck available). Sometimes there are 200 people in the waiting list, waiting up to 2-3 months in the rainy season. People seek for the emptying service at the very last minute when the toilet is full. There needs to be a better balance in the service between low and high demand periods, a second truck and methods for providing services to those in need for emergency situations (e.g. cholera outbreak).
- There are no available standards for the end products, as a result the Water Trust cannot sell the Bio solids commercially. Guidelines should be given to emptiers about adding water or disinfectant to emptied sludge.
- LWSC may need to create an FSM unit to ensure adequate support (with business, public health and engineering expertise).

Group D: Mtendere/Kalingalinga

Background

The Mtendere/Kalingalinga San Mark project is part of the Lusaka Sanitation Project funded by the Millennium Challenge Fund (2013- 2018) and will be continued by LWSC post fund. It aims to connect a per-urban area to a sewer network using a condominium sewer network to benefit 48,000 people. There is a possible extension until 2021 to complete sewerage extension and loan recovery.

LWSC collaborates with the Better Now Finance Company (BFC) since November last year to design new financial products to support toilet construction. It includes a financing facility in the peri-urban areas of Kalingalinga, Mtendere, Chazanga and Chipata townships.

Sanitation situation

Mtendere is low income settlement of 9,400 households and area was the epi-centre for a cholera epidemic in 2017.

- Prior to the project about 70% households used dry pit latrines; 20% septic tanks; 10% had no toilet
- Water Supply: Intermittent (approx. 8 hours per/day) and not a daily supply in all areas
- Issue with shallow aquifer contaminated by pit latrines that is expected to have contributed to the 2017 cholera outbreak.

Group D: Mtendere/Kalingalinga

Sites visited and key insights

Introduction to Mtendere part of the Lusaka Sanitation Project

The Lusaka sanitation project, as described above, and includes the sanitation connection action plan (SCAP) to connect 9,400 households to sewerage in three phases.

- The project is divided into 10 pages, 6 managed by LWSC and 4 by Lusaka City Council (LCC). A SCAP team and office formed by Lusaka Water – links community, LWSC, implementers, donor.
- The first phase is near completion and included construction of 3km of condominium sewers, 5.6km of water network to improve water pressure, sanitation marketing and community mobilization and sensitization on WASH. It aimed to connect over 150 households.
- Phase two (2) and three (3) of the project are expected to commence as soon as possible
- Sewerage was selected due to: locality of settlement above city's drinking water supply aquifer (on-site sanitation was therefore unsuitable); proximity to main sewer line; recognition of increased wastewater flows when the water master plan increases supply.

Lusaka Sanitation Project: Implementation approach

- Public Health Act implemented: All households within 60m of sewer pipeline must connect as soon as possible. The city council must enforce.
- Target of 80% connection to sewer to achieve service delivery and public benefits (100% can connect)
- Commissioning of water and sewerage services will be done in phases, the first from October 2018 to August 2019.
- Private contractor hired for construction, manholes built before new roads constructed.

House in Mtendere,

Construction of Sewerage

Sewer manhole

Toilets built through loans

Financial support for toilets and sanitation supplies

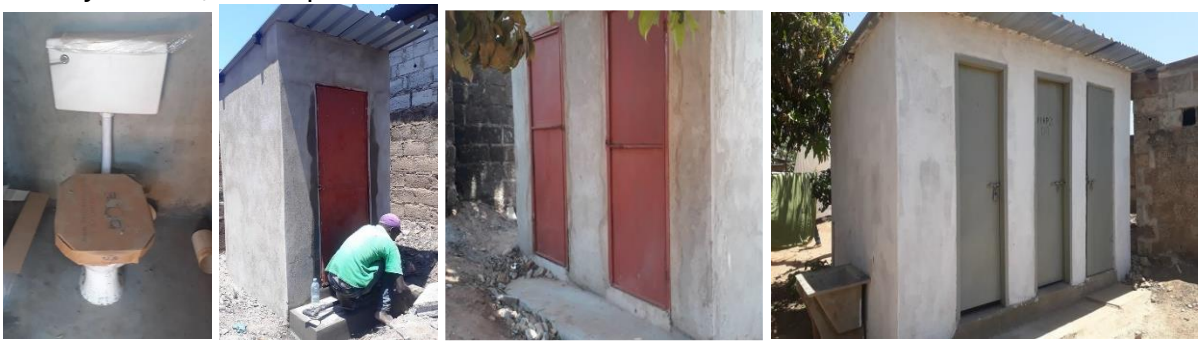
- Toilet financing: The overall project approach is for households to fund their own toilets and connection to sewer; however low-income households receive support. Medium poor households (881 households) have access to a loan to be repaid in instalments and ultra-poor receive a grant.
- The NGO People's Process on Housing and Poverty in Zambia established a revolving fund through MCF funding where they offer a range of toilets options: single/double/ with bath (580– 950 USD) and options suitable for people with disabilities. The loan disperses funds directly for the materials and artisans (no cash) and should be repaid including a 10% admin fee in instalments (15–30 USD per month). To date 500 medium poor households have built toilets and repayments have started. The repayment is expected to be done by landlords, tenants or close family members, and starts once the household is connected to sewer. There are provisions for extended repayment periods if required.

Group D: Mtendere/Kalingalinga

- Better Now Finance Company (BFC) have partnered with LWSC since late 2017 to design new financial products to support toilet construction. The role of BFC as a micro-finance company is to offer structured, affordable and flexible finance to suppliers of building equipment for the toilets and sanitation equipment. It includes a financing facility in the peri-urban areas of Kalingalinga, Mtendere, Chazanga and Chipata townships.

Awareness raising

A consulting firm developed communication materials for supporting toilet upgrading and connections and the Zambia Homeless and Poor People's Federation was engaged for community mobilization. The focus of the messaging is on health (preventing cholera), lifestyle upgrade and the legal requirement to connect. Reasons for households to connect included: feeling it is a "better" system than on-site system; to avoid the need to empty or pit overflows in rainy season; and to prevent cholera.



Photos: New toilets are adapted to meet the family's needs

Challenges

- It was initially requested that households provide a 15% upfront payment for accessing the loan, however many households could not afford this.
- There was also little initial interest in the loans due to lack of trust and expectation that toilets would be provided free (e.g. from government/NGO/donor). Only 5 households requested a loan in the first 6 months.
- It is unclear how the existing septic tanks will be decommissioned.

Recommendations

1. Introduction of cooperative approach to provide guarantee for loan repayment
2. If loans could be be accessed by richer households with extra charge, this could cross subsidize poor households.
3. Collect data on the 6000 households who have pit latrine but have not taken loan for upgrading to understand the status of their toilet and what is needed to connect as well as increase communication of the timeline for connection and enforcement measures.
4. Provide economic incentive for early connection
5. A strategy to decommission existing latrines is needed, this could be done by integrating the existing pit emptiers into this sewer project.
6. To improve likelihood of public health outcomes, hygiene campaigns are also needed (handwashing, hygiene for street vendors).

Block 3 – Approaches to Investment Decisions

Block three reflects on what was seen in the field visit and dives deeper into the different approaches to planning and decision making, including:

- Introduction to City Sanitation Planning
- Decision-making considerations for decentralised sanitation systems (DEWATS)
- Reuse in Practice - the Nakuru-Kenya experience
- Planning urban sanitation in Nicaragua
- Proofs and Refutations: Debating time

Introduction to City Sanitation Planning

Presentation by: Antoinette Kome

This presentation focused on new approaches to participatory city sanitation planning. When introducing this block Antoinette emphasized that city sanitation master planning is often very comprehensive, and the implementation is always slow. The presentation had reflections from:

- Indonesian urban sanitation strategies,
- Indian urban sanitation plans,
- Community-led urban environmental sanitation planning (CLUES) and
- Sanitation 21

The aim was to provoke participants to reflect on their approaches to city sanitation planning and the assumptions that underline them.

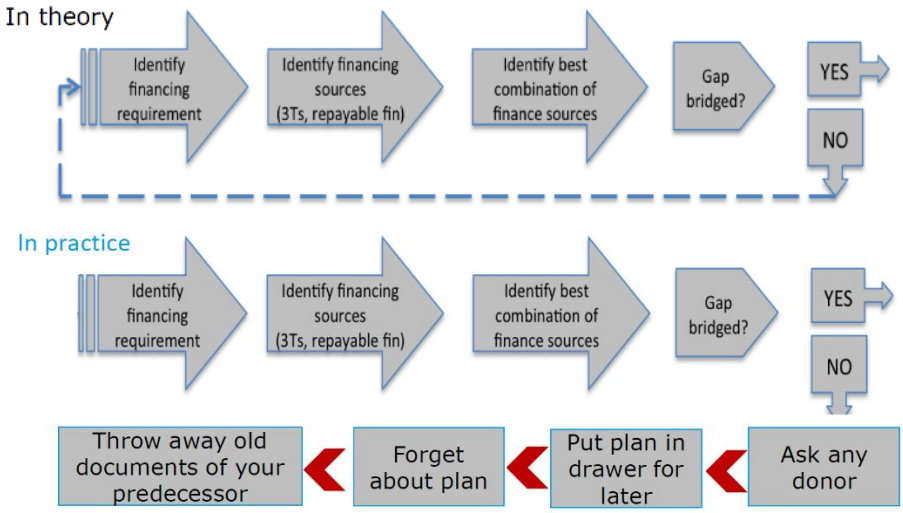


Figure 6 - Matching finance requirements and sources: theory vs practice

BLOCK 3

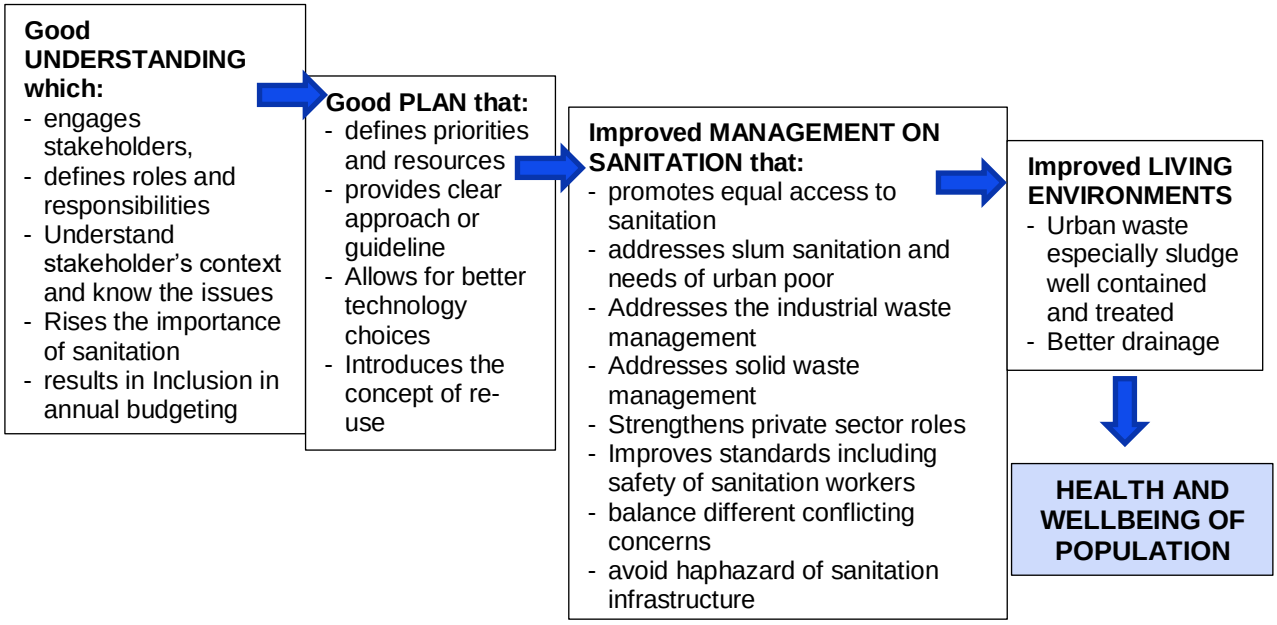


Figure 7 - City Sanitation Planning objectives at different levels (SNVWASH Dgroup 2012)

Reflections

- ➢ Are there too many objectives? Do we need to be more focused?
- ➢ Do we assume that human waste is a problem to get rid of? Or is human waste a resource to be used?
- ➢ Challenge of finding a balance between the many conflicting objectives
- ➢ Need to create shared objectives
- ➢ An important outcome of planning is raising awareness and increasing the priority of sanitation within urban development.

Barriers

- Several countries are still at the start of urban sanitation planning, having previously focused first on rural areas. There are often gaps in urban sanitation responsibilities
- Planning processes are time consuming with no quick wins
- Coordinated planning via inter-agency working groups does not necessarily guarantee quality outcomes, sometimes it becomes ticking the boxes.
- Resource allocation, either with local government not prioritizing sanitation at all, or focusing investment on selected parts of the service chain (e.g. treatment) instead of taking a holistic view

Enablers for urban planning

- ✓ Growing interest in green concepts, such as Green Healthy City, is creating more space for sanitation in overall city planning
- ✓ More interest to mobilize the private sector through Public Private Partnerships (PPPs) and engage private sector in dialogue

✓ More interest in joint planning and sector coordination for urban development that includes sanitation, also bringing in private sector and development partners.

Specific urban sanitation planning processes need to be included in mainstream local government planning

- **Added value:** Introduce innovation in mainstream local government planning, which otherwise would be difficult to achieve
- **Risks:** No real legitimacy for implementation of city sanitation plans if not included in the city's planning and budget preparation process
- **Do not institutionalize** because of a proliferation of committees and working groups which local governments will not have adequate resources to sustain

Reflections on city sanitation planning from ISF-SNV paper "Are we doing the right thing? Critical questioning for city sanitation planning".[1]

- Approaches to city sanitation planning are dominated by rational comprehensive thinking
- Should accept that less is more in city sanitation planning
- Monitoring and embedded learning processes need to be integrated within any planning process

Presentation: Decision-making considerations for decentralised sanitation systems (DEWATS)

Freya Mills from the Institute for Sustainable Futures – University of Technology Sydney shared two examples about the decision-making considerations for decentralised wastewater treatment systems (DEWATS) from Vietnam and Indonesia.

1. Can Tho Vietnam: Cost-effectiveness and sustainability assessment[2]

Figure 8 – Photos of Can Tho centre, collaborative planning and options mapping

The project aimed to develop a collaborative and analytical sanitation decision making process to find solutions for Can Tho city (in the Mekong Delta Vietnam) that were: context appropriate; fit for purpose; cost-effective and sustainable. It involved significant

[1] ISF-UTS & SNV (2016), Learning paper: Are we doing the right thing? Critical questioning for city sanitation planning. ISF-UTS and SNV. Available at http://www.snv.org/public/cms/sites/default/files/explore/download/2016-isf-utssnv-arewedoingtherightthingcitysanplanning-learningbrief.pdf

[2] References for this project include: Willetts, J.R., et al. ISF-UTS 2010, Cost effectiveness and sustainability of sanitation options: A case study of South Can Tho - Technical Report, pp. 1-49, Sydney, Australia. http://hdl.handle.net/10453/35021 Willetts, J.R. et al. ISF-UTS 2010, Selecting sanitation options: A case study of South Can Tho - Technical report, pp. 1-50, Sydney, Australia. http://hdl.handle.net/10453/35020

local data was collected to inform the decision process, including: GIS data (building type), demand (water, wastewater, reuse), costs (unit, capex/opex, asset replacement).

Most households were using septic tanks however a treatment plant and sewerage served the city centre. Options were developed collaboratively with local stakeholders:

(1) Centralised – connecting to existing wastewater treatment plant
(2) Decentralised systems
(3) Combination of centralised for inner area and decentralised systems for peri-urban
(4) As for three with urine diversion & reuse.

Cost effectiveness analysis aimed to find the "least cost" to society based on levelized cost in terms of service received, for example: cost of water supplied ($/kL), household cost for sanitation ($/ hh). It considered the life cycle costs (capital, O&M, asset replacement, benefits to society) and net present value to recognise investment timing.

- **Considered life cycle costs:** Options 2 (decentralised) and 3 (combination) had the lowest Operation and Maintenance (O&M) and overall costs. Consider also who pays? Capital and operating costs borne by different agencies
- **Considered resource implications:** Water, energy and nutrients (P, N). 66% ongoing energy costs in option 1 were due to pumping (not treatment). In option 4 the predicted fertiliser sales more than covered annual O&M costs.
- **Guided sustainability assessment:** Framework developed for decision making including consideration of: technical aspects and risk; social and health; environment; economic; and the city's future vision. As reported by a local government stakeholder "I can sit at my desk and make decisions, but there will be no basis for them. Here we have a rationale and analysis to guide the decisions."

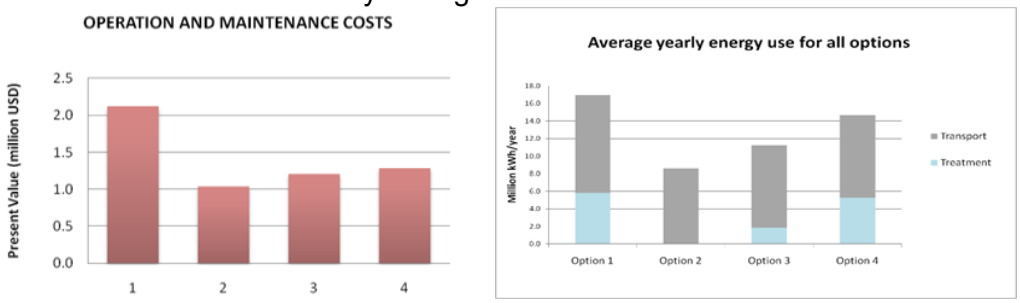


Figure 9 – Can-Tho O&M and Resource Use cost assessments

2. Decentralised sanitation in Indonesia – Need to consider the effects of upfront decisions on the management and operation sustainability[3]

Background context: Communal scale sanitation (SANIMAS) in Indonesia started in 2003 and has scaled up to over 25,000 systems in 2015. Originally the focus was on community toilet blocks and community empowerment, there has now been a shift towards community scale sewerage (<50hh). Communal scale sanitation is part of National Sanitation Strategy and are typically focused in low income areas.

[3] References for this project include: Mills, F, Willetts, JR & AlÁfghani, M. 2017, Increasing local government responsibility for communal scale sanitation Part 1: Review of national program guidelines and two city case studies, Institute for Sustainable Futures at the University of Technology Sydney. http://hdl.handle.net/10453/122064
Mitchell, C, Ross, K, Puspowardoyo, P & Wedahuditama, F 2016, Governance of local scale sanitation: Visual Synthesis Report for key stakeholders in Indonesia. http://hdl.handle.net/10453/88133

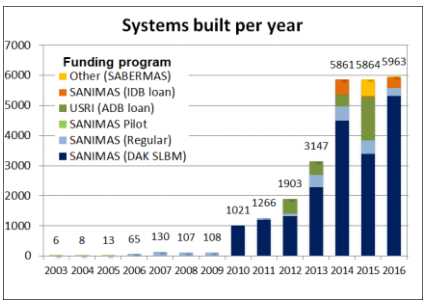


Figure 10 – DEWATS built per year in Indonesia (Mills, 2017)

Recent studies by ISF-UTS found several challenges to the sustainability of these systems influenced by initial project decisions:

- **Technical challenges in ongoing sustainability:** The research found there was very little information available on the technical status of the systems (no registers, unknown operational status, limited effluent monitoring). There were often construction issues as contractors were new to building sewers. Many systems were operating below design capacity while others had filled and stopped working since there was no means to empty them (particularly in dense hilly areas).
- **Management:** As the projects are implemented through different national and donor funding programs there were different levels and quality of engagement with both the community and local service providers. The government has little involvement or perceived responsibility in many systems (although sanitation is a local government responsibility and the systems are typically in the low-income areas). Often communities felt overwhelmed with the burden when something goes wrong and didn't know how to get help. The communal sewers are more complex to operate than the initial program's shared toilets, and as they form part of the city's sanitation strategy, greater local government involvement and coordination is needed.
- **Finance:** As these systems are communal managed the fees are agreed informally and are not legally binding, this resulted in most operators not being paid and limited funds available for repairs. The uncertain government role and that the systems are on community owned land, makes government finance for major repairs complicated.

Improving ongoing operation through improving upfront program decisions

- Involve local government from project outset and during implementation
- Clear asset ownership - preferably by government
- Ongoing technical, financial and management monitoring and support
- Mechanisms to connect more customers to existing systems
- Consider communal systems within citywide planning

Figure 11 – Co-design stakeholder workshops, DEWATS sewer and toilet blocks

Q&A

Q. What is the scale for the Can Tho project and why was upfront cost highest in the centralized sewer option? A. 3,500 people. Most operation costs are due to pumping since it is a flat area and the distance to treatment is far.

Q. Why are some centralized sewer built even if they are not economically viable and when is it suitable? A. Centralized sewers are chosen due to the local conditions. In this scenario the centralised option had high cost per user due to high pumping costs and low density in peri-urban areas. However, in another context this could be the more economical options – it must be assessed for each situation.

Q. Why was the mixed sewer and DEWATS option included in the Can Tho project? A. Due to the different densities: central dense area close to a treatment plant and less dense peri-urban areas, resulting in different options suitable to different locations. Decentralised was more cost effective in the lest dense areas since it reduced pumping.

Q. What is the operational percentage of DEWATS in Indonesia? A. There has not yet been a national assessment of system operation status.

Q. Why are some DEWATS not operational? A. It often depends on the level of management and community engagement and local government support. Often those with good upfront community and government engagement were operating well.

Presentation: Reuse in Practice - the Nakuru-Kenya experience

Presentation by Reinilde Eppinga

Nakuru County Sanitation Programme

- Funded by the European Union to demonstrate and upscale approaches to manage the complete sanitation value chain for the (peri)-urban low-income areas. Funding was from 2013-2016 and was extended to 2018.
- Project team included: VEI, SNV, Unmade Trust, NAWASSCO and the relevant stakeholders from Nakuru County Government, Egerton University, NEMA, KEBS and KIRDI.
- Background: Nakuru had a treatment plant but had not been operating for 15-20 years and manual emptying was illegal.
- Project idea: To re-use the faecal sludge to create fertilizer for tree plantations. However, after an assessment of 50 options, reusing sludge for briquette production was found to be more economically viable and beneficial to the community.

The project approach:

1. Research – Assessment of the current sanitation situation to estimate the quantities of sludge that could be produced, based on transport availability, distances, discharge quantities and treatment capacity.

2. Product research - Trials were conducted in partnership with Egerton University. 50 ideas for reuse were considered, including fertilizers, bio-char, pellets for carbonized briquettes among others.

3. Bio fertilizer and briquettes were chosen as the best options from the 50 suggested ideas. Prototypes were created.

4. Market studies conducted to decide between bio fertilizer and briquettes - briquettes were found to be the easiest to make and more economically viable.

- **Steps to briquette production:** Dewatering, solar drying, mechanical drying (sludge and sawdust), carbonisation, milling and homogenising, densification &

making briquettes, drying briquettes, quality check and packaging, storage and distribution.

5. Community pilot studies and field trials – Researchers tested the products (human waste, molasses and saw dust) in the lab for approval and it was also tested in the community for acceptance.

6. Next steps - Bigger machinery will be required to make viable - the water company and local government joined the project.

Figure 12 – The briquettes produced and in-use.

Outcome: During the pilot project (2017-2018) there has been the successful production and sales of 2 tonnes of briquettes per month. The five-year business plan aims to increase production from 5-150 tonnes per month and ultimately producing 250 tonnes per month. Break even costs are expected after 3 years or 60 tonnes/month. However, the speed of scale up depends on availability of additional funding and capacity building support.

This project demonstrates the re-use potential of faecal sludge and consideration of the whole chain – emptying, treatment, new policies and encouraged enforcement. It also resulted in new actors playing different roles and shifted the perspective of sanitation as an issue to a business opportunity.

Q&A

Q: Do you have any problems with acceptance by the community and if yes how do you overcome such challenges? A: Since the whole community was involved from the onset and in all stages, there was good acceptance. In addition, the briquettes did not produce any smell.

Q: How is the market for briquette compared to petroleum gas? A: The pricing is lower than charcoal which is typically used.

Q: What is the environmental impact compared to charcoal? A: It has less emissions compared to wood and charcoal. If the facility was upscaled they would need to take care of gas emissions.

Q: How much was the investment? A: 300,000 Euros granted by EU

Q: What quantity of energy does a kg of briquette produce? A: 60 % of energy needs. It cooks 3 times more than charcoal.

Q: Have you tried plastic? A: No, It causes pollution.

Q: What type of tech do use? A: We use drying beds and dewatering machine as they reduce water content by 60%

Q: Why are your prices low? A: We want to hook the market before we increase the prices.

Planning urban sanitation in Nicaragua

Presented by Marc Perez (SNV)

Sanitation in Nicaragua

- Nicaragua met the millennium development goals in 2015 for access for improved water service from 73% to 87%, and 97% in urban areas (1990-2015). While access to improved sanitation improved from 44% to 68% (1990-2015).
- There are 29 cities with sewerage system serving 36% of the population coverage.
- The water and sanitation comprehensive programme (PISASH) received USD 343 million to invest in 19 cities from 2014-2019. It aims to increase access to improved water up to 95% and sewerage coverage from 18% to 55%.

Slums upgrading projects: A loan from the IADB was accessed by municipalities and citizens for a Housing and Comprehensive Habitat Improvement Program. It aimed to improve water and sanitation, roads, drainage and electricity in 14 neighbourhoods in 9 cities. The investment was approximately USD2,500/family lot, with a total of 4.000 families and 20,000 beneficiaries.

Importance of infrastructure planning for slum upgrading: Marc investigated slum prevention and upgrading as part of his PhD, including an analysis of the alternative infrastructure options. Some examples included:

- **Leon: Azaria H. Pallais** a peri-urban area planned for city expansion. The city planned to build a new sewerage system, pumps and treatment plant (UASB) to service 700 families. Options included: 1. Connect to the existing treatment plant and 2. Modular treatment plant (new plant) to cover 9 neighbourhoods. The modular approach had lower treatment maintenance costs however an increase to the trunk pipe's diameter would be needed. Overall this option was 44% less than option 1, however future upgrading of the treatment facility might be needed.
- **Chinadegga: El Limonal** peri urban area and informal settlement (located next to the landfill). Improvement options to suit 281 families were considered including a new sewerage system, increased capacity of existing sewer pump or connecting to existing sewer and treatment system. Increasing the capacity of the pump had the most favourable benefits, although only marginally cheaper it had the potential to be used by other neighbourhoods.
- **El Viejo: Bello Amanecer and Rosario Murillo:** Considered both a new sewerage system or direct connection to the city sewerage for a population of 1500 citizens in formal and informal settlements. Connecting to the existing sewerage didn't allow capacity for future neighbourhoods to connect, however was a lower cost per capita.
- **Jinotega Diriangen:** Options were considered for 1300 people in this peri-urban and isolated area, including connect to existing treatment, build a new treatment, build a

treatment and sewerage. These were high cost options and there was a risk of weak institutional coordination.

- **San Rafael del Sur: Perfecto y El Pinol:** Options for the formal settlement in the urban area to serve 1902 people included connecting to existing treatment, sewer pump to treatment plant or building a new treatment plant. The pump option was seen as best to connect future neighbourhoods while increasing the treatment plant capacity could also improve citywide coverage.
- **Bluefields Rama Cay Island** – An indigenous community in a rural area on an island, investigated building a big biodigester for each 10-15 families.

Conclusion: The analysis highlighted that adequate planning leads to greater benefits and lower maintenance and investment costs. Inter-institutional coordination and planning urbanisation and network services comprehensively can help to implement more profitable solutions.

Q&A *Q: What kind of incentives would be provided to people who live near the dumping site?* A: The incentive is to improve the area by designing the recycling plant that will also create jobs for people.

Proofs and Refutations

The formal activities on day 3 of the learning event closed with speed debating, intended as a fun way of reflecting on the pros and cons of current question in sanitation planning.

Debating Topic: Sewer connections will always be the preferred Investment	
Arguments from the affirmative side	**Arguments from the negative side**
• Sewer connection will always be preferred due to government's ambition to make the environment safely managed • Sewer connections maximise benefits for citizens. • The cost on sewer connection is on government and no cost on the user • Sewer connection typically has legal/institutional backing, making it preferred • Maintenance roles and plans always exist with sewers. Greater management requirements for on-site sanitation. • On-site sanitation relies on awareness • Sewer connections provide excellent options for re-use • When water supply is improved sewer is required • Planners can anticipate urban growth therefore investing in sewer connection should be a priority. 	• The investment required for sewerage is unaffordable in most cities • Maintenance of sewerage is costly, and the connection fee is very high • Leakages from sewer lines have devastating effects to the environment • Skilled labour is required to operate and maintain sewer systems • Sewer is best in high density areas, rather than low density areas • Areas with sewer are still at risk of exposure to cholera • Sewerage currently on serves 20% of the population in Asia and Africa • On-site sanitation can be safely managed and suits various scales 

Block 4 – Mapping, Zoning and Equity

This block looked into the role of mapping in decision making and how it can be used to increase equity of investments.

- Introduction to Mapping, Zoning and Equity
- Presentation: Treatment Technology Options
- Presentation: Technology Selection Process for Khunla's FSTP
- Presentation: Sanitation Facilities Mapping for Lusaka
- Group Work - Mapping

Introduction to Mapping, Zoning and Equity

Presentation by: Antoinette Kome

Synthesis of D-Group discussion on **decision making in the context of limited funding.** The online forum discussed the influences of limited funding on sanitation options and decisions, considering both present funding and uncertainty about any future funding. A range of options were proposed:

- Can opt for low-cost systems, which can spread funding further
- Systematic method of planning, technology selection, prioritisation according to the resources available.
- Benefit of raising awareness in a centralised (or regional) planning agency who are empowered to disburse funds.
- Justify more funding by highlighting the following issues caused by inadequate sanitation: pollution load and issues, public health issues or disease outbreaks (e.g. cholera), faecal waste discharge to the environment through shit flow diagrams, etc.
- Seek complimentary funding, for example from: National or local government, different donors, private households (e.g. subsidising loans such as the example from Kenya), private developers (e.g. from Malaysia requiring private developers to include sanitation infrastructure and contribute to a sewerage trust fund).

Political pressure may also influence decisions, particularly in the context of limited funding. The group identified the following challenges and methods to overcome them:

- Politicians may only be aware of sewer options. However, extending sewer networks is expensive and often only serves small areas, therefore on-site sanitation may remain necessary to serve the entire city. Therefore, it is useful to broaden their perspective, not just the municipal engineers but also the politicians and other decision makers, so they understand the options available and involved in decisions.
- Similarly, community sensitization is needed as sanitation is often hidden and rarely a priority.
- While citywide investment plans are ideal, even without one progress can be made through discussions and transparent decision making to identify and prioritise needs based on basic data collection and some level of planning.

Presentation: Treatment Technology Options

Presentation by Freya Mills, Institute for Sustainable Futures, University of Technology Sydney

Initial considerations in decisions on treatment

This presentation highlights both the influences and key decisions in selecting a treatment option for urban sanitation followed by a summary of some treatment options typical in the countries attending this learning event.

At a high-level, some factors that could influence the type of treatment selected include:

- Meeting global objectives
  - SDG 6.2: Achieve safely managed sanitation: for treatment his requires at least secondary wastewater treatment and the treatment of both the sludge and liquid fraction of faecal sludge.[4]
  - SDG 6.3: Wastewater treatment meets national or local effluent standards.[5]
- Achieving multiple objectives: public health risk reduction, environmental protection, resource recovery, cost effectiveness (see Can Tho example in Block 3).

Some of the key decisions when selecting a treatment option relevant to the local context include:

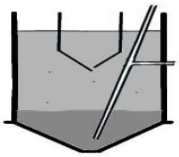
- Whether to separate or co-treat faecal sludge (FS) and wastewater. As there are both solid and liquid fractions to wastewater (liquid and sludge produced in treatment) and sludge (solids and liquid extracted in treatment) – there may be opportunities to treat the two components together.
  - Benefits of co-treatment: Similar technologies are needed, can locate on the same site and more common when a wastewater treatment plant exists, and sewerage coverage is high (co-treatment typically requires a ratio of more wastewater to sludge); Sludge could be dumped into certain sewer manholes – reducing the transport.
  - Considerations in co-treatment: Sludge is more concentrated therefore the ratios of sludge/wastewater need to be controlled; solid waste will often need to be removed prior to co-treatment; partial co-treatment may be preferred, for example dump sludge into a drying bed and co-treat the liquid fraction only.
- Level of treatment – both what is required based on the local discharge requirements, nature of discharge (long ocean outfall vs reuse) and what is feasible for the city (depending on capacity, funding, status of rest of service chain).
- Treatment objectives for different steps: separation, dewatering, solids removal, pathogen/nutrient removal
- Mechanical (requires electricity, sometimes require greater skill in operating) vs non-mechanized (nature based, gravity flow)
- Location and land availability: if the land is close to residential areas the facility may need to be more compact or enclosed (due to smell), while a site far away from residential areas may have less issues with odour and more space.

[4] WHO and UNICEF, 2018. JMP Methodology: 2017 update and SDG baselines. WHO and UNICEF, Geneva. Available at https://washdata.org/sites/default/files/documents/reports/2018-04/JMP-2017-update-methodology.pdf

[5] WHO 2018. Progress of wastewater treatment. Piloting the monitoring methodology and initial findings for SDG6.3.1. WHO, Geneva. Available at https://www.who.int/water_sanitation_health/publications/progress-of-wastewater-treatment/en/

- Nature of the inputs – for example, sludge from dry pit latrines has different treatment requirements from more liquid waste.

This section briefly summarises some options for faecal sludge treatment and examples where they are suitable or have been used. Significantly more detail on decisions and design is available in literature such as Tayler 2018 or Strande et al 2014.[6]

Faecal sludge treatment options (or solid fraction of wastewater)	
Objective	**Method**
Solid liquid separation – initial step to separate fractions for further processing. Depends on input quality (wet/dry, concentration, settlability)	**Non-mechanised options**
	Settling-thickening tanks (e.g. Imhoff tanks): Solids settle and discharge through a base at bottom and the liquids flow off the top. Advantages: small land area and low operational costs/requirements. Disadvantages: sludge requires further drying, sludge can solidify at bottom if not discharged regularly. Many examples in Indonesia. 
	Sludge Drying Beds: Sludge discharged into shallow chambers with a well-draining base (sand, gravel) allowing liquid to evaporate or drain out. Dried sludge can be removed for further treatment and reuse, discharge liquid requires further treatment. Advantages: low initial cost, low maintenance and suitable for low loads. Disadvantages: large area, influenced by rain/humidity, may have odour and fly issues. 
	Planted drying bed: Similar to sludge drying bed but planted with reeds which improve treatment. Advantages: Reduced emptying needs, every 5-10yr. Disadvantage: reuse is less common (hard to remove sludge), and greater maintenance in replanting. Example in Khulna Bangladesh.
	Mechanised options
	Mechanical dewatering: Separation through physical filtration, squeezing/compaction or centrifugal separation. Requires a much smaller area than drying beds and can achieve greater dewatering for a high input volume. Requires a constant electricity supply and access to equipment (repairs/replacement). While the operation requirements are low, some skills needed for repairs. Additional treatment is still needed as pathogens are not completely killed off. Example: rotor-press Jakarta, Indonesia. 
	Thermal drying: Direct or indirect dryers transfer heat to sludge and water is evaporated from sludge, producing granular like dried sludge. The evaporated water is captured/removed. It requires some pre-dewatering for wet sludge (can't be liquid). Achieves a significant reduction in volume and weight and treated sludge can be applied directly in agriculture, although energy requirements are high. Example in LaDePaSouth Africa
Further treatment – Additional	**Co-composting** Co-treat dried sludge with organic solid waste through composting. Heat generated in covered piles/bins kills pathogens yet leaves nutrients beneficial for agriculture. No electricity needed but manual turning,

[6] Various information sourced from Tayler 2018 Faecal Sludge and Septage Treatment: A guide for low- and middle-income countries https://www.developmentbookshelf.com/doi/book/10.3362/9781780449869 and Strande et al (Eawag) 2014 FSM Book. Chapter 5 - Overview of Treatment Technologies. Mariska Ronteltap, Pierre-Henri Dodane and Magalie Bassan https://www.eawag.ch/fileadmin/Domain1/Abteilungen/sandec/publikationen/EWM/Book/FSM_Ch05_Treatment_Technologies.pdf

treatment of separated sludge, particularly to reduce pathogens	and sieving is required. Similar to black soldier fly treatment. Many examples, including Faridpur Bangladesh (SNV/Practical Action).
	Lime stabilisation: Addition of quick lime (CaO) or slacked limed (Ca(OH)2) to treat pathogens by changing the pH. Pre-treatment is suggested. Care in handling and storing lime is needed since it is very corrosive. Example: Talcoban Philippines and in disaster situations.
Disposal – reducing risk by containing sludge	**Deep row trenching:** Land disposal of untreated faecal sludge into trenches in soil which are then covered. Does not require electricity or ongoing operation. There is a potential risk to groundwater, soil or surface water if poor site selection. Example: Malaysia (Narayana, 2017) or South Africa (Still 2012). Similar options are the Arbourloo.
Wastewater treatment options (or liquid fraction of sludge)	
Non-mechanised Secondary treatment	**Waste stabilisation ponds** Large manmade ponds, typically three types in series: anaerobic, facultative and aerobic (maturation), each with different treatment objectives and design. Achieves high nutrient, solid, BOD and pathogen removal and has low operating cost and low maintenance. However, they are typically very large and require regular sludge removal. 
	Up-flow anaerobic sludge blanket reactor (UASB): Wastewater enters the reactor from the bottom and flows up and is treated through suspended sludge blanket filters as the wastewater flows through it. It is suited to high organic and hydraulic loads and little sludge produced. However, it requires skilled operation and is unsuitable for variable inflows
	Constructed wetlands: As for the planted sludge beds (above) these systems are aided by plants which increase porosity of filter media and provide some nutrient removal. The flows can either be horizontal subsurface or vertical and the operation requirements are low, they can look attractive. However, they require large land area and there is limited nutrient removal. Many examples, including Kathmandu, Nepal.
Mechanised - Secondary treatment	**Aerated lagoons** - Mechanical surface aerators provide oxygen to the pond and keep organisms suspended. They achieve high removal of BOD and pathogens and are resistant to shock loading. Example include Jakarta (for sludge) and Yogyakarta (wastewater) in Indonesia
	Rotating biological contactors – A pack of disks rotate through wastewater; biological film builds up on plate which provides aerobic treatment. They can take up a small footprint and be located inside buildings. Example: Banjarmasin Indonesia. 
	Trickling filters - Wastewater "trickled" or sprayed on-top of gravel bed and is treated by filtration and aerobic digestion through the filter material. Has a small surface area and low power requirements but a high capital cost.

Q&A

Q. *Should greywater (from bathing, washing) be combined or separated from blackwater (from toilets)?* **A.** Traditionally sewers and wastewater treatment are designed assuming greywater is combined, particularly to ensure adequate flow in sewers to flush solids. However, there are some examples where they are not combined – settled or small bore sewers which connect to septic tank effluent and convey solids free flows, or in cases where separate greywater treatment or reuse or is considered to reduce the faecal pollution of greywater.

Q. *In what situations can deep row trenching be used?* **A**. In areas where there is no risk to groundwater pollution or pollution of surface runoff. It is typically suitable in more remote areas, such as forests, that sludge can be dumped in a contained way and covered to avoid contact with people or animals.

Q*. Can you share a few considerations on transfer or dewatering stations and any examples?* **A.** They are suitable when the treatment plant is far away, or transport costs are prohibitive. As investigated by SNV in Khulna, finding land for a transfer station is difficult (underground storage in urban areas where sludge trucks can regularly discharge to) and a mobile transfer station (large tank on a truck) was built. While transfer station relies on a larger truck to remove the contents and take to the treatment, a dewatering station assumes that some of the liquid is removed making the volume/weight of sludge to transfer to treatment much lower. However, the extracted liquid must also be treatment, therefore most suitable in at city where it could discharge to a sewerage network.

Q. *How do you reduce nutrient loss for reuse?* **A**. This depends on treatment option, some such as composting retain the nutrients but reduce pathogens, while others aim to reduce nutrients due to environmental pollution of waterways.

Presentation: Technology Selection Process for Khunla's FSTP

Presentation by Rajeev Munankami, SNV Bangladesh.

SNV supported Khulna City Corporation to develop options for faecal sludge treatment plant (FSTP) suitable for their local conditions and available site as well as business models for their operation. Stakeholders were guided through an informed choice process so they could understand the advantages and disadvantages of each and chose which best suited their vision and needs. This presentation summarised the selection process:

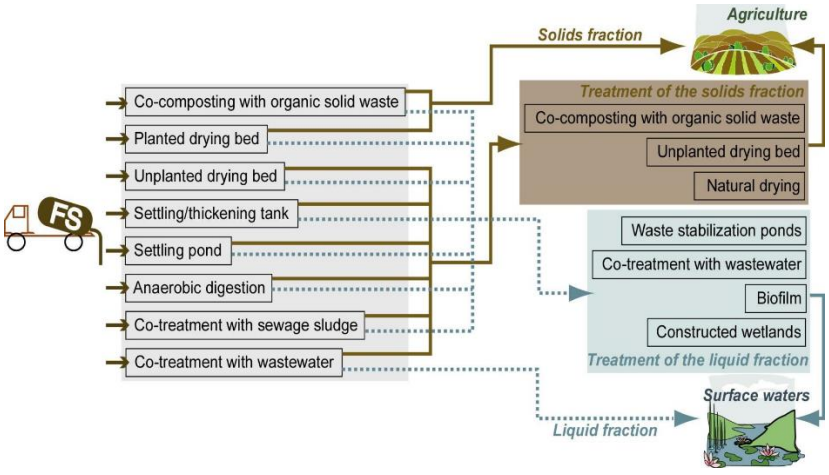


Figure 13 - Faecal Sludge Treatment Option (Source: Ingallinella et al 2001)

Background: The site of an old landfill was made available for the FS treatment, it had been covered for 5 years, however this meant the treatment must be watertight due to risks of contaminated leachate discharging into local waterways. SNV developed options suitable for a 5-year plan and shortlisted through discussions with local government.

Three options were compared:

- Two constructed wetlands in series – low smell, fast drying.

- Sand drying bed and constructed wetland – smaller footprint that does not disturb old land fill, sludge by-product can be removed for reuse (with additional drying).
- Anaerobic digester and sand drying bed – excavation required which would disturb the landfill and more costly, but better treatment and dried sludge available for reuse.

The government committee chose the constructed wetlands in series since they were uncertain about sludge reuse so preferred the longer operating and non-reuse wetlands. However, in the end a small 3m^3/d unplanted sludge drying bed for piloting reuse was also built. The total cost of construction was US$240,000 for the constructed wetland with capacity of 180m3/day, which also included the unplanted drying bed and cost of the office building and other security measures. The details of the treatment plant are outlined in the SNV Learning Event Report 2017.

Figure 14 - Khulna's constructed wetland

Some of the challenges faced in the selection of treatment options and during construction included:

- Sub-optimal piece of land available – far from the city, unstable for heavy loads, cannot dig into it and needs to be protected from infiltration. This required that the wetlands be built-up with embankments (costly) and lined with geo-textiles (ordered from Dhaka) so they don't leak.
- Since the trucks could not pump up to the raised inlet (they discharge by gravity), the access road also had to be raised.
- In Khulna there was limited availability of typical filter media like stones. Therefore, brick aggregate was used, along with sand, gravel and cut plastic bottles.
- Lack of capacity to construct non-conventional infrastructure.

Presentation: Sanitation Facilities Mapping for Lusaka

Presentation by Chaiwe Mashauka/ Kapanda GIZ

This presentation focused on the Climate-friendly Sanitation (CFS) Project, which is part of GIZ's broader support to the Water Sector Programme in Zambia and as the advisory and capacity development partner for the LWSC and LCC projects.

To support the LSP, a mapping exercised was conducted by the CFS to provide a reliable customer and infrastructure database for on-site sanitation facilities users within four critical LSP peri-urban intervention areas (Kanyama, Chawama, Chazanga and George).

Objectives of Sanitation Mapping: Develop an onsite sanitation database for Lusaka and support the development of inputs to the following aspects for the LSP

i) Data on current services and service providers to inform both coverage and monitoring of FSM Services (for effective service delivery under PPPs with VTOs & Emptier and compliance to regulations – NWASCO, ZABS, ZEMA)
ii) Database development for a customer payment management system (sanitation service fee collection through water bills or payment points)
iii) Data on demand, attitudes and practices of household sanitation to inform targeted marketing for on-site sanitation and FSM services.

Data Collection Process: Consisted of two components: 1) the facility mapping which identified GIS location of toilets, water points and solid waste sites across the four neighbourhoods; and 2) Knowledge, Attitude and Practice (KAP) study – data collection on drinking water sources/service providers, O&M of sanitation facilities; solid waste and greywater disposal methods, and handwashing and menstrual hygiene practices and knowledge.

Table 2 – Data collection process Lusaka Sanitation Project

Methodology	Facilities Mapping	Sanitation KAP Study
Digitization	2017 Ariel Imagery, Georeferenced to Arc 1950 using GCPs, Digitized roads and buildings	Images/ Vector Data used for data collection on mobile devices
Field Data Collection	Mobile Apps (Trufield, ODK)/ Offline Maps Online servers, Enumerators/ operational zones	Sampling Methods (95% CI, 3% ME) Survey CTO Software Enumerators
Steps/process	• Digitizing of areal imagery • Training & selection of Enumerators • Pilot test • Mapping & data verification • Handover	• Training & selection of enumerators • Pilot Test • Data collection • Data verification • Handover
Timeframe	• 2 months (March-May 2018) – Phase 2 • 1 month – Phase 1	• 1 month (June 2018) – Phase 2 • 3 months – Phase 2
Consultant	Fibbonacci Engineering – Phase 2 Open Street Map Zambia – Phase 1	Fibbonacci Engineering – Phase 2 SBK Consulting Ltd - Phase 1

Figure 15 – Resulting sanitation facilities mapping from Lusaka

Other key activities to support the LSP included:

i) **FSM Market Assessment:** To determine the market size for informing emptying and transport needs. It collected data on customer segmentation according to facility type and the social class of the users and developed zoning of the city for FSM services.

ii) **FSM Service Delivery:** Assessed the following aspects to design the scheduled emptying programs:
   - Accessibility of facilities for desludging based on the technical features and geographical location (83% accessible to vacuum tankers).
   - State and design of OSS facilities to inform desludging methods, quantity and quality (lots of solid waste).
   - Customer tracking to build understanding of emptying frequency
   - Route analysis to optimize the transportation of sludge to FSTPs

iii) **Public Awareness and Sanitation Marketing:** Developed hygiene promotion campaigns and IEC messaging from the information collected. Assessed the effectiveness through **t**oilet usage monitoring to assess the ratio of users/toilet and ensure safe behaviour, including whether solid waste was dumped in latrines. Enforcement of safe practices by the LLC health inspectors

iv) **Planning for emergency interventions:** Developed a plan to support desludging during disease outbreak (e.g. LCC and LWSC emptied pit latrines in Kanyama during the recent cholera outbreak); Investigated the cause of disease outbreaks (monitoring water contamination, sanitation inspection); tested the water quality and chlorination of water points and closing shallow wells; and refurbished or decomissioned unsanitary latrines.

v) **Updating the database** (next steps) in order to integrate it into existing water supply systems (LWSC-EDAMS). Develop ICT for service providers to have mobile apps to track toilets and systems which could also be used by the FSM call/dispatch centre to be developed under the LSP.

Q&A

Q. To what extent have consumers of the data used the recommendations from the data collection process? A. LWSC are using the data to digitize standard operating procedures and the data will also be used in monitoring and evaluation as a component for verification. LWSC is considering implementing an integrated management system which will manage all data and program post LSP.

Q. Are the solid waste sites landfill sites or sludge disposal sites? A. Most of them are landfill sites hence a lot work is required to improve them.

Q. Do you feel that there is significant variation to require a census? A. A sample-based survey is cheaper but it lacks facility mapping. A census was not required for market assessment because it is intended for planning in the future.

Q. How do you link different data components (e.g. .toilet, household and land)? A. There are some limitations in linking data, particularly between the mapping and the KAP study.

Q. How many people were hired to do data collection, what was the cost and timeline? A. They were 50 enumerators hired. The cost K1.7million (143,000 USD). The timeline for the first study was two months and one month for the second study.

Group Work - Mapping

Participants from country groups were asked to talk about the use of mapping to ensure equity in investment decisions, in particular answering:

- Which type of equity considerations are important in your context?
- How can you use mapping in relation to equity?

Indonesia	• Equity considerations: Gender issues, elderly, Slum areas and low-income groups or informal settlement, people with disability (though not considered in current programme). • Useful to understand which areas have vulnerable groups for planning. Need information on the different groups otherwise it is difficult for investors to consider them in decision making processes.
Bangladesh	• A database exists in many cities, although of varied functionality. • Supported by universities in mapping due to a lack of expertise of government departments. • Identified which wards had bad sanitation access. • Used GIS mapping in the pilot project, however lots of information is needed to develop into maps which is very challenging.
Nepal	• Important to involve disadvantaged groups in decision making • Manual data base is developed to identify each household. • Use maps for basis of subsidies
Tanzania	• Equity considerations include: the ownership of toilet depending on whether landlord/tenant to inform upgrading and investment options as well as understanding market for communication. • Consideration of equity affects the: investment decision, emptying tariffs, program advocacy.
Zambia	• Special mapping to assess where investment need is required: urban vs peri-urban, population density, income levels (poorer population lower service), gender, disability and age (access to information). • Mapping will help tariff planning and technical innovation.

The discussion highlighted some additional considerations of equity and data collection, including:

- ✓ Privacy issues of data should be considered
- ✓ Some GIS database designs are not useful for customer data base management. Where possible the monitoring and customer databases should try to align.
- ✓ The GIZ approach to data collection and processes had useful notes and examples.

Block 5 – Country group work and wrap up

To close the learning event, this block focuses on sharing knowledge and reflecting on what has been learnt and what can be taken back to their country programs. It includes:

- World café Sessions-sharing advice on key sanitation challenges
- Country group take away massages in “Shopping Bag”
- Closing learning event

World café Sessions

Following the discussions and ideas over the four days, country groups were asked to develop key topics or questions to ask a group of consultants for advice. Two representatives from each country were appointed to be the country ‘client’ while the remaining participants were allocated to 5 mixed groups of ‘consultant companies’ who rotated amongst the clients to offer their advice to the questions in 15-20 minutes.

Five counties, Nepal, Zambia, Bangladesh, Tanzania and Indonesia received technical assistance on different policies on sanitation Investments. This information was then shared with their country counterparts and will be ‘taken-home’ to inform future decisions.

Country group take away messages in “Shopping Bag”

An important objective of the learning event is that participants take away a ‘shopping bag’ full of new ideas and learning to influence practice their own countries. In country groups participants reflected on their learning highlights from the four days and used this opportunity to collect any additional information or examples from other participants.

Each country was asked to present the lessons learnt and the lessons they are carrying with them to their respective countries. Documenting what is in each country’s ‘shopping bags’ hold participants accountable to knowledge and learning they pledge to take back.

Country	Shopping Bag Contents: Learnings and Actions
Nepal	• Integrate sanitation planning and investment within municipal planning and to disburse budget through municipal plan. • Engage the poor and marginalized in decision making. Including use of disadvantaged group (DAG) mapping from household surveys to target DAGs and provide financial support mechanisms. • Collaborate with private sector for investment in construction and operation of sanitation services e.g. (public toilets, FSM) • Need for mass campaigns to advocate for timely and correct FSM • Develop bankable project proposals to access basket fund/ matching funds from provincial and national government
Zambia	• Revision of strategic plans to include on-site sanitation and consider different FSM models. • Importance of sanitation mapping and review but also need to balance data collection, planning and consultative implementation

Country	Shopping Bag Contents: Learnings and Actions
	• Consider the various sanitation models and choose options that suit the local scenario and available resources • Involvement of stakeholders in planning, decision making and management. • Coordinate the management of solid waste and FSM. • Improved options for manual desludging of pit latrines (Formation) • Minimize disposal of solid waste into pit latrines by introducing an extra charge to provide incentive • Production of briquettes and other products from waste • Enforcement using the Public Health act (Sewer Connections)
Bangladesh	• Manual emptiers (mechanical emptying) can be safely managed and the business can be viable. • Options exist to use drums, barrels and trailers for FS emptying and transport as a basic option for dense areas. • Various business opportunities exist, including the production of briquettes as by product FS treatment • Different considerations for sanitation planning process: Sewer is not always the best option, however not enough emphasis on how to achieve a citywide service.
Tanzania	• Interested in re-use options (Briquettes from Nakuru experience) • Informed choice require data, sanitation mapping can be used for both decisions and verification. • On-site sanitation remains important and manual empties should be incorporated into main service provisions.
Indonesia	• Need to anticipate urbanization and population growth in sanitation investment as well as anticipating and calculating O&M costs from the outset, • Informed choice as a process and a menu of options presented. • Importance of PPE and OHS for emptiers • Investigate compliance mechanisms and tools to encourage proper maintenance of toilets. • Possibility of mandatory connection to sewer system and adequate regulatory framework to do so. • Progressive ring-fenced sanitation tax (for domestic and non-domestic premises) • Look in to sludge re-use possibilities and view sludge as a resource rather than a problem

Closing learning event

Closing comments from managing Director for Chambeshi Water and Sewerage Company Mr. Simumba:

- He highlighted that for many years Zambia has been faced with serious challenges in the provision of proper and acceptable sanitation services.

BLOCK 5

- While Muchinga and Northern provinces have recorded zero cases of cholera outbreak or increased cases of diarrheal diseases, cases can mostly be attributed to poor sanitation at household level.
- Open defecation remains a challenge, particularly as SNV found significant levels of OD remain in Kasama, Mpulungu, Mbala and Nakonde.
- The water utility company is now mandated to provide water and sewerage services and hopes to see improved sanitation for all.
- Agreed that informed choice in urban sanitation services is required and needs the involvement of all relevant stakeholders in decision making, use of current data and information and comparison of sanitation solutions appropriate to local context.
- Expressed the need to revise the Strategic Plan to encompass various options for sanitation and selection according to the needs of towns.

Appendices

Appendix 1 - Programme

"Informed Choice in Urban Sanitation Investments"

Lusaka, Zambia, October 1- 4, 2018

Time	Activity
DAY 1	
9.00	Presentation of the programme, introductions and official opening
	Block I: A piece of the puzzle
11:15	Introduction Block I and summary of D-group discussions
	Country group work on infrastructure investment
	Block II: The Lusaka Sanitation programme
14:00	Introduction Block II
	Introductory presentation on the Lusaka Sanitation Programme
15:15	Preparation field assignment
17.00	Closure
DAY 2	
Full day	Field assignment
DAY 3	
8.30	Welcome day 3
	Groups consolidate their findings
10:30	Presentation of 4 groups to a panel of Zambian representatives
	Block III: Approaches to investment decisions
14.00	Introduction Block III and City Sanitation Planning
	Presentation on DEWATS in Indonesia and Vietnam, Reuse in Nakuru-Kenya; Urban sanitation planning in Nicaragua;
	Proofs and refutations – Group debate
17.15	Closure for the day
DAY 4	
	Block IV: Mapping, zoning and equity
8.30	Introduction to Block IV
	Presentations on Treatment technology options, Technology selection in Khulna Bangladesh, Sanitation Facility mapping in Lusaka Zambia.
	Country group work on mapping
	Block V: Country group sessions and wrapping up
14:00	World café sessions
15:40	Country groupwork – Shopping bags
17:00	Closure

Appendix 2 – Field Visit Testimonies.

Group A - Testimony: Kabwe Manual Emptiers (Fred Muiepukand and Jackson Makofi)

- Main business comes from households with septic tanks and not pits.
- Time: They work in the morning about 3 to 4 hours
- Frequency of work: 2 to 3 pits emptied per week; more in the rain season since septic tanks are not properly sealed.
- Manpower required:3 to 4 people are needed to empty the septic tank
- Equipment: Pushing rods, shovel, buckets, 3 pairs gloves, lime and spirit of salt
- Pricing: K1000 (USD84) depending on the size of the pit
- Have not experienced any accidents nor health hazards
- Health measures: No eating before work, take milk or beer after work

Group B - Testimony: Pit Emptiers (Dream Team)

Interviewed Jessica Phiri (CDO) and Abel Mbofana (Dream team leader)

- The Dream Team (Emptiers) has helped the community keep the environment clean by doing their work professionally
- Emptiers still face stigma at times from their family members
- FSM creates jobs hence reducing poverty in the area

Group C - Testimony from Pit Emptier Mr. Samson Kanyanta – Emptier at the "Miracle Team" in Chazanga Compound

Mr. Samson Kanyanta is part of the emptiers "Miracle Team" in Chazanga compound.

He started as an emptier 5 years ago and is one of the founding members in the team making him the team leader of the "Miracle Team". When he was recruited, he received technical training on manual desludging of latrines, handling and transportation of the faecal sludge, health and safety regulations. Apart from the theoretical and technical training received, he also had a practical field experience training of the job where together with his colleagues he joined the "Dream Team" emptiers in Kanyama compound. He receives regular refresher trainings as well as bi-annual medical check-ups.

When asked why he chose to become an emptier, a job that is usually looked down upon by many community members, he first smiled and laughed it off, but later indicated to the group that it provided good business and income for him. And not only that, he also felt that his job was able to transform communities into safe and clean environments for the community to live in thereby preventing them from diarrhoea diseases and unsightly conditions. "*Being an emptier is not only good money, we also help keeping the community surroundings clean as well as preventing people from falling ill"*

The emptiers are contracted by the Water Trust and get paid on a 60% commission for every toilet that is desludged. This because the Water Trust manager feels this makes

them more motivated than when they receive a fixed salary. Samson, however, would be happier with a fixed salary as this would give him more security and space to financially plan in advance.

The biggest problems Samson and his team encounter in the course of their operations include:

- Solid waste that is dumped into the latrines (accounting for almost 20%-30% volume), makes it difficult and hard to empty. After de-sludging, the team encourages households to limit the amount of solid waste being thrown in the latrine, but not all households that have regular emptying are doing so.
- The foul smells that are emitted from the pits when they need to break a hole in the side of the latrine to start the de-sludging process. The (ammonium) fumes hurt their eyes and it gives them difficulty breathing. They do have “dust” masks to use, but don’t have any safety glasses. Some stick to wearing regular sun glasses, but that doesn’t prevent the fumes stinging their eyes.

Finally, Samson was asked what advice he would give to other emptiers starting this job. He reiterated that being an emptier is seriously a good job, not just for the money but also in contributing to a cleaner and healthier community environment. Apart from that he advised new emptiers to be tough: most fall ill after around 3 months into the job, but once you toughen up, you’re fine. They haven’t encountered any serious illness so far, and most emptiers have been working there for more than 3 or 4 years.

Appendix 3 – Summary of D-group discussion

"Informed Choice in Urban Sanitation Infrastructure Investments"

Introduction

This September and October SNV is conducting a learning activity called "**Informed Choice in Urban Sanitation Infrastructure Investments**" as part of its knowledge and learning component of the programme: Urban Sanitation & Hygiene for Health and Development.

The learning activity consists of:

1. A preparatory **email discussion running on this Dgroup platform** from next week Wednesday 5th of September till the 25th of September
2. A **face-to-face workshop**, which will take place in Lusaka, Zambia from Monday 1st of October till Thursday 4th of October
3. **Follow-up activities in countries**, depending on country priorities

For whom is the Dgroup discussion?

The discussion is for all people interested in urban sanitation and hygiene in Asia and Africa. We are giving preference to people from local and national governments who are currently working in the sector, but there are also professionals from many development organizations and banks. Currently there are 391 people from 45 countries in the urban san Dgroup.

What will we discuss?

With a greater attention for urban sanitation, many local governments are faced with the challenge to invest in infrastructure. Aside from the costs, the choices made around investments have large implications for future management, equity and health outcomes. Yet, often only a single technology option is considered, depending on who may be supporting the process and experiences in neighbouring cities. It is very hard to ensure informed choice by local authorities.

To explore this issue, we will discuss 3 topics and each topic will run for one week. At the end of the discussion, we'll make a summary paper as input for the workshop. Below are the three topics. The discussion on the first topic will start on Wednesday next week.

Topic	*dates*	*Topic*
Topic 1	5 Sept- 11 Sept	What do we mean with informed choice?
Topic 2	12 Sept- 18 Sept	Informed choice in the context of limited data and capacity
Topic 3	19 Sept- 25 Sept	Informed choice in the context of limited funding and political pressures

Only part of the people in the Dgroup will participate in the learning event. Therefore we will be sharing the report of the learning event and the different materials on this forum as well.

How does it work?

On the first day of the discussion, you will find some questions in your inbox. Everybody is invited to share their ideas, comments and examples, responding to the Dgroup message. All experiences and opinions are welcome and please don't be shy to contribute.

Please write your message in the main email text and not in an attachment, because some participants are based in remote locations with limited internet speed. Dgroup automatically stores attachments on the website, so people would need to go there to read your attachment.

At the end of the week, all messages of the block will be processed and integrated into a chapter of the summary document. This will be the same for all 3 topics.

Topic 1: What do we mean by informed choice?

Dear colleagues,

This week we concluded the first topic of the discussion on "Informed Choice in Urban Sanitation Infrastructure Investments", which ran from 7th -11th of September. In this first topic we looked into the meaning of informed choice. There were 18 contributions from 10 countries: India, Bangladesh, Mozambique, Zambia, Indonesia, Nepal, Uganda, Tanzania, Malaysia and Malawi. Thank you all for you interesting contributions!

The discussion questions were:

1. In your country, how are decisions made (in practice) about urban sanitation infrastructure investment at city level?
2. What is the main information is used for these decisions?
3. Who makes the decision?
4. Do you consider this informed choice? Why? Why not?

Below I will try to give a short overview of your contributions. Please accept my apologies for any misinterpretations.

Best,
Ant.

Ad 1. In your country, how are decisions made (in practice) about urban sanitation infrastructure investment at city level?

All countries have some level of national level guidance for the infrastructure investments made at city level, but in some these are tighter frameworks, whereas in other countries, the guidance seems lighter or more focussed on procedures.

A strong macro level framework for infrastructure investment clearly defines the space for decisions at the local level. It can be generic like Dorai Narayana explained for Malaysia: the "National Physical Plan" and the "State Level Structure Plans". It can also be specific for sanitation like Moses Mutyoka explained for Zambia: the "National Urban Sanitation Strategy" which is defined nationally and implemented by the commercial utilities.

In more decentralised contexts, the autonomy of city to make infrastructure investments is greater. It is not fully clear from the contributions, but this is what seems to be suggested in the contributions on Indonesia, Nepal and India. Horacio Quembo describes the situation in Mozambique where larger infrastructure investment is decided at national level, and smaller infrastructure by municipalities at the local level. The practical challenge, he says, is that municipalities tend to prioritise investments in solid waste over sanitation.

However, government-led investment is not the only sanitation infrastructure investment. Dorai (and some others) point out that the bulk of infrastructure investment in their country is done by private housing developers. These build infrastructure (whether septic tanks or sewerage systems) on piece meal basis, often disregarding macro planning. On completion of their infrastructure, they hand it over to the house-owners (in the case of on site systems) and the Public Utility Operator (for sewerage systems). This disconnect between the asset builder and the operator often brings about issues. There are regulatory requirements, to monitor these private infrastructure constructions, but this is insufficient.

Elisekile Mbwille from Tanzania mentions the investment by households (and other private entities) at their level. This often represents a significant part of infrastructure investment in a city, but households do not always have the information or access to affordable supply, to make an informed choice. Also here the issue of regulation of their investment, is a challenge, as the sum of individual household decisions does not automatically generate the right set up for the city as a whole (today and in future).

Ad 2. What is the main information is used for these decisions?

Several of you mention the use of census information as basis for planning, though you also recognize the limitations of this information. As Sunetra Lala from India points out, there can be discrepancies between the formal population and the actual population of a city (for example due to informal and/or transient populations). Needless to add that the quality and breadth of census data differs across the countries.

Others mention city level sanitation plans as a basis for decisions, but it is not always clear where the information for the plan comes from. You also mention feasibility studies and environmental impact assessments and other types of local studies as a source of information for decisions. Depinder Kapur from India points out that the information challenge is not only at the level of census data, but that there is also an absence of credible estimates of the type of on-site facilities to define treatment needs.

Praveen Nagaraj from India explains the difference between larger and smaller cities in terms of access to adequate information. In bigger cities and towns, there is the person-power, resources, political power and skill to conduct studies and gather specific information (even though still limited by capacity and political agenda's). However, in the smaller towns, decisions are more often made from a state driven political agenda and more often rule of thumb estimates are used to selected options (which can result in surprises during implementation).

Ad 3. Who makes the decision?

When drilling down as to whom makes the decisions in practice, there were a range of answers. In theory there are arguments to include many different groups in the decision, for example:

- Local politicians should make the decisions because they are the elected representatives of the people
- Future operators should be involved in the decision because they will need to manage the infrastructure
- The population should be involved in the decisions as they are supposed to be the beneficiaries
- It should be an expert-led decision because sanitation is a public good that is not always well understood by politicians and/or the general public
- People living and working around the area of a future treatment plant (for example) should be included because they will be most affected

Legislation should provide clarity on who are decision makers and who should be consulted. In practice though, this may sometimes work out differently, as can be seen below.

Led by technical civil servants and/or external experts.

Sunetra says that in smaller towns it's usually an engineer who prepares the plans, while in larger cities it can be a full-fledged department. Oversight by elected representatives is usually very poor. Depinder states that it is almost a social norm that important decisions are made by technical institutions/utilities. Praveen points out that these civil servants do not always have sufficient exposure. Also in Mozambique, Horacio states, in practice decisions are made by government officials, communities are just consulted.

An anonymous contribution from Uganda states that actual decisions on investment in the cities are often driven by consultants, who already have certain solutions in mind or have their fixed preferences. The information that's provided basically pre-defines the decisions, and there's insuffient capacity (or time) to question it.

In Zambia, some contributions suggest that the local level decisions lie with the commercial utility, or that the decision is made centrally and only implemented by the commercial utility. Others, like Justin Chongo state that the decisions lie with the city councils and central government. Elisekile explains that in Tanzania several investment decisions are made from different stakeholders, households at their level, the cities on dumping sites and the utility on treatment infrastructure.

Decisions by politicians

In the decentralised structure in Indonesia, local authorities have significant autonomy to decide on sanitation infrastructure investment, as explained by Lena Saptalena and Ika Praesty. The infrastructure decisions are based on the city's (multi-sectoral) spatial planning documents, but these only provide broad lines on sanitation. Whether investment takes place depends on the political will of the Mayor, though most cities also make a city sanitation strategy.

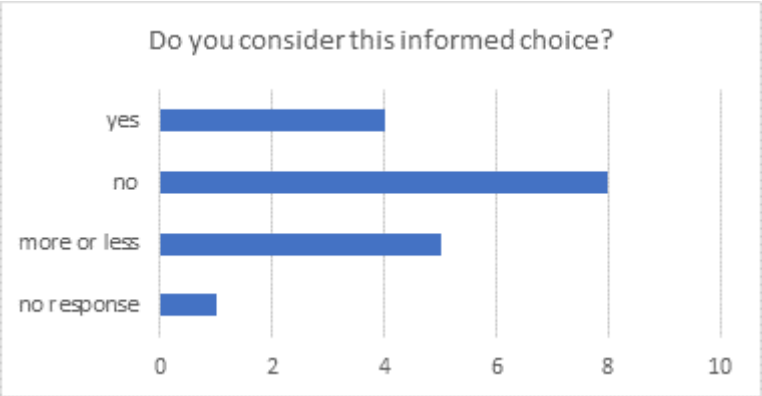
Lekh Shah from Nepal shares that under the new federal structure in Nepal, the intention is that an executive board of the local body will make decisions.

Decisions pushed by INGOs, donors, and other funders

Wema Mtika from Malawi describes the heavy influence of INGO's, private sector and donors in decision making. As government plans get outdated and there is no money, the donors bringing in the money have a large influence. Moffat Tembo from Zambia also points to the influence of different sources of funding (Ministry and external agencies). He says: "When agencies come with predetermined approaches, service provider take it one without much say".

Ad 4. Do you consider that the decision making in your country is informed choice?

A minority of the contributors considered that the decision making about urban sanitation infrastructure investment in their countries was, in practice, an informed choice (see graph).



The explanations as to why people do or do not consider these decisions informed choice, provide an insight into what we consider an informed choice should mean:

1. Consulting the right people
2. AND using the right information
3. AND to choose the right options
4. AND within an overarching framework
5. AND decision making by the designated authority

In terms of consulting the right people, Kailash Sharma from Nepal emphasizes that this means a range of stakeholders in the city. This is also mentioned by Justin Chongo and Moses. Wema adds to this that such participation will only work if public sector and community members move away from the idea that external donors are experts and that they should accept donor suggestions "as is". Moffat points out that it cannot be informed choice with use of household (end-user) participation structures. Geofrey Hilly from Tanzania gives an example from his country where good participation is used and he therefore considers this informed choice. Lena adds that no involvement and a faulty handover to operators, creates operational challenges and a lack of O&M budget.

In terms of using the right information, Lucksow Simumba from Zambia emphasizes the importance of locally specific information. Sunetra and Lekh both talk about definition and accuracy issues in information, while Praveen points out that it's not always up to date, and suggests a system of regular updates for technical government staff. Dorai explains that in his country there is generally good information and a degree of informed choice, but that information is only used in government-led investment, not by private developers. Depinder suggests that part of using the right information should also be to look at past failures and understand what happened.

In the contribution from Uganda it is stated that the current situation cannot be considered informed choice, because there is no information and no options to make a choice. Also Horacio emphasizes the need for looking at multiple options in order to have a choice. Sahidul Islam from Bangladesh states an example where different scenarios were given to local government to make a decision.

With regards to the overarching frameworks, Dorai points out that we should not forget that sanitation is a public good, in terms of public health of the community, water resources, and economy (including benefits). Governments should seek to balance those short and long(er) term objective, considering "appropriate" interventions over time in different areas of the city, the capacity to absorb these changes, the relation with other sectors and the reality that will be a progressive realisation of goals.

With regards to decision making by the designated authority, it is evident that it's not always clear to all who the designated authority is, or that several parts of the sanitation chain may have several different decision making entities (not necessarily in alignment). In some countries, the designated authority takes (political) decisions without sufficient information or at least the suggestion is that it depends too much on a single person. Whereas in other countries, there's limited interest to engage, for example because sanitation comes in a small package under other infrastructure and it's not seen as a priority.

Summary Topic 2: Informed choice in the context of limited data and capacity

The second topic of the discussion on "Informed Choice in Urban Sanitation Infrastructure Investments", which ran from 16th-22nd of September. In this topic we looked into the reality of informed choice about infrastructure investments in a context of limited data and capacity.

General comments on "Decision making in the context of limited data and capacity"

- Kizito Kuchibanda from Tanazania, shared that poor and **limited information** has been shown **to limit the effectiveness of decision** and planning while also a lack of real time data makes it difficult to identify emerging problems and build consensus on the causes of a problem and how to respond. He also raised the importance that the data **and information collected** needs to be both **physically and cognitively accessible** to those that make decisions. However, many districts lack the technical capacity to facilitate data collection and its use in decision.
- Dorai Narayana shared experience from Malaysia, where there was rarely adequate data but that this should not limit decisions, "**a decision based on incomplete data or data of incomplete integrity is better than no decision**". Data can become outdate and projections are approximate, therefore retrofits will be necessary anyway. Even when there is data, it can become outdated and projections are inherently approximate therefore retrofits will be necessary anyway.
- Lukas Ulrich from Eawag Switzerland highlighted that a **lack of data**, experience or knowledge may even make people **exclude alternative solutions**, not be willing to take the risk to "experiment" with something unknown. He **suggests that a rough, generic checklist** could help structure the process of taking a difficult decision and dealing with data uncertainties. It could help inform – what steps to consider, what data do we need vs estimates/assumptions/expert judgement and how to collect this data.

a. When do you go for (extending) sewer and when do you decide to improve on on-site sanitation services (with FSM)?

There was a general consensus that decisions about scale and type of sanitation are not black and white and almost **every urban area** will in the **foreseeable future have a hybrid solution** of on-site, decentralised, and maybe some centralised systems and that policies should recognise this.
Both Lena Saptalena from Indonesia and Dorai suggested that decision on what sanitation options should be based on a **systematic evaluation of the local conditions** (both provided detailed points on environmental, topographical, technical and social considerations). While Freya Mills from Australia also added that institutional capacity and political preferences may need to be considered within these criteria. However at the same time it was recognised that data availability is limited or not always up-to-date and best estimates could be used with an indicated level of confidence as a first step before more information is available.

b. When do you decide centralized treatment is appropriate and when do you go for decentralized treatment?

There were many interesting points on this topics. Juliet Willetts from Australia shared the experience from CanTho Vietnam where cost-effectiveness analysis was used to compare four options (including centralised and decentralised). This included life cycle costing, multiple criteria assessment and participatory sustainability assessment. While this was a data intense approach, if this is applied in more situations, maybe rules of thumb could be developed for use when data in unavailable.
Both Dorai and Lucas highlighted that **cost analysis is not the main consideration** in selection of treatment size and scale, with availability of land availability and other context specific factors often have greater influence. Dorai highlighted that there is a challenge of decentralised systems being close to households and that increasing pressure led many decentralised plants to be decommissions and connected to new centralised systems. While it may appear a double expenditure, these are the inevitable steps of progress. Freya indicated that the management capacity should also be included in this decision while Juliet also highlighted that the scale of management does not need to be "coupled" with the technology and decentralised systems can also be centrally managed.

c. While discussing dimensioning of faecal sludge treatment, how do you usually estimate faecal sludge production? Which assumptions do you make?

Lena, Freya, and Dorai all highlighted the importance of a phased approached, starting smaller/conservatively for the first phase, particularly when emptying services and demand is not well developed, but to consider the future expansion needs from the outset.
Assumptions on size should consider both current and future demand with the authors providing details of important considerations in sizing.

d. Do you consider non-domestic users in your planning? How?

Lena and Freya provided examples of the varied non-domestic uses and how their faecal sludge characteristics (quantity, quality, emptying frequency) vary from domestic uses and should be included in design, preferably based on local data.

e. Do you consider new investments should be in full compliance with treatment standards or do you feel lower standards are acceptable?

There was a general consensus that while national standards should be a target, these are sometimes not specific to FS treatment or too ambitious to be met with the technical/financial solution available in the short term. All indicated that lower standards should be accepted (some treatment is better than none) within am objective of meeting the standards in the future. Dorai indicated this is accepted in Malaysia, where the Environmental regulator tolerates non-compliance based on a time based "plan to comply". Freya also indicated that the standards are often environmentally focused, and that consideration of downstream exposure to pathogens should be examined through a health risk assessment and a multi-barrier approach can be used when treatment is inadequate.

f. What are the most important factors influence the choice of location for treatment in your context?

With sludge and wastewater treatment both requiring liquid and solid treatment, Dorai highlighted that this can influence co-treatment or co-location of the FS and WWTP. Geography, topography, risk of inundation, accessibility and availability of land as well as many other criteria were provided by Dorai and Lena.

g. What do you see as the most important treatment technologies suitable in your context? And what considerations do you use to decide for a technology?

All contributors suggested that a specific technology can't be recommended without considering the various local conditions that influence suitability – both sludge quantity and quality, capacity to operate, site conditions or constraints. This is an area where data collection should be prioritised before technology selection and design. Dorai also suggested the importance of an incremental approach: starting with simple, robust technologies, and progressing to higher technologies in the future as capacity and knowledge and need develops.

h*. What do you consider a suitable design horizon for a faecal sludge treatment plant taking into account the ongoing changes in your context? (e.g. population growth, changing sanitation service levels/ technology, climate change)*

Lena and Freya both suggested that the design life must consider the hybrid of solutions, as mentioned earlier, with decentralised, centralised and on-site sanitation likely for different parts of the city and at different time frames. Cities are not homogenous and will change at different rates while climate change or rapid urbanization may add to the uncertainty of future predictions and solutions should be chosen that can be adaptable to change.
As mentioned previously in question c, the sizing of treatment should start conservatively particularly when current demand is low but with planning/consideration of how it can expand to meet future needs – modular or phased construction but maybe ensure the land is available to meet longer term needs.

i. Which aspects of management and O&M do you take into account in investment decisions?

Even once a treatment was built, there were various examples of inadequate O&M and management causing the systems to fail or not achieve their objectives. Lena suggested the importance of clarifying responsibility upfront and the importance of local ownership (particularly when built by others). Juliet also indicated that the life cycle costs, including management costs, should be considered up font while Freya indicated that the mechanisms to recover these costs should be a focus of project set-up. All contributors stated the importance of building capacity to operate effectively and that this is ongoing not just up-front.

j. In which situations are you considering integrating re-use?

Dorai and Freya indicated that this should be considered from the outset, however it should be recognised that it may not be suitable in all contexts and not to raise expectations, particularly around revenue while the focus

should be more on the utilization of resources. As the nature of reuse influences the choice of treatment, some demand assessment/analysis of reuse potential and options should be conducted early.

k. Do you consider new investments should address the needs of an entire city? If not, how do you prioritize?

There was consensus that fixing/improving sanitation across the entire city is unlikely with current finance although it is important that investments will fit into a broader/long-term citywide plan. Priority intervention areas need to be identified. This can be done with multi-criteria assessment or check lists, with transparent criteria and weighting. Lucas proposed that phased development is a useful way to start, and that when focusing on a smaller area, data collection requirements are minimised as there is more flexibility to adapt the solution to suit the realities on the ground.