Scheduled emptying services as an entry point for change

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Improving citywide urban sanitation is a complex challenge. It must consider on-site and off-site systems across the service chain, serve a variety of customers and be acceptable to a broad range of stakeholders. When existing sanitation services are limited or unsafe, the actions required can be overwhelming. It may be unclear where best to start. A tangible activity can help stakeholders to gain a deeper understanding of the issues and develop grounded ideas on ways forward. It serves an entry point for broader change. Given that emptying is an area of evident need in cities where SNV works, the set-up of scheduled desludging was deemed a practical entry point.

This brief summarises the associated learning paper (Mills, et al., 2019), which aims to reflect on scheduled desludging as an entry point for change and inform sector thinking and practice on faecal sludge emptying (also known as desludging). It draws on examples from SNV's programmes in Indonesia, Nepal and Bangladesh in developing scheduled emptying services as part of broader urban sanitation programmes. The paper describes the approaches to developing scheduled emptying, highlighting the evidence-based decision-making involved, and the complexities of improving sanitation services and faecal sludge management (FSM) in cities in developing countries.

This brief is directed at sanitation practitioners, professionals and local governments to help improve urban sanitation. This learning brief was prepared by the Institute for Sustainable Futures at the University of Technology Sydney and the SNV Netherlands Development Organisation.

Importance of regular emptying

Septic tanks must be emptied regularly. Tanks need to have enough free volume to store wastewater and allow the solids to settle (one or two days) (Figure 1 on next page, left). When septic tanks are not emptied regularly, the sludge fills up the tank and there is inadequate

volume for settling, reducing the quality of effluent (Figure 1 on next page, right). If the tank is overfilled with sludge, the effluent is discharged without being adequately treated, similar to a toilet discharging directly into a drain. In addition, the solidified sludge is difficult to pump out, or must be removed manually (Mills, et al., 2014).
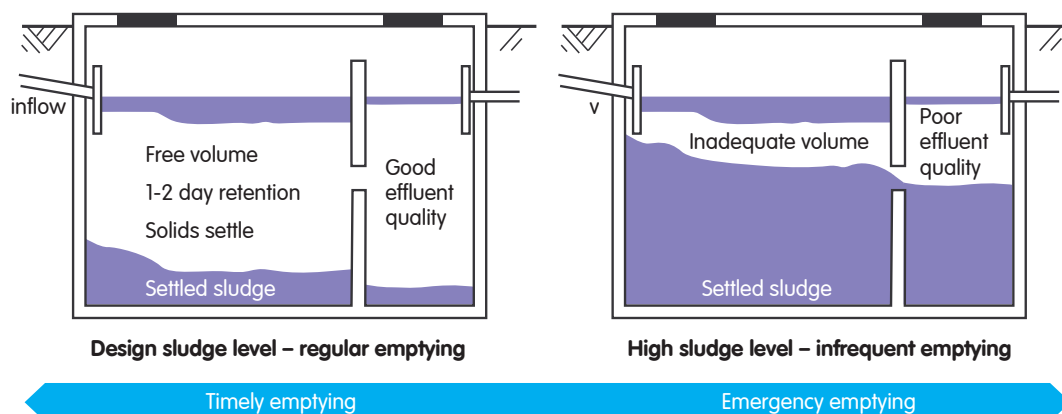
Key messages

Scheduled emptying is a particularly valuable starting point as it engages a broad group of stakeholders, can be applied at various scales (pilot to citywide) and builds skills across diverse aspects of urban sanitation: governance, regulation, finance, behaviour change, private sector engagement and treatment.

The experiential learning process builds capacity in new areas through the engagement and participation of stakeholders and local authorities in all steps. This aligns with the iterative approach needed to develop emptying solutions.

There are several possible entry points for improving urban sanitation in a given city. Whichever entry point is chosen, it should take account of both the short-term needs and priorities and of the broader citywide urban sanitation system. Once momentum is triggered, programme prioritisation and planning should be revisited.

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Design sludge level – regular emptying

Free volume
1-2 day retention
Solids settle
Good effluent quality
Settled sludge
inflow

High sludge level – infrequent emptying

Inadequate volume
Poor effluent quality
Settled sludge
v

Timely emptying   Emergency emptying

Source: ISF-UTS and SNV, 2019, p.8.

Key steps to developing scheduled emptying

Each city has a different starting point for developing emptying services, depending on existing service levels, available technologies and the enabling environment, and stakeholder priorities and preferences. The development of scheduled emptying services needs to be iterative and flexible. A common strategy to develop scheduled emptying is shown in Figure 2. It includes participatory research, iterative learning and decision making, and testing options; as followed by SNV's programmes in Bangladesh, Indonesia and Nepal.
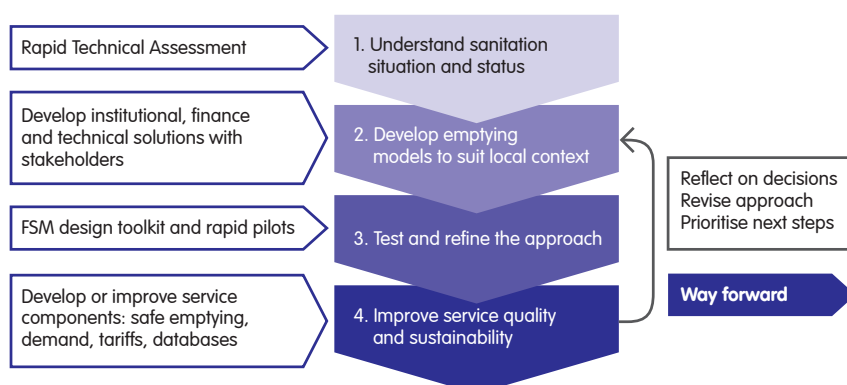
Step 1: Understanding the sanitation situation

Scheduled emptying, like any entry point, needs to be embedded in a broader process of assessment and planning of sanitation improvements. A legal scan and a baseline study are a useful starting point to inform stakeholder dialogues and programme design, and to prioritise activities and understand enabling or limiting components of services or regulations. The legal scan identifies the regulatory limitations and opportunities for improved sanitation services by clarifying the local responsibility and finance arrangements, and by reviewing

national and local policies, regulations, standards and permits for the whole sanitation service chain. Through surveys and interviews, a baseline study can collect citywide data on existing conditions, services and behaviours relating to the entire service chain. A baseline survey can also assess professional, organisational and institutional capacities with regards to urban sanitation and hygiene. Baseline findings are discussed with government staff and used to inform programme development and priorities.

If improving on-site sanitation is prioritised in a city, a Rapid Technical Assessment (RTA) is important to undertake. The RTA is an FSM-specific tool for capturing details on containment and emptying to inform the design of sludge emptying programmes. The RTA collects data on the typical conditions of and major issues for emptying in a city. It provides preliminary inputs to the Septage Management Toolkit (see Step 3). An RTA can be conducted by a small team in three to five days. With a well-designed sampling method, adequate training of enumerators and smart-phone data collection, an RTA can capture the necessary information faster and more cheaply than a community-wide census. The RTA involves local authorities in its implementation and in the analysis of its findings.

FIGURE 2: Steps to developing scheduled emptying

Rapid Technical Assessment

Develop institutional, finance and technical solutions with stakeholders

FSM design toolkit and rapid pilots

Develop or improve service components: safe emptying, demand, tariffs, databases

1. Understand sanitation situation and status

2. Develop emptying models to suit local context

3. Test and refine the approach

4. Improve service quality and sustainability

Reflect on decisions
Revise approach
Prioritise next steps

Way forward

Source: ISF-UTS and SNV, 2019, p.13.

Step 2: Developing emptying models to suit local contexts

Three types of emptying models

On-demand/ on-call emptying describes the situation where each household or business decides when to empty its tank, and to contact a service provider. Many people are not aware of the need for regular servicing, so emptying often occurs only when the system overflows or stops working (e.g., blocked sludge in inlet or clogged leach field). In these emergency emptying situations, people may seek the easiest or fastest service. On-demand emptying provides little incentive for households to empty in a timely manner, particularly when there is limited awareness about the potential environmental and health consequences of inaction.

Scheduled emptying removes the decision burden from the household by providing regular, preventative emptying at a frequency appropriate to local conditions (based on sludge accumulation and containment type and size). It can also have financial and sustainability benefits to service providers and customers. The benefits of timely and organised emptying are detailed in Figure 3.

Block emptying is an interim step between on-demand and scheduled models. Emptying is done for all customers in an area. Typically, participation is voluntary. It aims to remove the decision burden from customers and achieve efficient emptying, particularly if multiple systems can be emptied with one truck.

Selection of an emptying model must consider:
- Who makes the decision to empty? Does the household or business decide, or is emptying a government requirement?
- Is the programme managed centrally or by the service provider?
- What is the scale of service? Is it citywide or targeted on specific areas?

No single approach works best for all locations. However, in all cases, poor sanitation harms the entire community, not just the household or business involved. The question then arises as to whether decisions about emptying should be left with the owner of the premises. In SNV's programme, scheduled emptying was selected as the best option to take forward in the relevant cities of Bangladesh, Indonesia and Nepal.

Roles and responsibilities in scheduled emptying

Typically, on-site sanitation and disposal are unregulated and responsibilities are unclear or not prioritised by local authorities. The following steps were used by SNV to determine involvement in decisions on scheduled emptying and to increase motivation for making on-site sanitation services a priority.
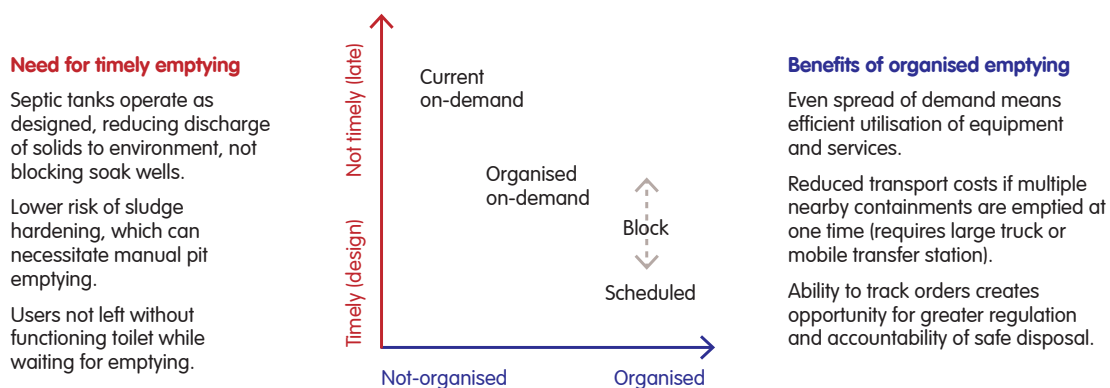
- *Stakeholder working groups:* Multi-stakeholder working groups at the city level were formed or strengthened to better coordinate sanitation activities.
- *Clarification of responsibilities:* A workshop was held following the legal scan to provide clarity to all stakeholders on who was responsible for specific activities. Workshops also encouraged action or a revision of regulations if a change in responsibility was needed.
- *Advocacy to local agencies:* Advocacy activities developed local authority motivation to prioritise sanitation activities and allocate adequate staff, budget, etc. It also enabled city leaders (e.g., mayors) to recognise the importance of their leadership and the need for their buy-in to approve budgets and regulation amendments.

For effective scheduled emptying, essential roles can be divided amongst providers depending on current responsibilities, skills and capacities. Important roles include:

Management: scheduling services, managing customer database, managing customer engagement and feedback, receiving and dispatching orders.

Promotion: behaviour change and awareness campaigns, registration for scheduled or block emptying service,

FIGURE 3: Benefits of timely and organised emptying

Need for timely emptying

Septic tanks operate as designed, reducing discharge of solids to environment, not blocking soak wells.

Lower risk of sludge hardening, which can necessitate manual pit emptying.

Users not left without functioning toilet while waiting for emptying.

Not timely (late)

Timely (design)

Current on-demand

Organised on-demand

Block

Scheduled

Not-organised

Organised

Benefits of organised emptying

Even spread of demand means efficient utilisation of equipment and services.

Reduced transport costs if multiple nearby containments are emptied at one time (requires large truck or mobile transfer station).

Ability to track orders creates opportunity for greater regulation and accountability of safe disposal.

Source: ISF-UTS and SNV, 2019, p.20.

educating operators about safe emptying practices.

Emptying: manual or mechanical emptying, initial emptying vs. from transfer station.

Financial management: billing, collecting tariffs, processing payments, managing accounts and paying contracted service providers.

Regulation and enforcement: independent oversight of service providers, operators and regulating institutions.

Matching allocation of the above roles to the right actor\ required consideration of legal institutional arrangements as well as motivation. In the three countries these roles could be filled by: the local waste, drainage, infrastructure or environmental departments; water or wastewater authorities; community-based organisations and NGOs; and private-sector organisations or individuals. The legal scan and stakeholder engagement revealed that the decisions on who was responsible for each activity were influenced by current local institutional arrangements, the presence of private or other service providers, and political preferences. If current actors are not motivated to take on additional responsibilities or do not have the right skills or authority (e.g., independent authority on finance), changes in institutional responsibility or regulations may be required.

Proposed changes to emptying service provision in the three countries are shown in Table 1.

Step 3: Testing and refining the approach

Septage Management Toolkit

The Septage Management Toolkit is an Excel spreadsheet to calculate the infrastructure requirements and costs of a regular emptying programme.[3] It requires input of locally sourced data for the proposed model. It calculates a citywide estimate of necessary infrastructure and investment for a sustainable scheduled emptying service with full cost recovery.

TABLE 1: Existing and [proposed service providers for emptying

Existing	Proposed
Bangladesh	
Khulna city corporation had two 5m³ trucks but emptied fewer than five systems per month, less than 5% of services. Three community development committees, each with 1m³ vacutug[2]. Many private manual emptiers. **Kushtia** municipality had three vacutugs (0.5–5m³) making 3 or 4 trips per day. **Jhenaidah** municipality had three vacutugs (0.7–1m³) making 4 or 5 trips per month.	City will tender for private sector involvement in scheduled emptying and reserve government truck for emergency or institutional emptying. City will manage administration and regulation of scheduled emptying. Committees will operate in low-income areas. City expects to receive two new vacutugs from grants, which it may lease to private sector. Kushtia and Jhenaidah have outsourced operation of treatment to private sector and NGOs. Prefer to keep responsibility for emptying with local authorities but may consider private sector services when demand increases.
Indonesia	
Kalianda government cleaning department had one truck and emptied five systems per month. No private sector involvement.	Government cleaning department developed more independent technical unit to operate emptying with greater independence in management of finances and staff.
Nepal	
Birendranagar municipality had one broken truck. All emptying was conducted by one licenced private provider.	Birendranagar is developing programme for scheduled emptying that will likely be involve private operator. Discussions underway to formalise arrangements.

Source: ISF-UTS and SNV, 2019, p.23.

The toolkit requires more than 60 inputs, including technical details sourced from the RTA, financial data and management assumptions. Stakeholder involvement in the input of data and assessment of options is integral to ensuring that proposed assumptions are realistic and acceptable to government and service providers.

The toolkit was used in Kalianda Indonesia, Khustia Bangladesh and Birendranagar Nepal. Table 2 shows a broad range of approaches to scheduled emptying. The impacts of the different inputs and assumptions are particularly evident in the calculated cost-recovery tariffs, which range from US$ 0.23 to 1.21 per household per month.

Interactive workshops were used to present the findings and test the toolkit's sensitivity to different inputs. The toolkit provided grounded examples of the influence of stakeholders' decisions on finance, service provision and scale, and indicated whether each option was suitable for the local context.

Rapid pilots

SNV conducted two pilots to implement and test block emptying models in Khulna, Bangladesh, to test assumptions and decisions and identify potential gaps in infrastructure and capacity. The first pilot included a promotion campaign to assess the willingness of households to pay for non-emergency emptying on a

planned 'emptying day', and to test the capacity of the Community Development Committee (CDC) to organise and lead scheduled safe emptying. Only five households signed up out of the 65 who were visited by the sales agents (community leaders and students). Only three systems were emptied on the desludging day due to difficult access, and one household withdrew. In addition, while the CDC could support promotion activities, it could not effectively manage the emptying day and was unable to control finance, labour, equipment and disposal to treatment as required for a high quality of service. This


TABLE 2: Toolkit inputs and outputs for three test cities

	INPUTS	OUTPUTS
Kushtia, Bangladesh	13,093 households 1,500 businesses 85% participation, 63% with containment systems of which 89% can be emptied Systems 3.5m^3, emptied every 5 years Capital cost includes truck repayment over 5 years with 10% interest but treatment funded by externally 3% population growth, 10% inflation	**Treatment:** Requires 22m^3/day. Existing treatment too small **Trucks:** Requires an additional 10m^3 tanker, and four 1.9m^3 vacutugs **Tariff:** BDT 70/85 (US$ 0.89/1.09)/month for residential/commercial, increasing after 5 years to 95/100 (US$ 1.21/1.28) **Finance:** BDT 8million (US$ 102,000) profit after 10 years
Kalianda, Indonesia	5,000 households served 100% access and participation Systems 2.4m^3, emptied every 4 years Truck purchase and repayment over 7 years with 10% interest Commission treatment over 8 years 3.8% population growth, 5% inflation	**Treatment:** Requires 13m^3/day; existing 15m^3/d system requires repair **Trucks:** Requires additional 3m^3 truck, motor-tricycle, repairs to existing truck, booster pump, extra hose **Tariff:** IDR 9,600/house/month (US$ 0.723) Finance: Break even after 10 years **Finance:** Break-even after 10 years
Birendranagar, Nepal	22,227 households, 1,767 businesses 60% participation, all with containment systems, of which 90% can be emptied Systems 5m^3, emptied every 5 years Capital cost includes truck repayment over 7 years at 10% interest, excludes treatment plant capital costs 15% profit/overhead for private sector	**Treatment:** Requires 46m^3/day. No existing treatment **Trucks:** Requires an additional 5m^3 truck **Tariff:** NPR 24.5 (US$ 0.23)/house/month **Finance:** Break-even after ten years

Source: ISF-UTS and SNV, 2019, p.25.

FIGURE 4: Block emptying pilot in Bangladesh
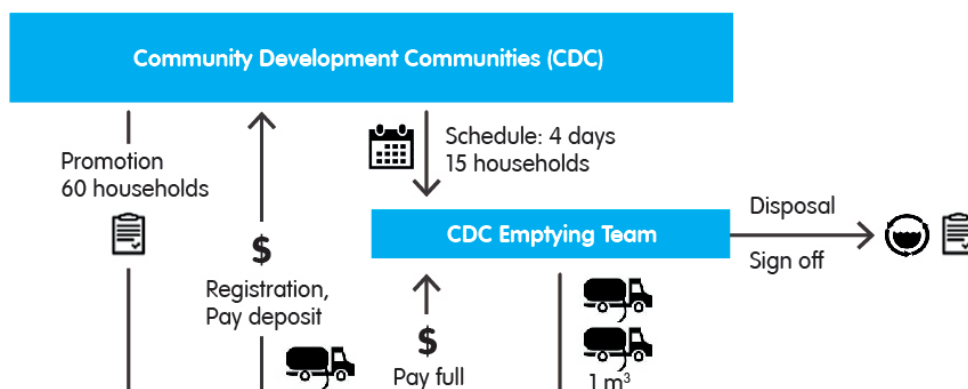
Source: SNV, 2016 in ISF-UTS and SNV, 2019, p.27.

pilot provided useful lessons on available capacity and the (low) willingness and interest of households to participate.

The second pilot aimed to increase CDC's experience in managing emptying, ensuring that sludge was delivered to the disposal site, and assessing emptying efficiency and customer willingness to pay. Door-to-door promotion covered 60 households. Fifteen registered to participate.

The pilot found that: CDC required additional training on documentation and scheduling the emptying; the operators did not always wear protective gear due to heat; and the disposal at the official site was not confirmed since CDC ran out of sign-off forms and the plant was unstaffed at night. Emptying was also less efficient than expected due to workers starting late, time spent talking to households and opening the tank, and work slowing down in the afternoon due to heat. Efficiency was also reduced since the mobile transfer station was not available for the pilot. The vacutugs were smaller than the containment volume, and so an average 2.4 trips to the treatment were needed to empty each household's tank. Again, this constitutes valuable learning to develop an effective service.

Step 4: Improving service quality

Alongside the development of scheduled emptying, a successful service also requires development of multiple connected components and activities, including:

Demand-creation is essential to a successful scheduled emptying programme, particularly as the baseline assessment and RTA showed low demand for emptying in all cities. The demand-creation activities revealed that uptake required trust in the service provider, with masons and community leaders effective in promoting emptying. Demand-creation activities were most effective when they occurred soon before the activity. Otherwise, messages and motivation were forgotten.

A customer database was necessary to plan and track orders and payments, and to record details about containment and emptying history. However, databases did not typically exist for sanitation and were instead built from existing databases (e.g., water supply, electricity or property tax).

FIGURE 5: Sample pricing differentiated by property and sanitation type
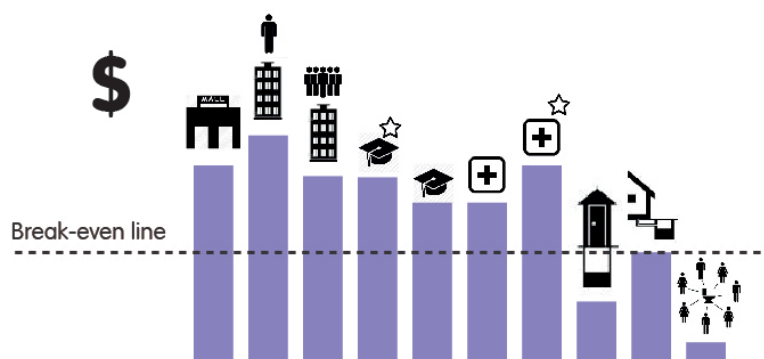
Source: SNV, 2016 in ISF-UTS and SNV, 2019, p.27.

Sustainable and equitable tariffs. While the toolkit calculated a cost-recovery tariff, this was often much higher than the city's approved tariff, if one existed. Raising tariffs was a politically sensitive issue. A key concern for politicians was the affordability for low-income households. SNV recommended that fees varied depending on property type and containment size, with higher tariffs for commercial and larger customers to subsidise low-income households.

Standard operating procedures were necessary for treatment operation, mechanical emptying and importantly in Bangladesh for manual emptying, which will continue to be needed in areas inaccessible to vehicles. SNV developed the Occupational Health and Safety Guidelines and Training (Repon, et al., 2015a and b) and worked with Khulna City Corporation to train 40 manual emptiers. Standard operating procedures for treatment were developed and implemented in Indonesia.

Private sector engagement. In many cities, local authorities did not have the capacity or equipment to handle the increased demand experienced under a scheduled emptying programme. Private sector services existed in most towns but often they were not operated in an organised or safe way, nor did these involve local government. SNV helped bring together government and the private sector, and helped both to see the advantages of working together.

Enabling regulations. Scheduled emptying was typically a new concept, with few existing regulations or guidelines. In Bangladesh and Indonesia, SNV supported the development of new ordinances and regulations for: on-site sanitation management, allocation of responsibilities, enforcement, tariffs and payment mechanisms. However, the development and approval of new regulations progressed slowly.

Reflection and moving forward

Addressing urban sanitation requires a focus on both infrastructure and service delivery systems. Where on-site sanitation is the main type of sanitation, as in the programme cities, a focus on safe faecal sludge management was a priority. Regular emptying of on-site containment systems is a key challenge that provides an entry point for improving urban sanitation programming. This report has summarised the key steps and decisions in developing scheduled emptying programmes in Bangladesh, Indonesia and Nepal as part of SNV's urban sanitation support programme over the last five years, yielding the following three key lessons:

Lesson 1: Schedule emptying is a tangible entry point for catalysing broader change

- Ensuring safely managed urban sanitation across the service chain requires a significant shift from current practices. Often the decisions and approaches are complex, and it may be difficult for participants with no prior knowledge or experience to know where best to start.
- Using scheduled emptying as an entry point provided a tangible objective to progress that did not require significant financial or land investment and engaged a broad stakeholder group. Developing scheduled emptying also builds the understanding and skills needed to manage the diverse connected aspects of urban sanitation: governance and regulations, finance and investment, behaviour change and awareness, and service provision and treatment.

Lesson 2: Experiential learning builds local capacities in new complex areas

- Developing a scheduled emptying service is an iterative process. It often involves less conventional approaches to service delivery and increased stakeholder engagement. It is therefore an excellent opportunity for experiential learning through participation in the planning, implementation, analysis and review of activities.
- Many of the decisions in developing scheduled emptying required a cyclical iterative approach, as is the basis of experiential learning. This involved: identifying or experiencing the current issue, observing and reflecting on what causes or drives it, developing a new theory or way forward and testing it in practice. Through this engagement, stakeholders gained understanding of the complexities of scheduled emptying and urban sanitation more broadly, plus experience in collecting and analysing evidence and testing options to inform decisions.

Lesson 3: Scheduled emptying is one of many possible entry points for implementing change

- There are several possible entry points for improving urban sanitation and the choice must be based on local priorities. Alternative entry points include: upgrading containment, building treatment or safe disposal, re-use, demand creation or citywide planning.
- Other considerations when selecting a starting point include: activities that build capacity in priority areas (financial, database, customer engagement); activities that bring together disengaged or non-coordinated stakeholders; and improvements that could achieve the greatest public health or environmental benefits (although further research is needed).
- Whichever entry point is chosen, it should be adopted while taking account of the needs and priorities of the broader urban sanitation system. Once momentum is achieved, programme prioritisation and planning for the citywide service chain should be revisited.

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Notes

[1] The diagram does not show the management of effluent discharged from the septic tank, which could be done using a leach field, a leach or soak pit or a sewerage system.

[2] A vacutug is a small truck with a vacuum pump and small tank (1-1.9m^3) designed by UN-HABITAT for sludge emptying in dense urban areas; a vacutug was provided to the community development committee by ADB.

[3] Example spreadsheet available at: http://m.forum.susana.org/forum/categories/53-faecal-sludge-management/16708-oxfams-septage-management-leaders-guidebook.

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Scheduled emptying services as an entry point for change

This learning brief draws on the USHHD Learning Paper (February 2019) titled, 'Scheduled emptying services as an entry point for change' by ISF-UTS and SNV.

Access the full paper here: https://on.snv.org/2TPDA5m

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