USHHD LEARNING PAPER | FEBRUARY 2019

# Scheduled emptying services as an entry point for change

SNV

UTS Institute for Sustainable Futures

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SNV is a not-for-profit international development organisation. Founded in the Netherlands over 50 years ago, we have built a long-term, local presence in 39 of the poorest countries in Asia, Africa and Latin America. Our global team of local and international advisers works with local partners to equip communities, businesses and organisations with the tools, knowledge and connections they need to increase their incomes and gain access to basic services – empowering them to break the cycle of poverty and guide their own development.

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The Institute for Sustainable Futures (ISF) was established by the University of Technology, Sydney in 1996 to work with industry, government and the community to develop sustainable futures through research and consultancy. Our mission is to create change towards sustainable futures that protect and enhance the environment, human well-being and social equity. We adopt an inter-disciplinary approach to our work and engage our partner organisations in a collaborative process that emphasises strategic decision-making. In international development we undertake strategic research and engagement in the areas of development effectiveness, water, sanitation and hygiene, climate change, urban development and energy policy and planning.

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# 1 Introduction

## 1.1 Background and aims

The aim of this paper is to inform sector thinking and practice on faecal sludge emptying (a.k.a. desludging) and contribute field-based learning on urban sanitation and faecal sludge management (FSM). The paper shares examples from SNV's programmes in Indonesia, Nepal and Bangladesh in developing scheduled emptying services as part of a broader urban sanitation programme. The paper describes the approaches to developing scheduled emptying, highlighting the evidence-based decision-making process and giving insight to the complexities of improving sanitation services in cities in developing countries.

SNV commissioned the Institute for Sustainable Futures at University of Technology Sydney (ISF-UTS) to synthesise and document SNV's approach and lessons learned, through interviews with country programme staff and review of internal reports and programme data. The paper has been prepared for an audience of sanitation practitioners, professionals and local governments to support improvement of urban sanitation, particularly in cities where safe emptying and disposal of faecal sludge represent a major concern. It contributes to one of SNV's programme objectives: to improve learning, documentation and sharing of best practices, with a view to creating an enabling environment for sustainable urban sanitation.

## 1.2 SNV's Urban Sanitation and Hygiene for Health and Development programme

The overall goal of SNV's Urban Sanitation and Hygiene for Health and Development (USHHD) programme is **improved health and quality of life of men and women through access to sustainable and environmentally safe sanitation and improved hygiene practices.** The development of USHHD started in Nepal and Bhutan in 2013, then expanded to Indonesia and Bangladesh in 2014 and Zambia and Tanzania in 2017.

The programme has focussed on building the capacity of local authorities to lead and accelerate sanitation progress in their cities and ultimately achieve inclusive, sustainable and safe city-wide sanitation services. Although this report concentrates on faecal sludge emptying, the USHHD programme considers the entire sanitation chain and an integrated city-wide approach to improving sanitation, including both off-site (sewer) and on-site sanitation.

Figure 1 shows the five components of the USHHD programme, which underpin a broad range of activities aimed at improving the institutional framework for services, as well as building the capacities of a range of stakeholders. This paper addresses **Component 2: Safe and affordable services**, particularly scheduled emptying services, which was one modality for emptying septic tanks developed during the programme.

The development of a sanitation service must consider the other programme components and be embedded within the wider institutional framework. It must also create awareness and demand from users of the service. Hence this report includes some discussion on other programme components where relevant.

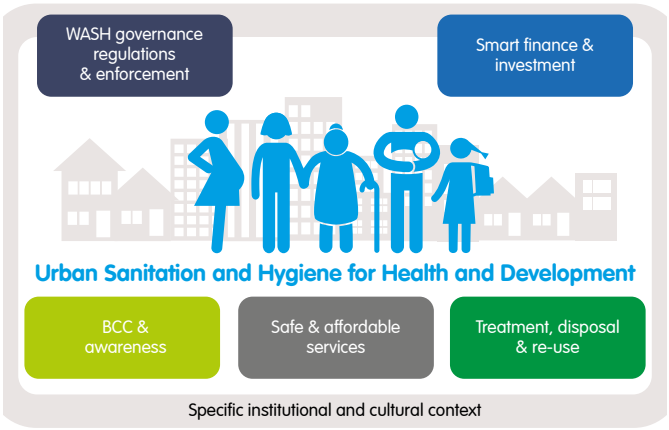


**Figure 1** SNV USHHD programme framework
*Source: SNV, 2018 (unpublished).*

**Box 1** Experiential learning

SNV works closely with local authorities in all stages of programme design and development —participating in data collection and analysis, facilitating evidence-based decision making and supporting stakeholder-led pilots. This experiential learning both increases stakeholder support and engagement and builds lasting capacity and a greater appreciation for further improvements. The experiential learning theory, developed by Kolb (1984), promotes 'learning by doing' and is based on the premise that a person learns from making discoveries and experiments first-hand, instead of hearing or reading about others' experiences. According to Kolb, effective learning takes place when an individual completes a four-stage cycle (McLeod, 2013):

**Concrete experience.** Active participation in a new experience or situation creates an opportunity for learning, not just observing or reading.

**Reflective observation.** The learner reviews and reflects on the experience before making any judgements and recognises inconsistencies between experience and understanding.

**Abstract conceptualisation.** Analysis identifies recurring themes, problems and/or issues and gives rise to a new idea or changes a pre-existing concept.

**Active experimentation.** What was learned is applied to solve problems, make decisions and influence people and/or events in another situation. The learner takes risks and implements theories to see what will result (experimentation) and in testing the concepts in different and new situations, discovers ways to improve.

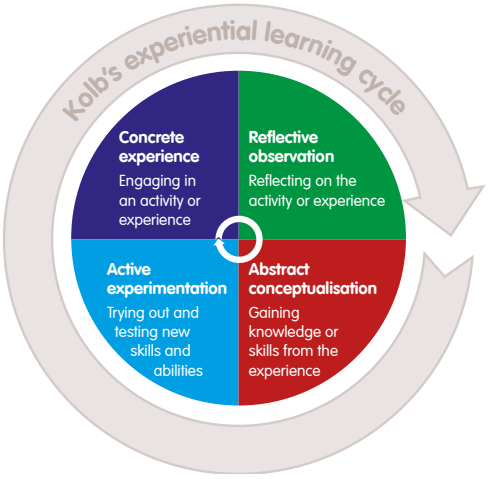


**Figure 2** Kolb's experiential learning cycle
*Source: Skills You Need, 2016.*

## 1.3 Why focus on faecal sludge management?

The majority of urban residents in Indonesia, Nepal and Bangladesh use on-site sanitation systems,[1] with fewer than 15% of the urban population discharging to a sewerage system (Figure 3). To achieve city-wide sanitation on-site solutions will continue to be needed due to the significant investments of both time and money required for sewerage to sufficiently develop.

Safe management of faecal sludge requires more than just access to a toilet and use of a septic tank; it must consider every step of the sanitation service chain, including safe emptying, transport, treatment and disposal (Figure 4). Because on-site sanitation is often considered a household issue and because investment in and governance of sanitation, if it exists, often focuses on sewerage systems, many steps of this service chain are left unmanaged and unregulated. Untreated faecal sludge is then discharged into drains and waterways, creating public health risks and environmental pollution.

Although this paper focusses on the safe management of faecal sludge from on-site systems, the liquid effluent that discharges from containments (septic tanks) is also a health hazard and should be safely managed (e.g., with leach fields, soak pits or treated with sewerage)[2]. However, in many of these countries the effluent is discharged directly to open drains, therefore upgrading containment is part of SNV's work in the USHHD programme but is not detailed in this paper.

## 1.4 Rationale for starting with scheduled emptying

Improving city-wide urban sanitation is complex as it must consider both on- and off-site systems, encompass the entire service chain, serve different customers and be acceptable to a broad range of stakeholders. In cities where there has been limited consideration of urban sanitation, the actions required can be overwhelming and it may be unclear where

[1] On-site sanitation refers to all the types of containment systems receiving wastewater from toilets, including septic tanks, wet and dry pit latrine and containment tanks.

[2] The health risks of this effluent are discussed in Mitchell, et al., 2016.

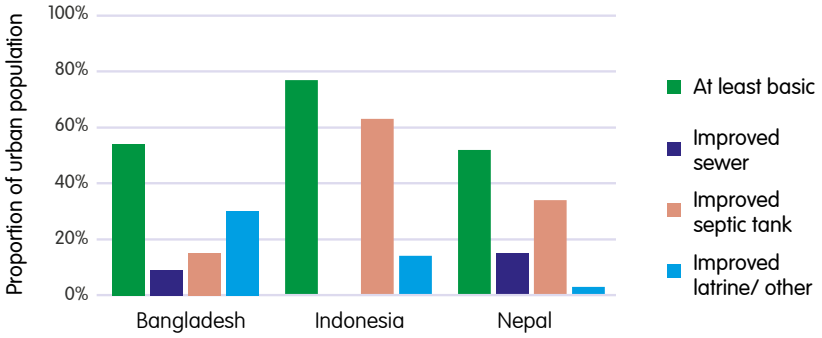


**Figure 3** National urban improved sanitation coverage, 2017
*Source: Data sourced from WHO, 2017*

best to start. To improve just one part of the service chain can often require changes in multiple areas, and stakeholder preferences and service objectives are not always predictable. This makes a linear planning process and the implementation of a city-wide sanitation plan inherently difficult. In addition, progress of a linear plan is easily blocked by delays to one component (e.g., constructing a treatment plant). The significant challenge of negotiating a path through this complexity often ends in acceptance of the status quo, even when a city sanitation plan is in place.[3]

An iterative process providing progressive improvements in services allows for learning, confronting and reflecting on implicit beliefs or assumptions and enables practitioners and organisations to make informed decisions. Grounding the planning process in a real activity, as opposed to an abstract situation, means that decisions, such as about service provider responsibilities or business models, among other issues, can be discussed in concrete terms. With the evident need to prioritise emptying services in the programme cities, SNV chose to target the development of a scheduled emptying service as a practical entry point for improving sanitation. The knowledge, skills and intersectoral coordination built through the development of a scheduled emptying programme would then become applicable to development of broader urban sanitation services. The hypothesis was that scheduled emptying, being a practical, visible intervention in service delivery, could generate increased awareness, interest and capacity for further urban sanitation improvements.

## 1.5 The importance of scheduled emptying

Septic tanks must be regularly emptied so that they continue to operate as designed. Tanks are sized with sufficient free volume to store wastewater and allow time (one or two days) for the solids to settle (Figure 5, left).[4] When septic tanks are not emptied regularly, the sludge fills up, there is inadequate volume for settling, and the effluent quality reduces (Figure 5, right).


**Figure 4** Sanitation service chain for on-site sanitation
*Source: Adapted by SNV from Tilley, 2014.*

[3] Discussed further in Abeysuriya, et al., 2016.

[4] Note that effluent from septic tanks still contains pathogens and should be safely managed. However, this report focuses on the management of the sludge component (solids). Figure 5 does not show the management of effluent discharged from the septic tank, which could be a leach or soak pit.

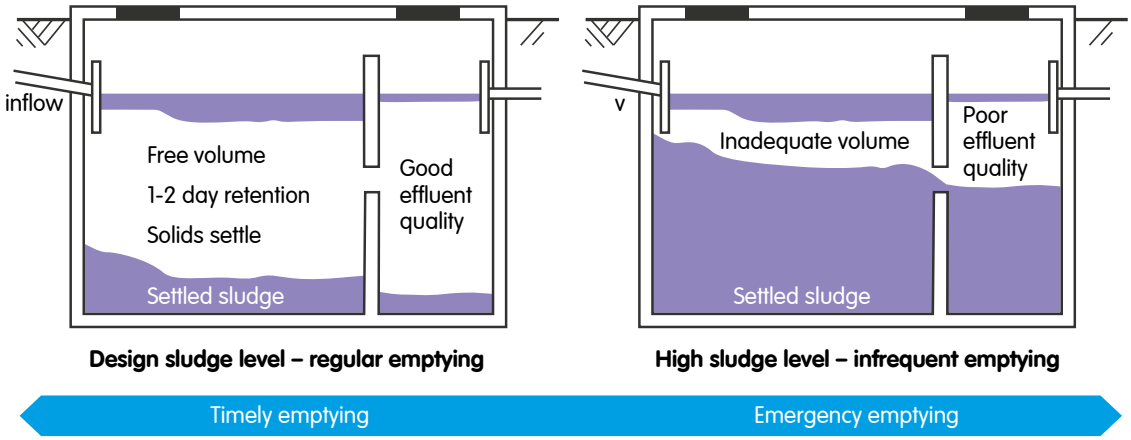


**Figure 5** Sludge levels in systems emptied as designed vs. infrequently
*Source: Mills, 2013.*

These unemptied systems can continue to operate for much longer than designed — some systems in South East Asia have been used for more than 20 years without being emptied — but no longer function as septic systems: the effluent is discharged without adequate treatment, similar to a toilet discharging directly into a drain. When eventually such tanks are emptied, the heavily solidified sludge is difficult to pump out or must be removed manually (Mills, et al., 2014).

In the programme cities, the household or business was responsible for deciding when to empty the tank and then contact a service provider, this is called **on-demand** or **on-call** emptying. Because many people are not aware of the need for regular servicing, it often occurs only when the system overflows or stops working (e.g., because sludge has blocked the inlet or the system cannot drain because the leach field is clogged).

In these **emergency emptying** situations, people may seek the easiest or fastest service so that they are not without a functioning toilet. On-demand emptying provides little incentive for households to practice timely emptying, particularly when there is limited awareness about the potential environmental and health consequences of inaction. Although on-demand servicing can be done in a timely manner, evidence from the Philippines indicates that even with awareness raising, pre-payment for services and other favourable conditions, households still did not request timely emptying, and uptake of the on-demand service was low.[5]

An alternative approach is **scheduled emptying** an organised service that 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. This report details how a scheduled emptying programme can also provide financial and sustainability benefits to both the service provider and the customer. The shift to scheduled emptying is not straightforward. Even though emptying addresses only one part of the service chain, it actually encompasses the breadth of the USHHD programme components: it requires clarification of institutional responsibilities and regulations, development of business and finance models involving both public and private sectors, behaviour change and demand creation, and building capacity of service providers to reliably deliver a safe service.

## 1.6 Purpose of this learning paper

This paper details the steps in an iterative and participatory approach to developing a scheduled

[5] The different phases of the Dumaguete, Philippines, emptying programme are detailed in ISF-UTS and SNV, 2015.

emptying programme, and it describes the resulting service decisions based on each city's conditions and preferences. We begin by providing relevant country background (Section 2), then describe the steps to developing scheduled emptying (Section 3) and conclude with reflections and ways forward (Section 4).

The SNV programme ran from 2014 to 2016 in the following cities:

**Bangladesh:** Khulna city, Kushtia and Jhenaidah municipalities in the Khulna administrative division of Southern Bangladesh;

**Indonesia:** Kalianda district in the South Lampung Regency of Sumatera; and

**Nepal:** Birendranagar city in the Surkhet District and Jumla town in Jumla District.

SNV also worked with other cities to implement their broader urban sanitation programmes, but the cities listed above received specific support for developing scheduled emptying services. The multi-country urban sanitation programme between 2014 and 2016 was funded by the Bill & Melinda Gates Foundation, DFID and EKN (for different locations); the Bangladesh programme also received funding from the Gates Foundation as part of its effort to demonstrate pro-poor, market-based solutions for faecal sludge management in urban centres of southern Bangladesh.

# 2 Country background

This section provides the national and local context for each city's sanitation services.

## 2.1 Bangladesh: Khulna City, Kushtia Paurashava and Jhenaidah Paurashava

**National context.** Only 11% of the urban population in Bangladesh is connected to sewerage. On-site sanitation, including septic tanks and pit latrines, is the main type of sanitation (WHO/UNICEF, 2015). Open defecation has fallen sharply in recent years; sustaining toilet use and safe disposal of faecal sludge are the next national sanitation priorities. SNV participates in a national FSM working committee that has developed an institutional and regulatory framework for FSM.

**Local context.** SNV provides support to three cities in the southern Bangladesh Division of Khulna: Khulna City Corporation (population 1.5 million), Kushtia Paurashava (population 238,065) and Jhenaidah

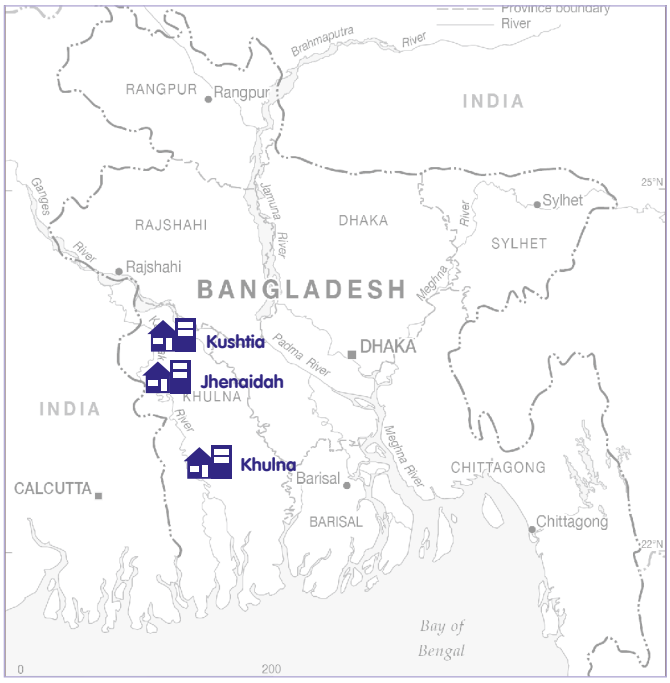


**Figure 6** Programme districts in Bangladesh
*Source: ANU, 2012a*

**Table 1** Status of urban sanitation in three Bangladesh cities

| | |
|---|---|
| Toilet access | Open defecation is less than 1% in all cities. Majority of households have access to improved toilets with fly control. Some open pits or latrines connected to drains still exist. Shared toilets are still common (18% Khulna, 19% Kushtia, 4% Jhenaidah), particularly in slum areas. |
| Containment | Most toilets discharge to septic tanks or pit latrines. Few were classified as environmentally safe (4% Khulna, 13% Kushtia, 35% Jhenaidah). Most containments discharge to drains since the high water table makes soak wells non-functional. A sewerage network serves 4% of Kushtia but is not connected to treatment plant. |
| Emptying practices | Only some households had never emptied their tanks (12% Khulna, 2% Kushtia, 7% Jhenaidah). Unsafe emptying is common (48% Khulna, 48% Kushtia, 67% Jhenaidah). Emptying was predominately manual (81% Khulna, 98% Jhenaidah) with mix of mechanical (for liquid portion) and manual (solids) common in Kushtia (61%). |
| Emptying services | Emptying is done by private 'sweepers' (the name given to manual pit emptiers) (81% Khulna, 33% Kushtia, 98% Jhenaidah) or government providers (16% Khulna, 62% Kushtia). Small vacutugs*, used by community development committees for mechanical emptying, cannot access all densely populated areas. |
| Treatment and disposal | Treatment plants in Kushtia and Jhenaidah are not operating well or have inadequate capacity. Sludge treatment plant in Khulna was built in 2017. Sludge from the Kushtia treatment is re-used as compost. |

*Source: Kabir and Salahuddin, 2014.*

*A vacutug is a small truck with a vacuum pump and small tank (1–1.9m3) designed by UN-HABITAT for sludge emptying in dense urban areas; a vacutug was provided to the community development committee by ADB.

Paurashava (population 157,822) (Kabir and Salahuddin, 2014). City corporations and *paurashavas* have different institutional arrangements, and thus the roles, responsibilities and activities also differed.

## 2.2 Indonesia: Kalianda, South Lampung Regency, Sumatra

SNV has worked in Kalianda, the capital of South Lampung, Indonesia, since mid-2014.

**National context.** The majority of the urban population in Indonesia uses on-site sanitation, with less than 1% connected to sewers (Figure 3). Although sludge treatment plants have been constructed in Indonesia since the 1990s, until recently there was little focus on improving emptying services. Recent developments included national workshops, guidelines for FSM and donor-supported programmes to introduce scheduled emptying in various cities.

**Local context.** Kalianda is a sub-district of the South Lampung Regency in Sumatra, Indonesia, with a population of 121,188 in both urban and peri-urban settings. SNV worked closely with the local government cleaning department (Dinas Kebersihan). SNV also worked in the nearby town of Pacing Sewat and shared lessons on scheduled emptying from Kalianda; the effort was not a specific objective and therefore is not detailed in this report.

The current programme has now been implemented in three other cities.


**Figure 7** Programme city in Indonesia
*Source: ANU, 2012b.*

**Table 2** Status of urban sanitation in Kalianda, Indonesia

| | |
|---|---|
| Toilet access | 4% practice open defecation. Most households have access to toilets. |
| Containment | 94% of toilets discharge to a containment, typically a single unlined pit. Others discharge directly to drain or use open pits. 34% of containments discharge to soak pit. Others discharge to drain or ground. 37% of systems are located under house; 43% have access ports for emptying. |
| Emptying practices | 10% of containments have been emptied in previous 5 years. Emptying is typically by vacuum truck, which can access most systems in Kalianda. |
| Emptying services | Government cleaning department is responsible for sludge management and empties approximately 5 containments per month. No private emptying provider exists. |
| Treatment and disposal | Sludge treatment plant was built in 2014 but not commissioned. Very little waste was discharged there and the plant did not operate well. Most emptied sludge is discharged untreated to the environment. |

*Source: SNV and Robbins, 2014.*


**Figure 8** Programme cities in Nepal
*Source: ANU, 2018*

## 2.3 Nepal: Birendranagar municipality and Jumla district mid-western region

SNV works with two municipalities in Nepal to develop scheduled emptying as part of the urban sanitation programme: firstly in Birendranagar Municipality in Surkhet District and more recently in Chandannath Municipality in Jumla District.

**National context**. National sanitation programmes have focussed on achieving open defecation–free (ODF) status for Nepal's large rural population. In urban areas, various municipalities have desludging trucks, but safe management and treatment were lacking and were recognised as priority areas at the first National FSM Conference in 2015.

**Local context.** Birendranagar Municipality is the capital of Surkhet district in the Mid-Western Development Region of Nepal with a population of 106,557 (NDRI and SNV, 2015). SNV has worked with Birendranagar Municipality since 2013, initially to support the city in access to improved sanitation and hygiene and achieve ODF status. In 2015, SNV supported the development of a city sanitation plan, including both wastewater and sludge management, which was endorsed by the municipal council in January 2016.

The water supply and sanitation divisional office and the existing private emptying provider have been involved in developing the emptying and other FSM services. The programme has now expanded to two more towns.

**Table 3** Status of urban sanitation in Birendranagar, Nepal

| | |
|---|---|
| Toilet access | Despite ODF status, 0.6% of households practice open defecation. 4% use unimproved toilet facilities. |
| Containment | Nearly all toilets discharge to large tanks or pits, with a few to septic tanks and biogas. Size varies from 5m3 to 40m3. Most systems were unsealed and leach to groundwater, a concern as 32% of households use wells for water supply. 30% of systems are located under the house. |
| Emptying practices | 25% of systems had been emptied at least once, typically by vacuum truck. Some manual emptying. |
| Emptying services | Main service provider is a private operator with one vacuum truck (5m3 capacity). Municipality owns vacuum truck but it is not operating. |
| Treatment and disposal | No treatment exists. Sludge is dumped in forest areas, barren land or waterways. Some untreated sludge is disposed to farms; farmers pay for sludge. |

*Source: NDRI and SNV, 2015.*

# 3 Key steps to develop scheduled emptying

Scheduled emptying, like any other entry point for change, needs to be embedded in a broader process of assessment and planning of sanitation improvements. Each city has a different starting point for developing emptying services, depending on the existing services, available technologies and enabling environments, as well as varied priorities and preferences for progress. For this reason, the development of scheduled emptying services needs to be iterative and flexible.

Across the three countries, SNV drew on a common strategy that started with investigation of the local context and issues through participatory research. This served to build capacity and buy-in for subsequent iterative actions: implementing small steps, learning from practice, revising and eventually progressing. An iterative approach was essential, since scheduled emptying was a new method of service delivery for all cities and a large shift from the current practices.

**Broader programme start-up activities.** A legal scan, baseline assessments and stakeholder dialogue are common starting points for all urban sanitation programmes.

**Specific activities**. The approach for scheduled emptying is summarised in Figure 9 and described below.

## 3.1 Understanding the sanitation situation and status

### 3.1.1 Overall start-up programme activities

SNV prioritises data collection as a key initial activity in its sanitation programmes. Data collected up front not only informed and shaped the programme and stakeholder engagement but also provided a clear evidence base to advocate for sanitation improvements. The initial assessments during all urban sanitation programmes' inception phase include a legal assessment and baseline assessment, aimed to collect sufficient data to develop the programme and prioritise activities. Additional rounds of more detailed or targeted data collection were conducted as needed.

The scope of the initial assessments was as follows:

**Legal scan.** The purpose was to identify the regulatory limitations and opportunities for improved sanitation services. The assessment included a review

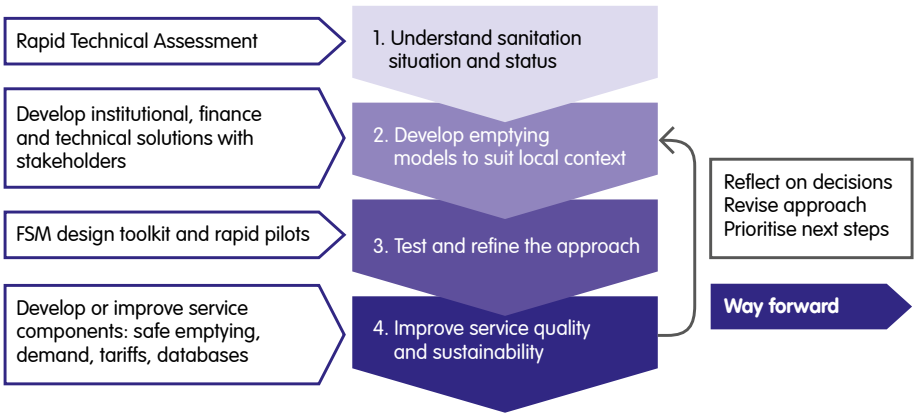


**Figure 9** Steps to develop scheduled emptying

of national and local policies, regulations, standards and permits for all steps of the urban sanitation service chain, as well as clarification of the responsibility and finance arrangements. It also served to increase coordination between stakeholders by bringing together local government agencies (e.g., health, planning, water, sanitation and environment departments) to provide input and discuss the findings. SNV and ISF-UTS (2016) summarises the process.

**Baseline assessment.** Surveys and capacity measurements enable both programme planning and progress monitoring. The capacity measurements were mostly done through dialogue and focus group discussions with stakeholders. The baseline assessment collected city-wide data through surveys of premises and interviews with service providers to determine the existing conditions, services and behaviours relating to the entire service chain of sanitation and hygiene. Both residential and non-

**Box 2** Faecal waste flow diagramme (SFD)

Findings from the baseline survey were particularly valuable for advocacy because they often represented the first assessment of a city's sanitation service chain. Revelation of the often poor status of sanitation was valuable for increasing awareness, motivating change and identifying priority areas. Although less detailed than the SNV indicators, another commonly used tool to assess and visually present the sanitation status is a faecal waste flow diagramme (SFD) developed by World Bank.

This standardised approach systematically assesses the proportion of the population's faecal waste that is safely managed (conveyed and treated; green) or unsafely discharged to the environment (red) (Blackett, et al., 2015). The diagramme can be created from the baseline survey findings (Figure 10).

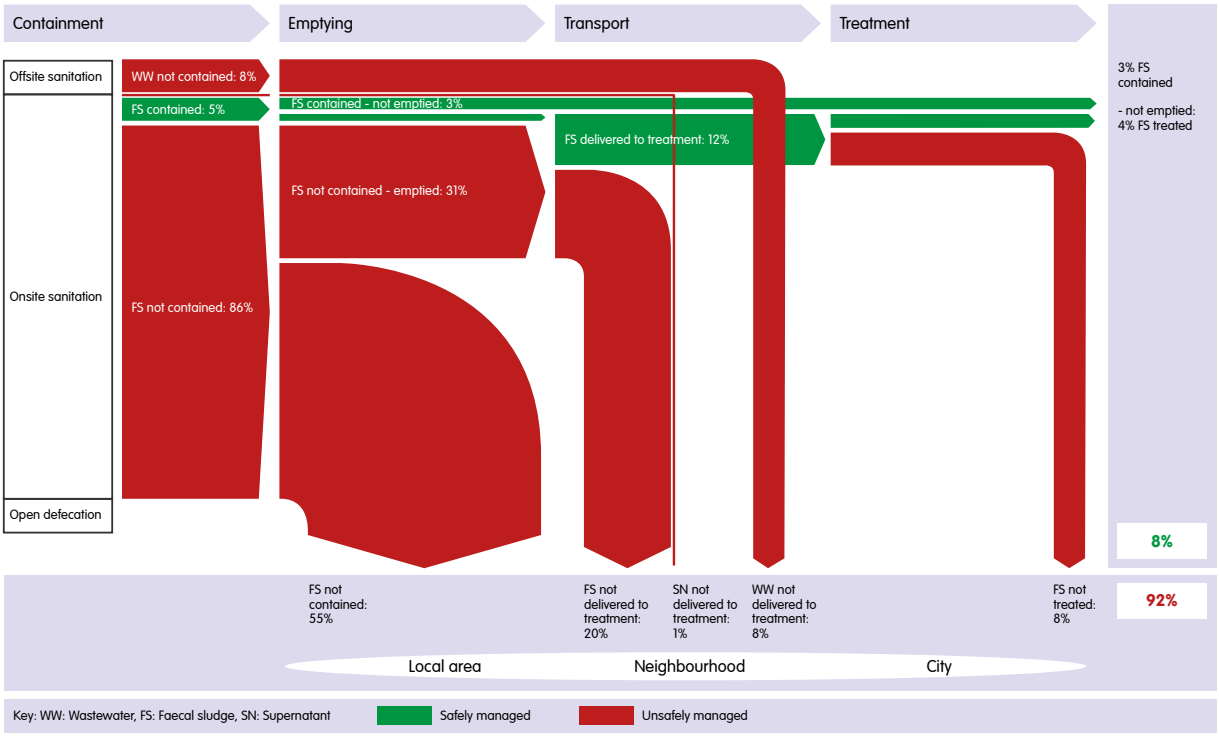


**Figure 10** Faecal waste flow diagramme (SFD) Jessore
*Source: SNV, 2018 (unpublished).*

residential premises across the city were surveyed, based on a systematic random sample. (In Bangladesh the sample size ranged from 999 from 4,404 premises depending on the city; Kabir and Salahuddin, 2014). The findings were then discussed with government agency staff. The resulting detailed picture of sanitation practices and conditions in the city, was valuable to both the sanitation sector and the health, environment and planning agencies. The baseline assessment covered all USHHD programme components, including demographic data, cost and affordability of services, private sector involvement, occupational health and safety, and need and willingness to improve systems. The baseline and subsequent mid-programme assessments identified improvements to services and stakeholder capacity while also revealing gaps to allow for course correction or alternative approaches.

### 3.1.2 Rapid Technical Assessment

A Rapid Technical Assessment (RTA) is a FSM specific tool to capture details on containment and emptying to inform the design of locally appropriate sludge emptying programmes. The tool was originally developed by David Robbins (2016) and has been adapted to suit local conditions.

The aim of the RTA is to collect sufficient data to understand the typical conditions and major issues for emptying in a city. It provides preliminary inputs to the 'septage' management toolkit (see Section 3.3.1.). **'Rapid' is the operative word: the assessment can be conducted with a small team over three to five days.** With a well-designed sampling method and adequate training of enumerators (see below), the RTA can capture the necessary information faster and at a lower cost than a typical community-wide census. The fields of assessment are size and type of containment; access for emptying; previous emptying method and provider; and willingness to improve containment. The RTA takes a participatory approach, including local authorities in both implementation and analysis of findings.

**Box 3** Use of smartphone technology for the RTA

Smartphones or tablets loaded with the Akvo FLOW application were used to conduct the RTA surveys. Field staff directly input responses to their smartphones, photographed toilets and containment systems and geo-referenced the site for mapping and quality assurance. Data was immediately uploaded to a web-based dashboard, permitting real-time monitoring of survey progress and much faster analysis than with a paper-based survey (Akvo FLOW (Field Level Operation Watch) was originally developed by Water For People to assess rural water supply).

The RTA had five steps:

**1 Refine the survey questions** with stakeholders to suit local conditions.

**2 Identify zones** in the city that were more likely to need an improved emptying programme, typically densely populated areas and those not connected to sewerage. One to three zones were selected for the survey, with a sample size calculated for a 95% confidence level based on findings from the baseline study. The sample included residential as well as commercial and institutional premises, since an improved emptying programme would likely serve a range of customers.

**3 Select a small survey team** of three to six people with some technical background (e.g., in building, planning or engineering). The team received two or three days of training on the technical details of on-site sanitation, emptying and the survey questions and approach. A test at the end ensured that the team was fully competent.

**4 Conduct surveys** over two or three days using smartphone technology (Box 3), including the following:

- Property owner questionnaire. Number of users, emptying history and frequency, willingness to improve non-standard facilities.
- Technical assessment. Type, number and volume of

containment systems; any constraints to emptying (location, access port, accessibility); feasibility for upgrading; discharge/drainage of greywater and rainwater.

**5 Analyse data** and summarise findings for input into Septage Management Toolkit.

The RTA was implemented in Kalianda, Indonesia; Kushtia, Bangladesh; and Birendranagar and Jumla in Nepal. Below we reflect on the benefits and challenges of the RTA in these cities; a summary of findings is presented in Table 4.

- The RTA provided an immediate picture of the current FSM status and sufficient data to initially scope the emptying programme. However once the initial emptying model is designed - emptying approach, service providers, scale of programme and suitable areas a second RTA might be needed to increase confidence in model inputs, collect data for a specific area or that aligns with an existing database (e.g., water supply). Both the Indonesia and Nepal programmes planned to conduct a second RTA to inform pilot trials and confirm programme assumptions.

- Participation of local authorities enriched their understanding of the survey process and results and also built their capacity to conduct future surveys independently. However, it was evident in Indonesia that prioritisation and motivation were also necessary for local authorities to independently conduct additional surveys.

- An RTA was not conducted in Khulna Bangladesh because a more detailed baseline study had been completed by Khulna University. However, use of

**Table 4** Findings from Rapid Technical Assessment

| | Kushtia, Bangladesh | Kalianda, Indonesia | Birendranagar, Nepal |
|---|---|---|---|
| Survey timing | 4 days, April 2015 | 10 days, January 2015<br><br>(first RTA included 4 days of analysis) | 5 days, December 2015 |
| Properties surveyed | 132 properties, of 1,300 in survey area | 355 households, of 4,763 in pilot area | 277 properties including 60% residential, 35% mixed, 5% commercial |
| Type of containment | 50% use septic tanks, 50% use pit latrine<br><br>33% have multiple toilets | Majority use single unsealed pits or septic tanks<br><br>6% have multiple tanks | 54% large holding tanks, 32% unsealed pits, 3% septic tank, 2% biogas |
| Average containment | 3.5 m3 | 3.2 m3 | 28% <5m3, 22% 5–10 m3, 18% 10–20 m3, 27% >20 m3 |
| Average truck size | 5m3 truck, 1m3 vacutug | 3m3 | 6m3 |
| Access to containment | 20% by 3-wheel motor-tank, 20% by hand-cart<br><br>70% located under house, 25% without access port | 13% more than 25m from truck parking area; 8% of roads not accessible by truck<br><br>37% located under building, without access | 25% deemed difficult to access<br><br>30% of systems located under building |
| Previously emptied | 41% previously emptied | 10% previously emptied | 25% previously emptied but only 10% in past 3 years |
| Willingness to improve containment | 33% to upgrade to septic tank, 66% to install soak-pit. | 93% | 94% |

the Septage Management Toolkit (Section 3.3.1.), which relies on the RTA outputs, was thus precluded.

## 3.2 Developing emptying models to suit local context

The preliminary data collection provides a valuable picture of the current sanitation status and the numerous issues across the service chain. The merits of different entry points were discussed. Compared with upgrading containment or building treatment plants, better sludge emptying would be visible, short-term and potentially profitable — all factors that can motivate stakeholders — and was chosen as a good place to start.

This section discusses two decisions regarding emptying models:

***What is the most suitable emptying approach?***
***Which service providers should fulfil the different roles in FSM?***

Many political, financial, institutional and social factors affect these decisions. A participatory decision-making process ensured that all stakeholders reflected on the findings of the preliminary surveys and made collaborative decisions on the emptying model suitable for their context and preferences. Stakeholder coordination and engagement was a necessary and valuable first step in developing a new emptying model.

The following section summarises the general requirements and considerations for different emptying models. They can be used in other cities to help stakeholders discuss and assess options. The decisions in this section fed into the toolkit and pilot (Section 3.3).

We assumed that emptying would be done by mechanical equipment, such as vacuum trucks, rather than manual emptying, which carries health and safety risks (Section 3.4.3). Although some models could be applicable to manual emptying, the descriptions below do not explicitly consider the different requirements and challenges relevant to manual emptying.

### 3.2.1 Stakeholder coordination, roles and responsibilities

In the three programme countries, on-site sanitation and disposal of human waste was largely unregulated, and faecal sludge management was typically not a priority for local authorities. In addition, responsibility for on-site sanitation often spans multiple departments: environmental, waste and drainage services, water supply, health and building. The following steps helped determine who was or should be involved in decisions on scheduled emptying while also building motivation for action and prioritisation of on-site sanitation services.

**Stakeholder working groups and meetings.** To gain broad support and better coordinate sanitation activities, the programmes supported the formation or strengthening of formal or informal multi-stakeholder sanitation working groups or task forces at a city level. Stakeholders represented the departments involved in sanitation, including building, planning, health and environment departments, water authority and in some cases private sector, non-government organisations and universities. Inclusion of senior staff aided the effectiveness of these groups, especially if participation was part of their job requirements

**Clarification of responsibilities.** In all cities the preliminary assessments identified uncertainty regarding institutional responsibility for on-site sanitation and related services. Responsibility for emptying varied between:

- part of larger department, such as the solid waste and cleaning department (Indonesia);
- distributed across multiple departments, with different departments responsible for containment, emptying and treatment (all countries);

- no defined responsibility, not included in any government staffs' job description, and the additional workload was assumed by the conservancy department, with overlap from the water supply and sewerage authority, the development authority and city corporation (Bangladesh).

The review of current institutional roles and responsibilities provided clarity and formal responsibility for specific agencies to take action and was an incentive to change. For example, in Bangladesh the recent FSM institutional and regulatory framework has now assigned responsibility to specific institutions based on existing laws and policies appropriate to the institutional set-up (e.g., city, municipality, district). This national policy was developed by the Bangladesh Faecal Sludge Management Network, of which SNV is a leading participant.

**Advocacy.** In the programme cities, local authorities often lacked motivation and willingness to accept their assigned responsibility, allocate adequate staff, and proactively improve service. The programme's advocacy sought to generate incentives for change:

- SNV facilitated meetings on sanitation with higher-level offices (e.g., mayor, head of department, chamber of commerce). Gaining leaders' support was particularly valuable to achieve legal and institutional changes and drive action and investment.

- SNV shared the baseline survey and RTA findings on sanitation status and highlighted how an emptying programme could address service gaps.

- SNV engaged in continual, repeated advocacy because of staff rotations or changes in leadership and threatened loss of momentum or retractions of previous decisions. SNV brought newly appointed staffers up to speed, prepared written agreements for major decisions or policies and widened the stakeholder base to ensure continuity. In Jumla, Nepal, frequent staff rotations necessitated making the chamber of commerce an alternative, more permanent leadership channel that proved influential in advocating safe management of on-site sanitation to successive local leaders.

Because emptying is only one component of urban sanitation, clarification of roles and responsibilities and high-level advocacy had to consider the city-wide sanitation context and needs, and how emptying would be integrated with other services and parts of the service chain.

### 3.2.2 What is the most suitable emptying approach?

Selection of a model must consider the following:

- Who makes the decision to empty? Does the household or business decide, or is emptying a government requirement?

- Is the programme managed by centrally or by the service provider?

- What is the scale of service? Is it city-wide or targeted on specific areas?

No one approach works best for all locations: the advantages and disadvantages depend on local conditions. However, in all cases, poor sanitation harms the entire community, not just the household or business with the unemptied containment. The basic question, then, is whether decisions about emptying should be left with the household or building owner. The question **to schedule or not to schedule?** was posted in SNV's online discussion forum on desludging.[6]

Table 5 details the spectrum of emptying approaches and the generalised advantages and disadvantages relevant to the SNV cities, located in Asia with predominately pour-flush toilets.

[6] SNV moderated an email discussion on the Urban Sanitation and Hygiene Discussion Group (Dgroups) platform between November and December 2014. The discussion group involved 202 members from 36 countries. SNV, 2015.

**Table 5** Spectrum of emptying approaches

| Model | Description of approach | Advantages (+) and Disadvantages (-) |
|---|---|---|
| On demand | Also referred to as on-call.<br>Existing approach in most cities.<br>Decision to empty rests with premise and is often reactive: emptying is requested only when system has stopped functioning.<br>Service providers can be government, private enterprise, community group or manual emptier. Typically, there is little coordination of service providers or enforcement.<br>Full payment at time of emptying is typical. | (+) Low management requirements, with transaction directly between customer and provider. |
| | | (-) Non-timely and unorganised emptying creates problems (see below).<br>Relies on customer motivation, which is currently low because of limited education, promotion and enforcement.<br>Customers may choose cheapest and fastest service over safe or approved providers.<br>Monitoring or regulation of private services has been absent or limited but could be implemented (with licences, registration). |
| Scheduled | Emptying service occurs at regular intervals (i.e., 3–5 years), depending on containment type, size and use.<br>Customers are notified when emptying is scheduled.<br>All premises in the scheduled area should be included; regulation to enforce participation may be required.<br>Emptying is typically coordinated by government authority but service can be provided by different organisations.<br>Payment could be upfront or in instalments and combined with other fees or collected as tax. | (+) Benefits of timely and organised emptying detailed below.<br>Not reliant on customer motivation.<br>Formalising emptying service provides opportunity for greater regulation of tariffs between service providers and cost-sharing for equity. |
| | | (-) Requires customer database, which may not exist and may require a large survey.<br>Requires higher level of management and administration.<br>Agreement on and establishing the regulations, tariffs, processes and systems takes time.<br>Even if scheduled emptying is compulsory, education and promotion are necessary to increase acceptance. |
| Block | Interim step between on-demand and scheduled.<br>Emptying is promoted to block of customers, who participate voluntarily.<br>Emptying is then scheduled for agreed-upon time.<br>Payment is typically upfront and one-off; a deposit may be collected at time of promotion.<br>Approach tested in pilot in Bangladesh. | (+) Benefits of organised emptying detailed below.<br>Customers have easier access to services through proactive service delivery.<br>Promotion educates customers about need for regular emptying.<br>Can often be implemented before local regulations, tariffs and services are finalised for a scheduled emptying programme. |
| | | (-) Typically one-off, does not necessarily lead to regular emptying.<br>Relies on household demand; not compulsory.<br>Customers may refuse service, particularly if no deposit was paid or emptying lags promotion. |

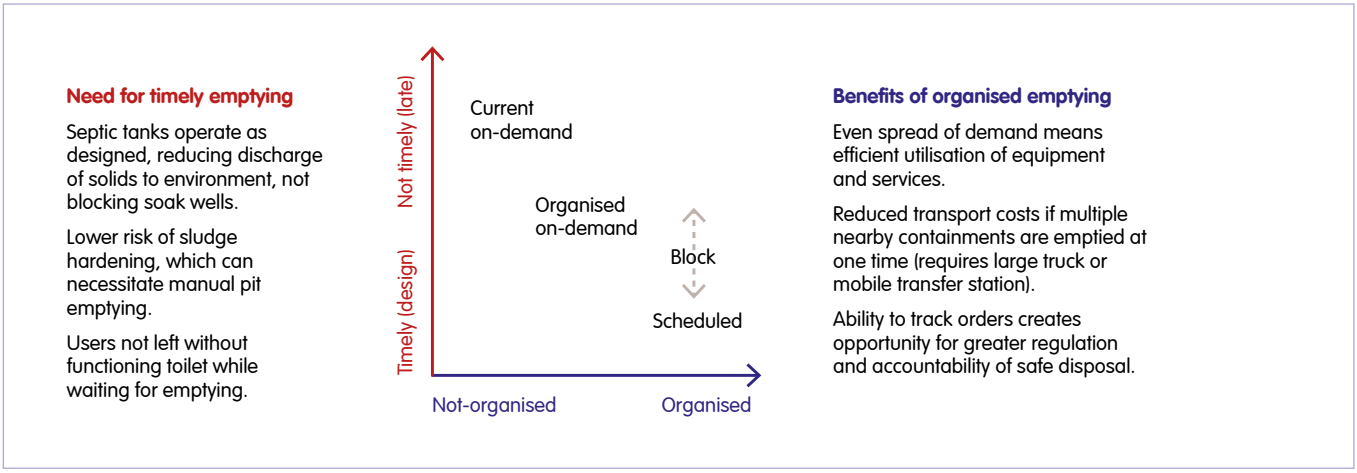


**Figure 11** Benefits of timely and organised emptying

Because more timely and more organised emptying service offers numerous benefits, scheduled emptying was the preferred approach in the programme cities, but the scope and scale varied. Large cities (e.g., Khulna) are developing city-wide services and the necessary regulations and tariffs; smaller cities (e.g., Kalianda), with service or management capacity limitations, are starting by developing scheduled emptying for certain areas or customers. The scope of the scheduled emptying programmes being pursued in each city is discussed below (Section 3.3.1).

Establishing a scheduled emptying programme takes time. Some cities (e.g., Khulna, Khustia; Section 3.3.2) therefore plan to start with block desludging to test assumptions while they await approval of scheduled emptying regulations and tariffs. Even as these cities pursue a scheduled emptying programme, on-demand emptying will still be required in unserved areas or for emergency (unscheduled) emptying, and many cities will therefore require a mixed approach. In developing a scheduled emptying programme, it is therefore beneficial to support improving on-demand service, particularly because many of the institutional and capacity-building aspects are interchangeable. One example of how the development of scheduled emptying catalysed wider change was in Kalianda, Indonesia, where the on-demand emptying rates doubled during the programme intervention.

### 3.2.3 Defining the roles for scheduled emptying

There are various roles that need to be filled in the operation of a scheduled emptying programme.

- **Management** scheduling services, managing customer database, managing customer engagement and feedback, receiving and dispatching orders.
- **Promotion** conducting behaviour change and awareness campaigns, handling registration for scheduled or block emptying service, educating operators about safe emptying practices.
- **Emptying** manual or mechanical emptying and if operating a transfer station there can be separate providers for the initial emptying and the, transporting sludge to treatment.
- **Financial management** billing, collecting tariffs, processing payments processing, managing accounts and paying contracted service providers.
- **Regulation and enforcement** conducting independent oversight of service providers, operators and regulating institutions.

No one approach suits every situation, and responsibilities can be divided amongst providers depending on current roles, skills and capacity. It was clear from the various cities that these decisions are influenced by the current local institutional arrangements, presence of existing private or other service providers, and political preferences. The following describes the potential service providers in SNV programme cities' and their existing or potential role in scheduled emptying.

**Local authority.** In all cities, local authorities were the initial sludge-emptying service providers, often established after a desludging truck was provided by a donor or the national government. The services were

**Box 4** Mobile septage transfer stations and block desludging

The trip from containment to treatment is often one of the largest expenses of desludging. Use of a transfer station for intermediate storage can reduce transport cost and can allow the use of smaller desludging trucks or carts to access densely populated areas. Emptying then occurs in two stages: a small truck or cart empties the pit and carries the sludge to a nearby transfer station, and once the transfer station fills or after all pits have been emptied, then a larger truck transports it to the treatment plant (Mukheibir, 2015).

However, finding land or obtaining approval for a fixed transfer station (e.g., an underground storage tank) is often challenging in the dense areas where it is most needed. For example, in Khulna a transfer station was originally proposed to be located under temporary solid-waste disposal sites, however this was refused by the waste disposal agency for fears of complaints. Instead, SNV worked with the city corporation to design and purchase a mobile septage transfer station (mSTS), a truck fitted with a large tank (7m3) that acts as the temporary storage.

Shown in Figure 12 the mSTS parks near the scheduled or block emptying area while the smaller trucks or carts make multiple trips to empty the household containments. Once the mSTS is full or all the scheduled or block containments are emptied, it is driven to the sludge treatment site. SNV has proposed that the mSTS be given to the city, but management and operation details not been finalised, and so far no private sector actors are interested.
The advantage of an mSTS is reduced transport costs, particularly if the treatment site is far from households and the truck can be positioned close to the households being emptying that day. However, there is still the challenge of finding an appropriate location to park the mSTS for the day and to ensuring that the smaller trucks and carts can easily and safely discharge into it.
An alternative to transfer stations could be increasing the pump capacity of larger trucks and outfitting them with longer hoses to enable access more houses from a greater distance. Often, private sector vehicles had stronger pumps and longer hoses than government vehicles.

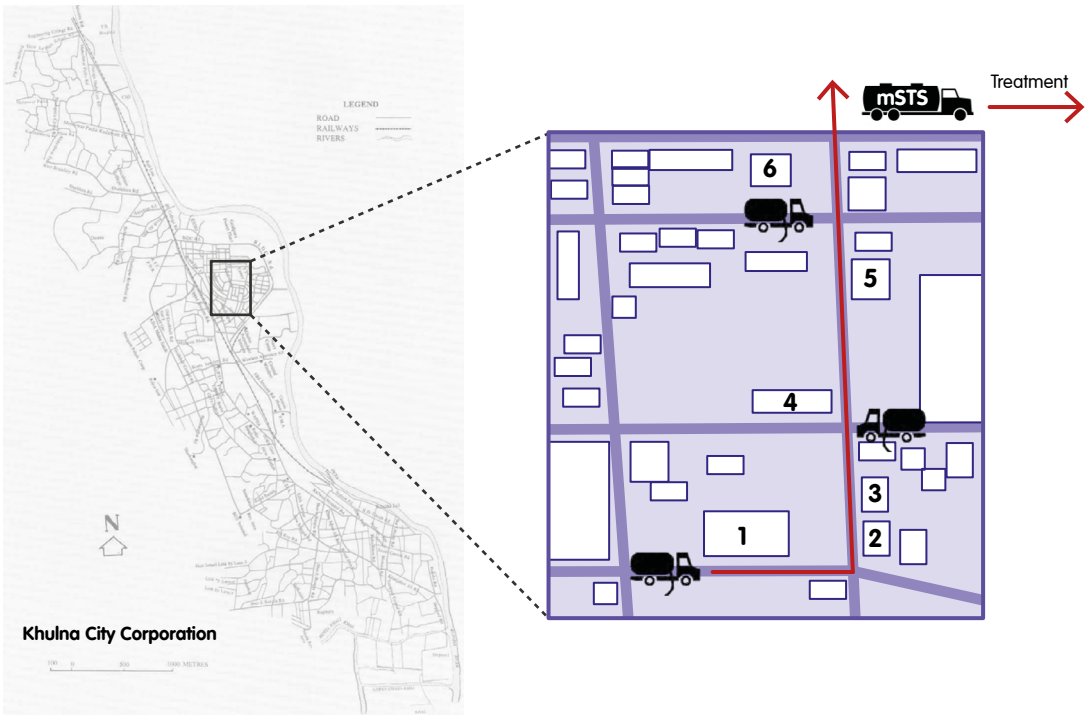


**Figure 12** Block desludging in Khulna City Corporation
*Source: SNV, 2016a.*

typically part of a broader local government department (solid waste or cleaning), and the operations often had minimal management support, few staff, few records of operation and no mechanism for enforcement of safe emptying or disposal to treatment. Most cities did have a regulated or formal tariff for sludge emptying. Government providers predominately served institutional or public toilets and typically did not advertise their services or promote regular emptying. Whether local authorities continue provide emptying services, or leave that to the private sector, their important role is regulation and enforcement of service delivery. Other roles for government departments are customer management, management of service providers, planning and allocation of orders, and education and promotion. Their capacity to manage monthly customer tariffs or reliably contract with private operators should be considered in model and billing decisions, since a lack of transparency or trust could undermine the system.

**Water authority.** In some countries the water authority also manages sanitation, but this was not the case in the programme cities. Particularly where water coverage is high, the water authority may have a natural role in a scheduled emptying service. Areas of overlap are existing customer databases, ability to collect tariffs and manage finances, and often operation and asset management staff and capacity. However, involving water authorities faces two challenges: (i) if water supply management is poor, adding FSM services is a risk; and (ii) water authorities may lack motivation and regard sanitation as an unprofitable burden.

**Community-based organisations.** In Khulna, Bangladesh, three community development committees received a vacutug from a donor in 2014, however use has been low since sustainable management models or tariffs were not in place. Compared with government service provision, the committees offered several benefits: fast response to orders, existing community relationships and less cumbersome bureaucracy. On the other side, these committees had limited management and finance capacity and did not coordinate with the local authorities. Their primary role as community support for low-income areas meant they often accepted low or no payment. To improve service delivery and truck utilisation, SNV supported the three committees to jointly coordinate the emptying services and connected it with government to work towards collection of tariffs and safe emptying and disposal practices. Given their strong community links, such organisations can play a valuable role in encouraging participation in a scheduled emptying programme.

**Private operators.** Private operators were the main service providers in Khulna and Jhenaidah, Bangladesh, and in Birendranagar, Nepal. Some private operators had vacuum trucks, but in Bangladesh manual emptying was more common. No formal agreement or interaction existed between the private operators and local authorities, although some manual 'sweepers' were employed by Khulna truck operators to assist in emptying hardened sludge. Private operators' tariffs were not regulated, and safe emptying practices or disposal to a treatment plant was not enforced. Most sludge emptied by private operators was apparently discharged directly to the environment. Shifting to schedhuled emptying will likely require a greater role for private sector in most cities to meet the increased demand for services. In cities where private sector is not yet engaged, the local authority may need to promote the opportunities to existing businesses and provide the link with customers and manage regulation and oversight of service quality. Private sector can also be involved in implementing social aspects such marketing and demand creation or training, such as emptier health and safety training.

An initial clarification of roles and responsibilities may reveal that existing institutional arrangements will be less than ideal, particularly as service demand increases and requires more formalisation. 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. These often must be approved by the mayor — something that underscores the benefits of early and on-going advocacy and coordination with city leaders.

**Table 6** Existing and proposed service providers for emptying

| Existing | Proposed |
|---|---|
| Bangladesh | |
| **Khulna** city corporation had two 5m3 trucks but emptied fewer than 5 systems per month, less than 5% of services. Three community development committees, each with 1m3 vacutug. Many private manual emptiers.<br>**Kushtia** municipality had 3 vacutugs (0.5–5m3) making 3 or 4 trips per day.<br>**Jhenaidah** municipality had 3 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 2 new vacutugs from grants, which it may lease to private sector.<br>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 1 truck and emptied 5 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 1 licenced private provider. | Birendranagar is developing programme for scheduled emptying that will likely be involve private operator. Discussions underway to formalise arrangements. |

Table 6 summarises the current and proposed responsibilities for scheduled emptying in the programme cities.

## 3.3 Testing and refining the approach

Once the preliminary decisions on the scheduled emptying model were made, the programme requirements were estimated using the septage management toolkit. The next phase of a small pilot was conducted in Khulna with other cities preparing to at a later stage. These provided a reality check, to determine what funding and infrastructure were needed for implementation, to test the accuracy of assumptions and to identify potential gaps in infrastructure and capacity.

### 3.3.1 Septage management toolkit

The septage management toolkit is an Excel spreadsheet developed by David Robbins, supported by USAID, to calculate the infrastructure requirements and costs of a regular emptying programme. It requires input of local data and parameters for the proposed model, then calculates a high-level estimate of what is needed to run a financially sustainable scheduled emptying service with full cost recovery. The toolkit calculates the following:

- required treatment plant size and number of emptying trucks;
- annual operating costs for sludge collection and treatment; and
- monthly customer tariff based on cost recovery over 10 years' operation.

The spreadsheet includes detailed notes on the data inputs.[7] Here, we highlight the decision-making process behind these inputs and the data sources. Stakeholder involvement was important to ensure that the proposed assumptions were realistic and acceptable to government and service providers.

The toolkit requires more than 60 inputs, including technical details, model assumptions and financial

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

**Table 7** Components and inputs to toolkit

| Toolkit section | Inputs from data | Inputs based on stakeholder discussion |
|---|---|---|
| Septage design flow (m3/day) | Average volume of containment*<br>Emptying frequency (typically 3–5 years)**<br>Households with containment systems that can be emptied (%)<br>Working days per week | Number of household and commercial properties proposed to be served<br>Expected participation (if not compulsory) |
| Number of trucks required | Capacity of truck<br>Time to conduct emptying (locating, opening containment, emptying, transport)<br>Average distance to treatment | Proposed treatment plant location<br>Use of transfer station if transport costs are significant |
| Collection costs | Capital truck costs<br>Operation costs: labour, fuel and maintenance including asset depreciation | Capital and operating collection costs to be included in tariff<br>Service provider and inclusion of overhead or profit margin |
| Treatment Costs | Capital treatment plant construction and land costs<br>Treatment operation: labour, electricity, water, supplies, maintenance, depreciation | Capital and operating treatment costs to be included in tariff<br>Payment period and interest rate of capital investment |
| Revenue and Projections | The inputs calculated above as well as population growth and inflation rate<br>Iterative process to calculate tariff | Flat or different tariffs for residential and commercial, short term and long term<br>Aim for cost recovery or profit over 10-year operation period |

* Because the RTA indicated a wide range of volumes, input volumens were often assumed to be the predominate size (rather than the average) of orften the capacity of the existing emptying truck. This assumed that larger systems may be only partially emptied or may be charged an additional fee for multiple emptying trips. | ** The average emptying frequency was often difficult to determine because most systems had never been emptied. Estimates were based on the capacity of the truck in comparison with the average of systems and the different emptying frequencies in the toolkit outputs. Properties requiring more frequent emptying may be required to pay an additional fee.

data (Table 7). For the technical inputs, the disparate data collected in the RTA and baseline surveys had to be reduced to a single city-wide input. For example, in Birendranagar, containment systems varied in size from 1 to 40m3 and emptying frequency ranged from annually to never in 20 years. Additionally, a number of assumptions (frequency, enforced or voluntary participation, service provider) and financial inputs (recovery of capital costs, profit for private providers) were new concepts to stakeholders unfamiliar with detailed cost analysis. Guidance on the assumptions was therefore needed. Because these inputs influence the overall tariff, investment capital and profit, a balance was sought between realistic expectations (e.g., are customers expected to cover the cost of treatment plant or major asset renewal?) and viability (e.g., will 100% of the city actually participate and justify a profit or lower tariff?). Adequate consultation and explanation of decisions lead to more accurate inputs and more realistic options.

The toolkit was applied in three cities. Table 8 shows there is clearly no single solution to scheduled emptying. The influence of input assumptions is particularly apparent in the calculated cost-recovery tariffs, which range from US$ 0.23 to 1.21 per household per month. An interactive workshop was used to present the findings and test the toolkit's sensitivity to different inputs. This approach helped stakeholders appreciate the effect of the assumptions on the overall tariff and profit, and it provided a grounded example to reflect on whether their decisions on finance, service provision and scale would work in the local context.

Although the toolkit provided only a preliminary cost estimate and was based on city-wide assumptions, it was valuable for outlining the investment and equipment required to implement a sustainable programme. These costs and assumptions were refined as the emptying programme was implemented and more accurate data collected.

**Table 8** Toolkit inputs and outputs for three test cities

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

### Benefits

Workshops to present the toolkit results to stakeholders were an important step in the advocacy for improved emptying services. Local authorities saw that scheduled emptying programmes could recover costs or make a profit, and thus sludge emptying went from being perceived as a burden to an opportunity. Additionally, engaging stakeholders in the data input and review showed what components must be considered for successful and sustainable FSM: tariffs, labour, equipment, infrastructure and involvement of private sector. In Indonesia, following presentation of the toolkit findings, particularly the potential revenue, local authorities became more interested in supporting improvements for on-site sanitation services: they advanced institutional improvements and requested funds for another emptying truck in the following year's budget.

### Challenges

Use of the toolkit in the different cities also highlighted some challenges and limitations:

- Decisions on the most suitable emptying model, frequency of emptying, use of a transfer station and truck size required some background knowledge and therefore depended on expert inputs. This report hopes to provide enough details on the options and selection process to support more independent use of this toolkit.

- Making city-wide assumptions from the broad survey findings was challenging, particularly because of the diverse sizes of containment and if commercial and institutional systems were included. It may be necessary to run separate analyses for different sizes of containment and emptying frequencies for commercial or institutions facilities, although it is not evident how the different findings could be combined.

- Estimation of costs was difficult for new activities and new infrastructure.

### Limitations

- The toolkit cannot assess whether an on-demand or regular emptying approach is more suitable for the local conditions. For example, is scheduled

emptying appropriate for small cities where only one or two household tanks would be emptied per day? Additionally, many cities may need a range of scheduled service options or a combination of scheduled and on-demand services, and the toolkit is currently limited to a single option.

- The results, based on city-wide assumptions and a small RTA sample, provided only a high-level feasibility assessments and preliminary cost estimates. Stakeholders hesitated to rely on these findings for formalising tariffs or budget requests. This was a particular concern in cities with diverse conditions, a mixed customer base or sprawling peri-urban areas.

- The toolkit's somewhat homogeneous solutions were deemed unrealistic in some of SNV's programme cities, with the following alternatives required:
  - ◇ different emptying frequency and size of containment for commercial and institutional customers;
  - ◇ a combination of scheduled and on-demand emptying, particularly for large cities; and
  - ◇ use of a transfer station for cities with densely populated areas or distant treatment plants.

- The calculated cost recovery tariff could not always be charged because of political and social considerations; some cities decided on an on-demand tariff, which the tool does not calculate.

### 3.3.2 Rapid pilots

SNV conducted two pilots to test assumptions and approaches for scheduled emptying models in Khulna, Bangladesh, as part of the iterative process to review and improve understanding. The pilots were conducted over just one to three days in small areas, to allow for immediate review of assumptions and

**Table 9** First pilot in Bangladesh: one-day emptying, 2015

| | |
|---|---|
| Aim | To test assumptions behind emptying model in the early phase of programme development in Khulna: did community development committee have capacity to organise and lead one day of scheduled safe emptying? |
| Programme components | **Model.** Block emptying of households and institutions in one neighbourhood on a designated day, at reduced cost (600 instead of 700 BHT). The community development committee (CDC) would use their small and discharge into mobile transfer station (large city desludging truck was used as the mobile transfer station).<br><br>**Promotion.** 'Sales agents' (students and community leaders) conducted door-to-door promotion to 65 households and institutions, asked about willingness to pay for non-emergency emptying, signed up customers to participate. |
| Participation | Of 65 households, 10 were willing to pay and 5 households signed up. Only 3 were emptied on the desludging day. |
| Outcomes | **Capacity.** The CDC could not effectively manage emptying day. It could support promotion activities but was unable to control finance, labour, equipment and disposal to treatment as required for high quality of service. Vacutug operators did not dispose to official site, cost of emptying was negotiated rather than fixed, collaboration between CDC and city corporation was difficult.<br><br>**Technical issues.** Vacutug could not discharge into city truck as intended. Some of the interested households could not be accessed because of narrow alleys and short hose length.<br><br>**Demand.** Promotion was effective because of existing relationships and trust but agents needed more training (information was inaccurate, technical details were insufficient). On designated day some households declined service (because someone other than head of household had agreed to participate). |

*Source: Enviu and SNV, 2015.*

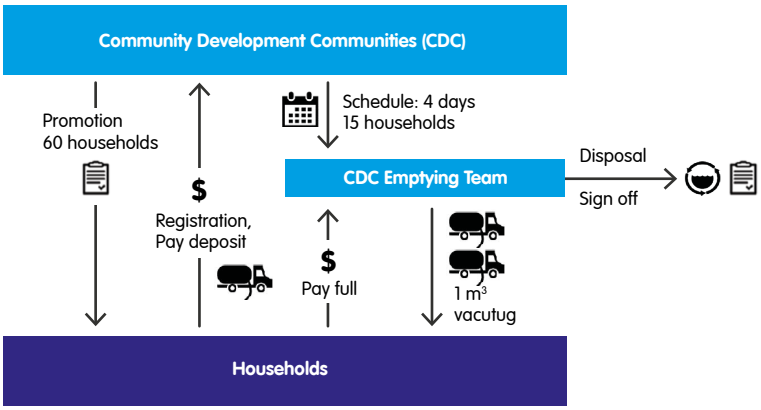


**Figure 13** Block emptying pilot in Bangladesh
*Source: SNV, 2016b.*

**Table 10** Second pilot in Bangladesh: block emptying, May 2016

| | |
|---|---|
| Aim | To further increase CDC's experience in managing emptying, test compliance mechanisms to ensure sludge is delivered to official disposal site, estimate number of customers feasibly served daily, assess willingness to pay. |
| Programme components | **Model.** Block emptying on designated day, managed by CDC with vacutugs that would discharge to new mobile septage transfer station.<br><br>**Promotion.** Door-to-door promotion in two wards to register interested participants. SNV provided promotion materials, hygiene gifts for participating households.<br><br>**Tariff.** A deposit was requested to ensure households' commitment to emptying. A higher fee (1000 BHT) was proposed to cover the operational expenses and included revenue for CDC to cover future investment, maintenance and promotion. For this pilot SNV provided promotion materials, hygiene gifts for participating households and safety equipment. |
| Participation | 11 participants from Ward 25; 4 from Ward 3<br><br>Households in Ward 3 refused to pay deposit because existing vacutug service costs 700 BHT with no deposit. |
| Outcomes | **Capacity.** The CDC needed additional training on documentation (finances, customer data records, service logs) and scheduling (customers preferred set time, not the large range). Test of compliance was inconclusive because committee ran out of tracking forms and disposal site was not staffed at night.<br><br>**Technical issues.** Mobile transfer station was not available. Vacutugs made multiple trips to disposal site which limited the daily trips to two customers per truck per day. Septic tanks volumes exceeded vacutug's 1m3 capacity, necessitating 2.4 trips per tank; households were required to pay per trip.<br><br>**Efficiency.** As well as the time to dispose to the treatment, operators also spent time talking with customers, finding and opening septic tank, and arranging hoses. Emptying did not begin until 11 a.m. and slowed in afternoon heat.<br><br>**Safety.** Protective gear was of poor quality/not suitable and not worn because of heat. |

identification of capacity gaps so that course correction and capacity building could occur before scaling up. These small pilots were conducted before all regulatory and institutional aspects, such as tariffs, had been finalised.

## 3.4 Improving service quality and sustainability

A successful emptying service ultimately depends on multiple components and activities, particularly the following:

- demand creation and customer database;
- sustainable and equitable tariffs;
- safe manual emptying and standard operating procedures;
- private sector engagement; and
- enabling regulations.

### 3.4.1 Demand creation and customer database

**Demand creation.** One essential element of a scheduled emptying programme is demand. The baseline assessments and RTA showed low rates of emptying in all programme cities and little motivation to improve containment. Behaviour change interventions and awareness campaigns are necessary to inform potential customers and create demand for the emptying services. The design of behavioural change interventions was based on research that is beyond the scope of this report, but a few lessons learned in the SNV programme cities can be summarised here.

- **Uptake requires trust in the service provider**. The pilot in Khulna found that knowledge and trust of community groups and leaders aided promotion and commitment. One successful campaign involved masons who had trained as part of SNV's broader urban sanitation programme and were also trained to promote emptying. In Khulna promotion and sign-up for the emptying programme was door to door; in Indonesia SNV helped local authorities develop an educational campaign, including radio talk shows and leaflets, on the importance of sanitation and safe emptying.
- **Demand creation is not a one-off activity.** Promotion should begin shortly before the provision of services so that messages are not forgotten and on-going demand creation is also important. A scheduled emptying programme in Dumaguete, Philippines, found that after the city stopped promoting the service, the proportion of participating households dropped significantly, from 90% to 30%. The authority then reverted to on-call services even as users continued to pre-pay monthly. Not surprisingly, on-call demand dropped further, and the scheduled emptying was re-established (ISF-UTS and SNV, 2015).

**Customer database.** A customer database is needed to efficiently plan and track orders, manage payments and record details, such as location or size of containment, for operators. Databases of sanitation customers rarely exist, however, and must be built from scratch. A customer database can build on an existing database, such as water, electricity or property tax. In Bangladesh, SNV helped local authorities in Khulna and Jhenaidah add sanitation information to existing GIS databases and maps. In Khulna the university was engaged to manually map septic tank locations for a pilot area and the information was entered into the property tax database; this approach may be expanded to the entire city.

### 3.4.2 Sustainable and equitable tariffs

The scheduled emptying approached proposed is based on a regular, monthly tariff rather than the one-off payment typical of on-demand services. Regular tariffs benefit the customer by spreading the cost over many smaller payments, and also the service provider, who receives a regular income.

**Setting the tariff.** The septage management toolkit calculates the average tariff required for cost recovery (Section 3.3.1). However, this is often much higher than a city's approved tariff, if one exists, and raising tariffs is a politically sensitive issue. Although some governments in the SNV programme cities were

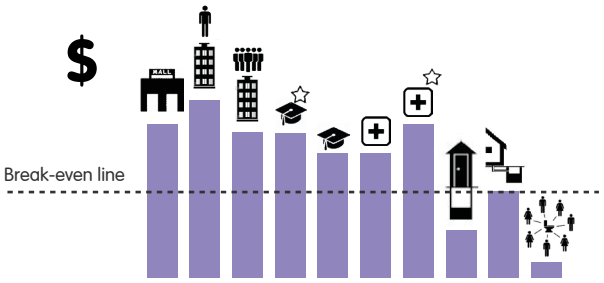


**Figure 14** Sample pricing differentiated by property and sanitation type
*Source: SNV, 2016b.*

hesitant to increase the tariff, the septage toolkit workshops helped raise awareness of the costs associated with safe faecal sludge management and the need for cost recovery. At the outset, for example, the government in Jhenaidah did not want to increase tariffs for emptying because sanitation was considered a government responsibility that should be subsidised. After the workshop, however, they saw the value of cost recovery and with the support of SNV (reviewing legal provisions, proposing alternative tax models, developing an action plan for implementation), decided to charge a city-wide tax of 5% for sanitation services. An existing fee for on-demand emptying covered only the operational expenses; the new tax is for sanitation service expansion. Khulna is also considering introducing a tax based on the positive experience in Jhenaidah.

**Equity of tariffs.** Concern about affordability, particularly for low-income households, is one reason governments are often resistant to increasing the tariff. Under differentiated pricing, however, fees vary depending on type of property (high-rise, slum, commercial) and size of containment, with the larger and more commercial customers charged a higher tariff that subsidises low-income households. Figure 14 shows an example from Bangladesh of the different levels of pricing that could be applied to commercial, institutional and residential customers. In Kushtia the existing tariff did not differentiate between property types (small slum households vs. large properties), size of containment or transport distance to treatment. In Kalianda the draft regulation for tariffs included a sliding scale based on affordability, with a focus on subsidisation to help poor households.

**Collecting tariffs.** In some cities the decision about collection and management of tariffs was complicated, and local regulations sometimes assigned those responsibilities to different entities. In Kalianda, Indonesia, for example, the authority that manages emptying is not permitted to collect tariffs, so billing and collection must be handled by another agency. SNV supported the assessment and discussions with various agencies about alternative collection arrangements, but the most likely actors were unsuitable: the water authority coverage was low and the transfer of fees if collected with electricity bills was considered complicated; door-to-door collection by community leaders has been proposed despite the labour involved.

### 3.4.3 Safe manual emptying and standard operating procedures

Both Nepal and Indonesia intend to stop manual emptying because of health and safety risks, but in dense urban areas of Bangladesh, it is likely that manual emptying will be required in areas that are inaccessible to vehicles.

Manual emptying by shovel or bucket is the main method used in Bangladesh. It is also common in Birendranagar, Nepal. In Kushtia 20% of properties were inaccessible even for the small vacutug (Table 11).

**Table 11** Emptying methods in Bangladesh and Nepal

| | Bangladesh (Kabir and Salahuddin, 2014) | | | Nepal (SNV, 2016b) |
|---|---|---|---|---|
| | Khulna | Kushtia | Jhenaidah | Birendranagar |
| Private mechanical (vacuum truck) | 1% | 1% | 0% | 49% |
| Mixed private mechanical and manual | 17% | 61% | 0% | 0% |
| Private manual (sweeper) | 81% | 34% | 98% | 28% |
| Manual emptying by household | 1% | 5% | 2% | 23% |

**Improving health and safety practices.** In Bangladesh manual emptying is typically done by private operators from the lower castes. To improve the safety of these practices and protect the health of these minority workers, SNV developed the Occupational Health and Safety Guidelines and Training (Repon, et al., 2015). The Khulna city corporation then trained more than 40 private manual pit empties. On completion of training the emptiers received a certificate that officially recognised them as safe service providers. SNV is also exploring additional safety options, including a manual pump that reduces the need to enter the pit and reduces sludge handling, use of improved handcarts to safely transport sludge, and methods to transfer the manually emptied sludge into desludging trucks.

Because mechanical emptying and treatment also present hazards, operators in Indonesia and Bangladesh were trained in health and safety standard operating procedures (SOPs) for emptying. The SOPs cover practices for safe collection (both mechanical and manual), transport, treatment and maintenance of equipment and infrastructure. The SOPs also outline roles and responsibilities for enforcement.

In Indonesia this SOP was tested with the local authority staff and uncovered various challenges in compliance and monitoring, especially with no budget or process to enforce safe emptying or disposal to treatment. Similarly, there was weak compliance with health and safety standards during the pilots in Bangladesh, even after training. Protective equipment was not used because it was too hot and the gloves

made it difficult to operate the equipment. Although the training imparted a basic understanding of the health issues associated with emptying and sludge disposal, there remains the challenge of changing long-practiced behaviours and motivating staff to take extra time and precaution. Better equipment, more training and additional compliance incentives are needed.

### 3.4.4 Private sector engagement

In many cities, the local authorities did not have the capacity or equipment to handle increased demand under a scheduled emptying programme. Manual emptiers operated in most towns but not in an organised or safe way and typically only had had mechanised desludging services in large towns but not in smaller towns. In Bangladesh sanitation provision was often considered a government responsibility and there was initial hesitation about involvement of private sector. While in Indonesia the private sector did not see the business potential in setting up a service in Kalianda. SNV helped both government and private sector see the opportunities that existed for both parties in improving desludging. Local authorities can encourage private sector participation by promoting improved on-site sanitation, educating or enforcing regular emptying and linking private operators with the market. Conversely, the private sector can push local authorities to improve FSM by demanding a safe disposal or treatment site and regulation or licensing of providers.

### 3.4.5 Enabling regulations

At the outset of the programmes, national policies or regulations for on-site sanitation services were limited, or those that existed needed to be translated into local laws and regulations. Scheduled emptying was typically a new concept, with few precedents or existing guidelines. Developing and receiving approval of new regulations progressed slowly. However, the sharing of local experiences with other cities and actors at national working groups informed new guidelines and frameworks for on-site sanitation.

In Bangladesh and Indonesia the information SNV collected in the initial assessments helped local authorities draft the ordinances and regulations required to establish their scheduled emptying programmes. New regulations were developed for on-site sanitation management, allocation of responsibilities, enforcement, tariffs and payment mechanisms. Because stakeholders involved in urban sanitation often have unclear roles and responsibilities, multiple discussions were necessary to find agreement. Early on, therefore, it is important to consider what regulations will be required and involve city leaders in major decisions to gain support and accelerate approval of new regulations.

Regulation and enforcement ensure compliance with the scheduled emptying model by all stakeholders—government or private operators and customers. A balance between encouraging greater engagement and regulating poor practices will require a staged approach as the current unregulated market moves towards improved compliance. Oversight by local authorities could include regulating tariffs, licencing or regulating operators and monitoring safe emptying and disposal (ISF-UTS and SNV, 2017).

# 4 Reflection and moving forward

Addressing urban sanitation requires a concurrent 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 required. Regular emptying of on-site containment systems is a key service delivery 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 between 2014 and 2017, yielding the following lessons:

1. Starting with a tangible objective creates an environment for broader change.
2. Experiential learning builds local capacities in new complex areas.
3. Desludging is one of many starting points

## 4.1 Starting with a tangible objective creates an environment for broader change

To move urban sanitation services towards safe management across the service chain requires a significant shift from business as usual. Often the decisions and approaches are complex and difficult for participants with no prior knowledge or experience. Therefore, rather than addressing the entire sanitation challenge at once, focussing on one tangible objective — here, scheduled emptying — provides a clear starting point to make progress.

As a focus, scheduled emptying is particularly valuable because it involves decisions on diverse aspects of urban sanitation: governance and regulations, finance and investment, behaviour change and awareness, service provision and treatment (Figure 15). In addition, emptying requires the engagement and coordination of multiple stakeholders and can be applied at various scales, from pilot neighbourhoods to city-wide.

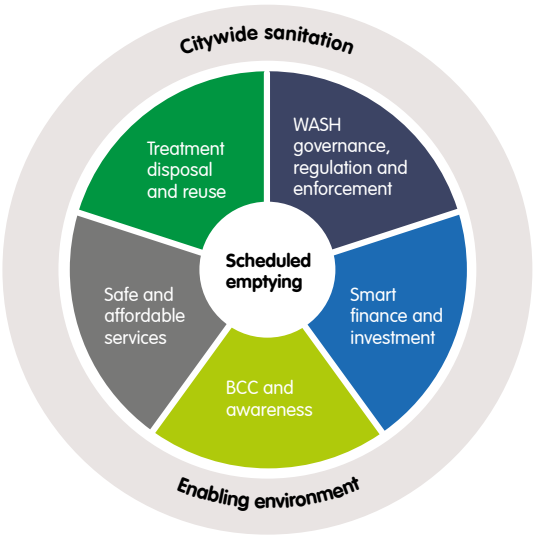


**Figure 15** Scheduled emptying to catalyse an enabling environment

How the development of scheduled emptying catalysed broader urban sanitation change is summarised below.

**WASH governance, regulations and enforcement.** A focus on scheduled emptying helped change the perspective that on-site sanitation was only a household responsibility: stakeholders saw that government had an important role in the safe management of all types of sanitation. The focus on scheduled emptying meant that roles and responsibilities were considered in relation to the specific activity and shifted decision, from continuing with status-quo, to better reflect on which actors had the required characteristics (e.g., capacity, authority, financial independence). In addition, the involvement of multiple stakeholders in decisions, analysis and testing fostered improved cooperation and coordination towards achieving a common goal. Clarifying the roles and responsibilities for scheduled emptying highlighted gaps in urban sanitation regulations. In Bangladesh uncertainty about local institutional responsibilities helped drive demand for greater national guidance and development of a national institutional and regulatory framework for FSM. Recognition of the need for safe emptying services led to a greater awareness of the value of oversight and the need to balance enforcement with encouragement of private operators.

**Smart finance and investment.** The costing toolkit was valuable for quantifying the potential revenues and sustainability of scheduled emptying. In particular, it raised local authorities' awareness and generated support from leaders for prioritising and investing in urban sanitation. Discussions about the inputs to the toolkit were often the first time the stakeholders had considered the importance of planning for the on-going costs of service provision, including repair, replacement and preventative maintenance. In addition, understanding of the importance of equitable and city-wide service provision was fostered by discussions about differentiated tariffs to reduce the burden on the poor. The experience in determining monthly fees for emptying and analysis the influences on achieving service cost-recovery, will provide a strong foundation developing sewer tariffs in the future.

**Behaviour change and awareness.** Demand creation and behavioural change in urban sanitation must consider behaviours and motivators that are different from rural contexts. While the baseline study and RTA provided some insights on the current levels of uptake of emptying services, it did not explore in detail the motivation of users to choose safe, scheduled emptying services over informal, unsafe ones. Formative research provided further insights, and the small pilots in Bangladesh was a particularly valuable method to test assumptions about user preferences and acceptance.

**Safe and affordable services.** Developing safe and affordable services is the main aim of scheduled emptying and accordingly received the most attention. That the programme cities approached emptying services differently highlights the importance of collecting local data and analysing specific needs to develop a service suitable to the context. Priorities varied: some stakeholder gave more attention to increasing private sector services, others to the safety of emptying and others to improving every step, from demand to delivery to treatment. As a result of all activities, however, local government perceptions of emptying service shifted: leaders saw that it could recover costs and be affordable to all users through regulated cross-subsidised tariffs and that private sector support may be needed to meet future demand.

**Box 5** Moving forward on developing scheduled emptying

Reflecting on the progress achieved and next steps in developing and implementing scheduled emptying services highlights areas that still need to be addressed:

**Technical challenges.** Hurdles to achieving safe services and access to all often include the following:
absence of safe and efficient emptying methods for wet sludge in very dense areas;

- lack of personal protective equipment for pit emptiers that is suitable for hot climates;
- limited options and methods to upgrade existing containments for the safe management of effluent, particularly in high groundwater areas; and
- absence of low-cost and low-tech safe disposal and treatment options, particularly for small cities with low capacity and low budgets, or as a preliminary solution prior to treatment plant construction.

**Capacity limitations.** Some cities' management, finance and planning expertise and staffing are inadequate for the complexities of scheduled emptying programmes. Ensuring adequate resources in the sanitation department requires advocacy to government leaders. Development partners should focus on addressing the skills gap or modifying proposed emptying approaches to suit the available human resources.

**Weak regulatory environment.** It is often unclear whether existing regulations apply to on-site sanitation services (i.e., do wastewater effluent standards also apply to faecal sludge?). Regulations may also be poorly monitored and enforced, with dumping of sludge in waterways. Regulation and enforcement are fundamental for a successful scheduled emptying programme but complicated by the number of actors and their interconnected actions. Innovative ways to apply smart enforcement to different components or stakeholders are needed for a safe emptying programme.

**Treatment, disposal and re-use.** Although treatment received less attention than typical when improving on-site sanitation, the development of scheduled emptying programmes shed light on various aspects of treatment. In particular, the RTA showed whether the treatment plant was over or under capacity and why—because of the frequency of emptying services, the physical location of the plant, its ownership and permitted uses or its operational status. The toolkit also calculated the treatment capacity needed for both the current level of emptying and a scenario of city-wide services. Stakeholder discussions about the toolkit helped local government leaders understand the influence of decisions on treatment size, type, modularity and phasing, and the upfront and on-going costs of each and whether these costs would be recovered.

## 4.2 Experiential learning builds local capacities in complex new areas

Critical to SNV's urban sanitation programmes is the continual participation of stakeholders and local authorities. This not only ensured that their perspectives and opinions were included but also allowed for experiential learning, in which greater capacity is built through participation in the planning, implementation, analysis and review of activities than formal teaching or explanation alone.

The process of experiential learning is based on a cycle of four stages (Box 1): (i) having a concrete experience followed by (ii) observation of and reflection on that experience, which leads to (iii) the formation of abstract concepts (analysis) and generalisations (conclusions), which are then used to (iv) test hypotheses in future situations, resulting in new experiences.

Developing a scheduled emptying service is an ongoing and interative process, often with less conventional approaches to service delivery and stakeholder engagement than current practice. It is thus an excellent opportunity for experimental learning. Many of the decisions required a cyclical approach: assessing the current

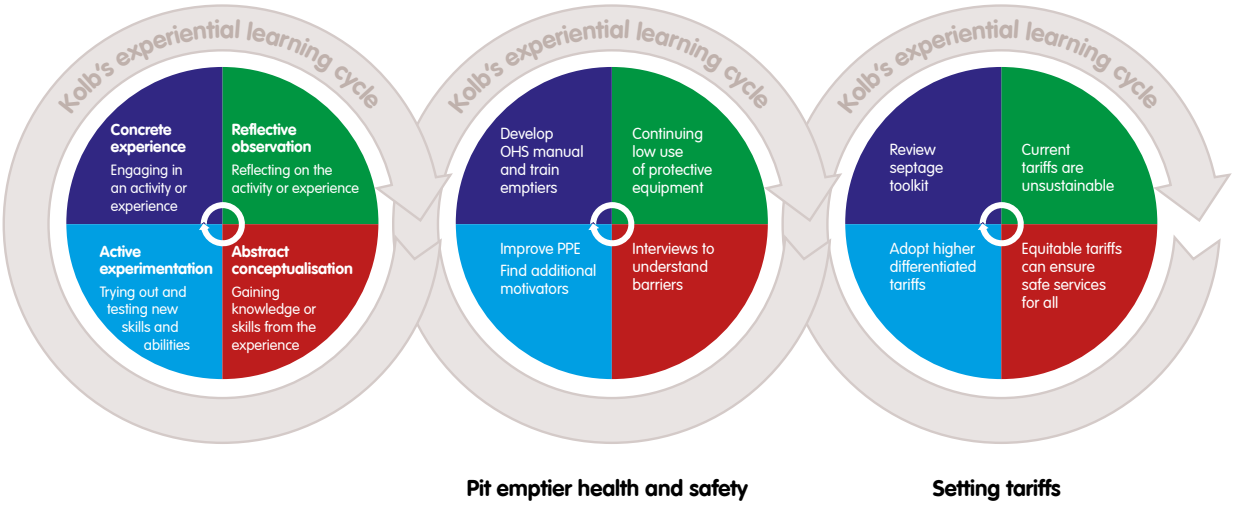


**Figure 16** Application of Kolb's experiential learning cycle to scheduled emptying
*Source: Adapted from Skills You Need, 2016.*

situation, understanding what causes or drives it, developing a new way forward and testing it in practice. Figure 16 shows two examples: the development of the Occupational Health and Safety Guidelines and Training and the tariff discussions following the participatory analysis of the toolkit.

Through this engagement, stakeholders gained greater understanding of the complexities of scheduled emptying and urban sanitaiton more broadly, plus experience in collecting and analysing evidence and testing options to inform decisions.

## 4.3 Scheduled emptying is one of many entry points

Scheduled emptying is one of several possible entry points to improve urban sanitation. Amongst its benefits are the inclusion of a wide range of stakeholders and the range of activities is develops relevant to other areas of urban sanitation. In addition, it can be applied at different scales, it does not require a significant financial investment, and many of the institutional, governance, demand creation and awareness activities are of equal importance to sanitation hardware.

The following paragraphs briefly reflect on other entry points as a catalyst for urban sanitation change.

**Containment**. If on-site sanitation systems are inaccessible or not adequately containing waste (e.g., leaking), this could limit the demand and benefit of an improved emptying service. Focussing on containment would improve services directly at the household, such as reduced contamination of groundwater wells and the immediate living environment. Development of containment would ultimately necessitate an emptying programme, after a lag of a few years, to avoid the additional hazards of failed toilets or unsafe sludge emptying. Other challenges for this entry point are (i) limited options to upgrade existing systems, particularly in areas of high groundwater or located under households, and (ii) the complexity of household-government responsibilities in improving assets on private land.

**Treatment.** A traditional entry point, treatment could be a priority if an existing emptying service is limited by the lack of safe disposal facilities, or if the current disposal practices are an immediate health or environment risk. Though likely to be infrastructure heavy, treatment as an entry point would also contribute to building institutional, regulatory and enforcement capacity but would engage fewer stakeholders, since there are no direct customers. A common challenge of this entry point is the availability of land and finance which can take considerable time to resolve and can create a bottleneck to further progress.

**Re-use.** When waste management is a priority or when good potential for co-composting exists (i.e., if waste separation is practiced), re-use can be considered an entry point. Cultural acceptance and demand for re-use products should also be in place. In communities with a traditional practice of faecal waste re-use, the practices could be scaled up and professionalised to achieve a higher level of safety and quality. Conversely, where re-use of sludge is not politically or socially acceptable, this may be a difficult entry point as approvals may not be forthcoming. Another challenge in starting with re-use is that the volume of waste inputs may be insufficient for developing a scaled and sustainable process. For example, re-use plants in Bangladesh are limited in their production because the current emptying services do not deliver enough sludge.

**Demand creation.** The assumption behind choosing this entry point is that demand for services will drive improvements in the sanitation service chain. In some cases, demand creation is used as an entry point based on successful experience in rural sanitation or when there is insufficient capacity or clarity about the development of services. In an urban context, however, the solutions for sanitation can rarely progress without service provision and regulation. If demand is created before services are in place, people may get frustrated

**City sanitation planning.** This entry point takes a broad perspective of what is needed to improve urban sanitation. Developing a long-term plan ensures that future developments fit into an overall vision and the development of the plan typically involves many stakeholders. However, the breadth of improvements means that the next step is often not clear. Tangible applications may also be limited by an assumed need for financial investment to make progress or the lack of clarity about leadership.

Other entry points include sanitation market creation (private sector emptying or toilet enterprises), data collection and mapping, and targeting improvements in low-income neighbourhoods or slums.[8] Other considerations to inform the 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).

Despite our intention to only start with one small activity, whatever entry point we choose, other aspects of the sanitation system are certain to call for attention. Importantly, the focus on an entry point should not forget that it this is to catalyse change. At some stage the scope of sanitation interventions needs to encompass the citywide service chain, and the chosen entry point should be viewed without losing perspective of the needs and priorities of the broader system.

8 Further discussions on the different entry points for change can be found in the D-Group discussion summary and the ISF-UTS 2017 Urban Sanitation Learning Event Report (internal). Available upon request.

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## USHHD LEARNING PAPERS

The USHHD (Urban Sanitation and Hygiene for Health and Development) learning paper series is an occasional SNV publication that presents the latest thinking and research on human waste management, across all types of premises. Each USHHD learning paper reflects on one or several components of SNV's USHHD interlinked components. These are: behaviour change communication and awareness; safe and affordable consumer services; WASH governance, regulations and enforcement; smart finance and investment; improved treatment, disposal and re-use; and knowledge management and learning. The series is part of SNV's mission to contribute to systems change. It facilitates the cross-fertilisation of knowledge, and imparts evidence-based and proven lessons, tools, and ideas that strengthen government, private sector and civil society capacity to launch and sustain city-wide and inclusive sanitation services.