Step 3

Make initial concept

The team can make the initial concept of the scheduled desludging scheme to be presented to the city government and other key stakeholders in the city. It is important they have a good understanding of the service scheme that will be proposed for their city. The initial concept should be developed in accordance with the basics previously agreed upon. In addition to the number of households to be served and the required infrastructure, the initial concept needs also to show financial estimates. The team can use secondary data and common sense to formulate the initial concept.

3.1 JUST AN ILLUSTRATION

The initial concept of a scheduled desludging scheme must show, at a minimum:

- the number of households to be served,
- the daily desludging frequency and septage volume,
- the required number of required desludging units and the capacity of the septage treatment plant,
- the desludging tariff and annual operating costs and revenues.

The initial concept should cover the portion of the city selected to be served in the first year of the scheduled desludging scheme (see **Step 2: Agree on the basics**).

The team may not have actual information on the number, size, condition, or accessibility of the septic tanks in the selected area, which would be needed for a detailed design of a scheduled desludging scheme of a city, but these are not necessary to put together an initial concept of the scheduled desludging scheme. The team can use the secondary information partially obtained in the previous step (see **Step 1: Identify local strengths**). This is still acceptable because now we only want to make an illustration of the future scheduled desludging scheme. Such illustration will be a helpful tool to introduce the scheme to the city government, other city leaders, and stakeholders.

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The initial concept is based only on the number of households that use septic tanks. Other types of buildings are not included in this step, that is, public offices, commercial buildings, and social buildings. This is done solely for simplification, especially in the early stages of the preparation. Later, the team will elaborate the scheduled desludging concept by including all types of buildings in the city.

3.2 ESTIMATE OPERATIONS

The initial concept of a scheduled desludging scheme, as mentioned earlier, presents the estimated number of households to be served, frequency of desludging, as well as the number of desludging trucks and capacity of septage treatment. These can be estimated from simple calculations using secondary information and common assumptions. The following are examples of calculations to estimate the operations:

(1) Obtain information on the population and households:

Parameter	*Example*
• *Population (people)*	*400,000 people*
• *Average number of people per household (people/household)*	*5 people/household*
• *Proportion of septic tank users (% number of households)*	*80% of households*

(2) Assume and agree on the values of the following operational parameter.

Parameter	*Example*
• *Tank volume of the desludging truck (m^3)*	*3.0 m^3*
• *Number of operation days (days/year)*	*250 days/year*
• *Working hours (hours/day)*	*8 hours/day*
• *Average desludging operation time (hour/household)*	*0.5 hour/household*
• *Average trip time to the septage treatment plant (hour/trip)*	*0.5 hour/trip*
• *Desludging period (year)*	*3 year*
• *Service coverage (% households using septic tanks)*	*75% of households using septic tanks will be served*
• *Average desludging volume (m^3/household)*	*1.5 m^3/household*

(3) Calculate the number of served households:

Parameter	*Example of Calculation*
• *Number of served households (households)*	*(400.000 people)/(5 people/household) × (80%) × (75%) = 48.000 households*
• *Number of served households per day (household/day)*	*(48.000 household)/(3 years)/(250 days/year) = 64 household/day*

(4) Calculate the number of operation cycle:

Parameter	Example of Calculation
• *Capacity of septage in 1 operational cycle (m^3/cycle)*	*3 m^3/cycle*
• *Number of served households in 1 operational cycle (household/cycle)*	*(3 m^3/cycle)/(1.5 m^3/household) = 2 households/cycle*
• *Number of operational cycles per day*	*(64 households/day)/(2 households/cycle) = 32 cycles/day*

(5) Calculate the number of desludging trucks required:

Parameter	Example of Calculation
• *Time required for one operational cycle (hour/cycle/truck)*	*[(2 households/cycle) × (0.5 hours/household)] + [(2 trips/cycle) × (0.5 hours/trip)] = 2 hours/cycle*
• *Number of operational cycles per desludging truck (cycle/day/truck)*	*(8 hours/day)/(2 hours/cycle/truck) = 4 cycles/truck/day*
• *Number of desludging truck required (truck)*	*(32 cycles/day)/(4 cycles/truck/day) = 8 trucks*

(6) Calculate the required capacity of septage treatment:

Parameter	Example of Calculation
• *Volume of septage that needs to be treated (m^3/day)*	*(64 households/day) × (1.5 m^3/household) = 96 m^3/day*

We can use spreadsheet software to speed up the calculation process above, such as Microsoft Excel.

3.3 CALCULATE BASIC COST

In the context of this book, basic cost means the cost to deliver a sustainable scheduled desludging service in order to set household tariffs while considering profit and loss. The basic cost is the same as the average tariff to be imposed to households provided the cost recovery principle is applied. Collectively, the total revenue from the households will fully finance scheduled desludging operations, including government subsidies.

The calculation of the basic cost of scheduled desludging operation should include all operating costs which are grouped as follows:

- **Collection cost:** The cost required to desludge septic tanks and transport the septage to the treatment plant, including fuel costs, maintenance costs, vehicle tax, honorarium, and communication costs in the calculation. The existing service provider in the area may have insights to incorporate into the collection cost.

- **Management cost:** The cost required for wages or salaries, office overhead, promotions, as well as for the depreciation of assets. The amount of the management cost is also influenced by the scale of scheduled desludging operation.
- **Treatment cost:** The fee required to pay the treatment service for each septage disposal at the treatment plant. The treatment fee is usually already set by the septage treatment service provider or by the municipality. The items in the treatment cost typically consist of energy (electricity and fuel) cost, material cost, maintenance cost and operator cost. The amount of the treatment cost is strongly influenced by the type of technology and by the treatment capacity.

The basic cost can be calculated and presented as a monthly cost using the following formula:

$$\text{Basic cost} = \frac{(\text{collection cost}) + (\text{management cost}) + (\text{treatment cost})}{(\text{number of served households}) \times (\text{desludging period}) \times (12\,\text{months})}$$

The following tables show the calculation methods that we can use to obtain the basic cost of the scheduled desludging service. Information on cost items for collection and treatment can be obtained from a service provider, septage treatment plant manager or from the tariff regulations. Information on cost items for management can be obtained from organizations that have similar public service delivery functions, for example a water supply utility or company. The cost calculation examples below use numbers from previously calculated operating estimates.

(1) Obtain values of the parameters that have been calculated previously:

Parameter	*Example*
• *Number of operation days (days/year)*	*250 days/year*
• *Desludging period (years)*	*3 years*
• *Number of served households (households)*	*48,000 households*
• *Number of served households per day (households/day)*	*64 households/day*
• *Number of served households in 1 operational cycle (households/cycle)*	*2 households/cycle*
• *Volume of septage that needs to be treated (m^3/day)*	*96 m^3/day*

(2) Calculate transportation cost:

Parameter	*Example of Calculation*
• *Desludging cost (USD per household)*[1]	*USD 10.00 per household*
• *Transportation distance of desludging truck (km/cycle)*	*40 km/cycle*
• *Fuel consumption (km/liter)*	*8 km/liter*
• *Fuel cost (USD per liter)*	*USD 0.5 per liter*

(*Continued*)

[1]It is assumed that the amount is taken from the existing desludging service provider.

Parameter	Example of Calculation
• *Number of operational cycles per day*	*(64 households/day)/(2 households/cycle) = 32 cycles/day*
• *Desludging cost item (USD per day)*	*(64 households/day) × (USD 1000 per household) = USD 640 per day*
• *Transportation cost item (USD per day)*	*(32 cycles/day) × (40 km/cycle) × (USD 0.5 per liter)/(8 km/liter) = USD 80 per day*
• *Collection cost (USD per day)*	*USD 640 per day + USD 80 per day = USD 720 per day*
• *Collection cost (USD per year)*	*(250 days/year) × (USD 720 per day) = USD 180,000 per year*

(3) Calculate management cost:

Parameter	Example of Calculation
• *Salary cost item (USD per year)*	*USD 90,000 per year*
• *Office overhead cost item (USD per year)*	*USD 120,000 per year*
• *Promotion cost item (USD per year)*	*USD 50,000 per year*
• *Depreciation cost item (USD per year)*	*USD 0 per year*
• *Management cost (USD per year)*	*USD 90,000 per year + USD 120,000 per year + USD 50,000 per year = USD 260,000 per year*

(4) Calculate treatment cost:

Parameter	Example of Calculation
• *Treatment fee (USD per m^3)*	*USD 3.00 per m^3*
• *Treatment cost (USD per day)*	*(96 m^3/hari) × (USD 3.00 per m^3) = USD 288 per day,*
• *Treatment cost (USD per year)*	*(250 days/year) × (USD 288 per day) = USD 72,000/year*

(5) Calculate basic cost of scheduled desludging:

Parameter	Example of Calculation
• *Total cost (USD per year)*	*USD 180,000 per year + USD 260,000 per year + USD 72,000 per year = USD 512,000 per year*
• *Basic cost (USD per month)*	*(USD 512,000 per year)/(48.000 households)/(12 months/year) = USD 0.9 per month*

Figure 3.1 With a good tariff, the accumulated revenue will be greater than the accumulated operating costs. The scheduled desludging scheme therefore can benefit the service provider.

By using a spreadsheet program, such as Microsoft Excel, the calculations to estimate operations can be combined with the calculations of basic cost. Different scenarios can be simulated quickly and easily with the spreadsheet program, any change in operating parameters will automatically adjust the basic cost.

3.4 STRIVE FOR PROFIT

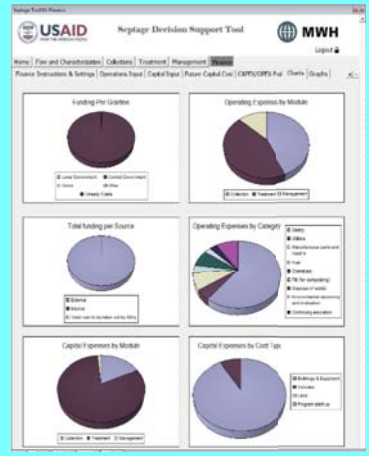
In the end, all costs must be borne by the households in accordance with the principle of cost recovery. The rate to be charged to households must be at least the same amount as the basic fee. It is even better if the tariff is set higher than the base fee. Referring to the example above, we may propose the rate of USD 1.00 per month for the tariff to households which is slightly higher than the basic cost of USD 0.9 per month. So, the proposed tariff is not just to fully recover the cost but also to make the scheduled desludging operation bring some profit to the city or service provider (Figure 3.1).

The fact that a continuous stream of revenue is expected encourages decision makers in the city to accept the introduction of a scheduled desludging scheme in their city. It is important to convince the city government and other decision makers that the scheduled desludging scheme can be financially independent or even bring profit to the city and the service provider. They should understand that the scheduled desludging scheme will not place additional burdens on the local budget.

Toolkit to simulate operation of the scheduled desludging scheme

A computer software has been created to help us simulate the operation plan of a scheduled desludging scheme and find out the implications for the financial aspects of the scheme. The official name of this software is the Septage Management Decision Support Tool (SMDST) but it is often referred to as the Septage Management Toolkit. Users can calculate the needs of the desludging fleet and septage treatment according to the projected number of served households. Different operation simulations can be performed by changing the values of the desludging technical parameters, such as septage volume, working time and distance to septage treatment plant.

This toolkit has five modules arranged in sequence: (1) flow and characteristics modules, (2) desludging modules, (3) processing modules, (4) management modules, and (5) financial modules. Based on the selected operating conditions, this toolkit will help the user to calculate the capital and operating costs of scheduled desludging. This will also help the user to calculate the basic cost and then the average tariff. The final output of the toolkit consisting of five modules is a financial plan, both in the form of a cash flow statement and an income statement. The results can be presented as pie charts.



The user is guided to use the five modules, including entering the values of the operational parameters. If the user is not sure about the operational parameters, the toolkit provides a set of default values. The user can choose the septage treatment technology most appropriate for the specific conditions of a city, be it a mechanical system, non-mechanical system, or a combination of both.

This toolkit was created by USAID by involving consultant Montgomery Watson Harza (MWH) as the developer. IUWASH is helping to improve this toolkit to make it more suitable for Indonesian cities. IUWASH is also fully involved in making the Indonesian version. This book can be downloaded from the IUWASH website.