

Small-scale Fecal Sludge Emptying (FSE) businesses

Affordable FSM services for urban poor districts

The sanitation needs of 2.7 billion people worldwide are served by on-site sanitation technologies, a number that is expected to grow to 5 billion by 2030. Fecal Sludge Management (FSM) chains are featured by many weak links., A major factor is that collection and transport trucks are not able to access narrow lanes and paths in densely populated areas. In a context of increasing demand for fecal sludge removal services, small-scale FSE businesses provide a solution to collect fecal sludge under hygienic conditions and transfer it towards disposal or treatment sites.

Challenge

In urban poor neighborhoods of low and middle income countries, the large majority of households rely on on-site sanitation, using simple pits or septic tanks to pre-treat and store excreta. In saturated environments, the management of filled pits poses extremely complex challenges from a technical as well as financial point of view.

Access-related constraints (narrow non-passable streets), the nature of fecal sludge, i.e. generally thick (total solids > 20%) and containing large amounts of solid wastes (cloth, glass, various debris, etc.), require **specific removal techniques**. In addition, the demand for this type of services occurs in a context of very limited capacity and willingness to pay.



Fig.1 Traditional removal using buckets

Small-scale emptying services

Households often organize themselves to empty their pits when these are full. Unfortunately, the solutions they use are outdated, i.e. emptying pits with buckets or letting the pit drain when flooding occurs (a frequent phenomenon in slums). These informal practices are uncontrolled and as a result the accumulation of fecal sludge in living zones poses serious risks to people's health.

Considering the needs in areas that are inaccessible to conventional services, small-scale FS emptying services offer the possibility of hygienic sludge disposal in densely populated settlements. Targeting very low-income populations, these services are based on business models and techniques that minimize investment and operating costs. To address accessibility concerns, services are often proposed per volume starting at 200 liters.

Beyond hygiene concerns, small-scale emptying also seeks to introduce professional sanitation services that are recognized by the authorities and equipped with qualified and trained staff to ensure an effective financial and logistical management.

Small-scale emptying as a business

A district with 50,000 residents holds a potential fecal sludge removal market of approximately 2,000 m³/year, which equals 8 m³ per working day. In practical terms, this volume matches the average capacity of one FSE business with two teams of three or four full-time workers each.

Excluding the treatment unit, an FSE service of this scale requires an initial investment ranging from 15 to 20,000 Euros in sludge removal materials (motor pump, tanks, barrels and carts, protections, etc.) and logistical equipment (scooter, computer, phones, etc.). The investment can be covered within 5 years when charging a rate of 20 to 30 Euros/m³ and including a 10% profit rate.

As such, in contexts where there is adequate solvent demand, alternative fecal sludge removal is a good business opportunity on the medium term. Its potential fully depends on the business model applied. In the most underprivileged areas, service costs can be minimized through recourse to public or semi-private systems involving social tariffs or the organization of "fecal sludge removal campaigns".



Fig.2 Sludge removal tricycle (750 liters)



Fig.3 Emptying a septic tank

Alternative sludge removal technologies

A wide range of technical solutions can be considered to set up a small-scale FS emptying service.



Fig.4 Using diaphragm handpump



Fig.5 FS transportation by mini tractor



Fig.6 Barrel cleaning station

To extract fecal sludge: available options include hygienic use of buckets, manual or mechanic piston or diaphragm pumps; wet vacuum cleaners and mini vacuum pumps. The selection depends on the characteristics of the sludge (dry content and solid debris content) and the local technical resources (available energy sources and maintenance capacity). The usage of pumps is generally limited to dry contents under 20%, therefore the addition of water is required for drier matters.

To transport fecal sludge: hand carrying, wheelbarrows and 1-, 2-, and 4-wheeled carts are effective solutions for narrow streets. They can carry sludge loads from 40 kg (hand carrying) to 300 kg (cart) with two or three operators. These options are most suitable in flat terrains and when distances are less than 300 meters. Tricycles and mechanic mini tractors allow for hauling volumes up to 1m³.

To dispose fecal sludge: in the case of drying systems, bar screens need to be provided to ensure proper hydraulic distribution. Where barrels are used, a high-pressure cleaning station may prove necessary to rapidly clean the equipment while saving water.

The design of a fecal sludge removal service mainly depends on the operating system desired, the configuration of areas to serve, distances from the collection to the disposal sites, and fecal sludge quality.

The solution requires designing a technological blend and logistic procedure that optimize the return on investments while minimizing the physical effort of the work. Most importantly, the solution needs to be technically and financially viable.

Creation of small-scale emptying business

Setting up FSE services needs to be considered as part of an overall sanitation planning by public authorities. In most African towns, an **assessment of the excreta management subsector** remains a key precondition.

To create sustainable services, it is essential to establish clear governance principles related to funding arrangements, intervention perimeters, sludge disposal arrangements and hygiene standards that fecal sludge removal workers and citizens can comply with. **Capacity building of public and private actors** in the field is crucial at this point.

Considering that alternative fecal sludge removal is an innovation in most countries, experience shows that an **action research phase** of a few months is needed to develop effective partnerships, logistics and marketing. Technical and financial support needs to be assured to support the ramp up phase.

Practica supports public and private sanitation actors at each step in the establishment of alternative fecal sludge removal services.

Our team of experts currently trains and supports alternative sludge removal professionals in Benin, Mali, and Madagascar.



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