Landscape study on the current faecal sludge management practices and the development of commercial viable pit emptying businesses in small towns in West Bengal.

By Samrat Gupta and Steven Sugden, Water for People-India

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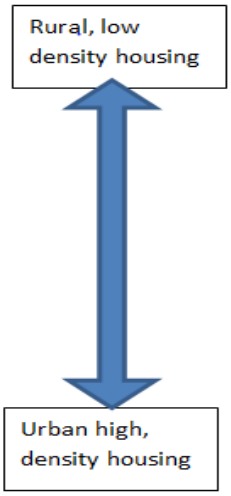
1 Introduction

Some form of pit emptying is readily available and affordable to all households in West Bengal and these can be broadly divided into the five following methods,



- **Self-emptiers**: performed by the males of the household who tend to remove only the thin sludge using a bucket tied to the end of a rope
- **Small time service provider:** In some areas household hire a local person to empty pits who remove the sludge with small centrifugal irrigation pumps. These pumps only have the capacity to remove thin watery sludge and providing such a service is not a full time occupation, but rather an occasional side line activity.
- **Manual scavengers / daily laborers** – Roam around areas where they may find customer and empty using a bucket and rope.
- **Municipal Corporation**: Some municipal councils own and manage vacuum tankers which provide pit emptying services for the residents of the municipality.
- **Private sector tanker operators**: Found in the larger cities, such as Kolkata, Durgapur etc.

As a general rule, the lower the housing density and the more rural an area, the greater the likelihood of using self-emptying techniques, whilst wealthier and higher density (high rise) areas are more likely to use private tanker operators. One of the main problems with all the approaches is the indiscriminate dumping of waste, together with high associated public health, operator and environmental health hazards.

The opportunities for commercially viable pit emptying services that do not indiscriminately dump on the nearest piece of wasteland are limited and the only real example of such businesses serve the wealthier high rise areas within main cities. Further investigation by Water for People within West Bengal found that the high water table within the state led to a sprawled development pattern that in turn had an impact on household FSM practices. The net result is a hard business environment with limited options for commercial viability, however the research recommended,

> *"…that the sludge transport and treatment process are most likely to be commercially viable in higher density areas which have started to develop in ribbon sprawl manner. This type of development seems*

to be occurring within Block Headquarters and market towns and therefore one of these is the most likely candidates for the second test bed area. A rapid landscaping survey needs to be will be undertaken to find the most suitable location"

This paper reports on the findings of the suggested landscaping study and identifies potential openings for improving current pit emptying services.

2 Going for gold, one step at a time; the incremental approach to FSM improvements

Previous FSM research in West Bengal have all highlighted one large common defect; the indiscriminate dumping of pit waste on open ground, in fields or in open ditches. The vacuum tanker operators are the only category which transport waste off site, but this is usually only as far as the closest convenient 'fast flowing' river. There is a lack of treatment plants or controlled dumping site outside the larger cities which makes the safe disposal of waste impossible. Even where a treatment plant is present within a municipality, it is usually difficult and expensive to access because of the high levels of traffic congestion and the narrow streets. Householders tend to have a relaxed attitude and a high tolerance over the indiscriminate disposal of pit waste, and there seems to be no public outcry or formation of lobby groups dedicated to improving standards. At most the dumping of waste only causes local annoyance and neighbor disputes.

It is recognized that the best approach to FSM involves the safe collection, transport, treatment and return to the environment of all faecal waste, but in West Bengal this will take time to achieve and not possible within a 3 year project timeframe. The process can be accelerated by well targeted technical innovations, but currently the long distances and lack of treatment plants would ensure any traditional tanker based business model would quickly fail if there was an insistence that waste could only be dump in treatment plants. In London the waste treatment plant lagged behind the laying of the main sewers by around 30 years, so the situation in West Bengal is not unusual. FSM will only achieve the desired higher standards by taking incremental steps over a longer period of time. In order to ensure any proposed approach is heading in the right direction and will result in *an* improvement to existing practices, the following classification has been developed,

Levels of Hazard breakdown		Type of hazard		
	FSM practice	Occupation	Environmental	Public Health
Level 1	Manual emptying and indiscriminately dumping at or near the pit latrine	X	X	X
Level 2	Mechanical emptying and indiscriminately dumping at or near the pit latrine	½	X	X
Level 3	Mechanical emptying, transporting the waste outside neighborhood, and indiscriminately dumping in flowing stream	OK	X	X

Level 4	Transporting the waste out of neighborhood and dumping at controlled open field site	OK	½	½
Level 5	Transporting the waste and dumping at properly designed and managed treatment plant.	OK	OK	OK

3 Methodology

The research process took place in between July and November 2015 and was broken into three parts

1) Exploratory scene setting research to gain background information on how pits are currently emptied, how waste is transported and dispose, and customer attitudes.
2) Semi structured interviews to gain a better understand of the manual scavenging processes, together with their attitudes and constraints.
3) Quantitative survey and semi structure interviews in three higher density rural towns to assess possibilities of improving faecal sludge management practices through introducing commercial viable pit emptying services

4 Finding of initial scene setting research into existing pit emptying practice and service providers

Households in West Bengal always have access to some form of (very) low cost, affordable, informal private sector, emptying service through which they can manage their household latrine needs; all be it, very unhygienically. The aggregation of these multiple and ubiquitous waste disposal actions creates a huge, almost insurmountable, risk to public health in West Bengal. A brief analysis of the five methods of pit emptying highlights the following in relation to commercial opportunities

- **Self-emptiers,** the process is considered unpleasant, but not particularly highly skilled or arduous. There may be a market for a low cost device which helps this process and to this end, Water for People is exploring the possibilities of a 'Pit life extender'. As one household reported,

  "Me and my son, get the work done. Why would I pay a contractor to do the job?"

- **Small time service provider:** Pit emptying does not represent a full time occupation or even a main income stream for these service providers. Pit emptying uses the same equipment and is a form of diversification from their make profession of providing irrigation services. They are relatively small in number within the communities and unlikely to invest in specifically designed pit emptying equipment to expand this side of their work.

- **Manual scavengers / daily laborers.** This group empties a significant proportion of pits outside the low density, agriculture based, rural household segment. Within most block towns or where households have started to aggregate into denser housing patterns, manual scavenging will be the main provider of pit emptying services. Their working practices are further outlined in section 5.

- **Municipal Corporation.** Many households in West Bengal consider pit emptying to be the responsibility of the council and many provide and manage subsidized pit emptying services. Their mode of working are further outlined in section 6.

- **Private sector tanker operators.** These are present within large cities whose customers live in high density, high rise apartment areas. Typical customers produce large quantities of waste water, but their septic tanks no longer have the capacity to drain their effluent into a ditch, drainage channel or sewer. Similar urban households adjoining open fields or within close proximity to an open ditch do not have the same problem with the accumulation of effluent within the curtilage of their households and therefore do not use the private tanker service. As one responded stated,

  "*Here people aren't used to an environment where cleanliness is expected. Rich urban elites are living in boxes next to dumping grounds; at least here you have free space."*

4.1 Pit demand and customers attitudes

Pit emptying generally occurs only when it is absolutely necessary as opposed to being part of a planned maintenance process. An emergency usually manifests itself either by an overflowing tank / pit or when the toilet will no longer flush.

Pit emptying work is largely seasonal with the peak being just after the end of the rainy season. The high clay content of the soils of West Bengal make drainage out of the pit slow in the rainy season and once the soil has become saturated; the pits act more like sealed tanks than leach pits. If a pit overflows during the rainy season, the householders will generally wait for the rains to end before emptying as they do not want to have to repeat the process when the pit fills up again with flood water.

Households reported no immediate problems with the way their pits were emptied and seemed oblivious, or at best accepting, of the risks associated with the indiscriminate dumping of pit waste and the obnoxious smell this creates. One interviewee reported,

"It's not only us who do it. Everybody around does the same thing. Please understand we are not doing it every day"

Another strategy used by households is building large volume pit in the belief that they will never need emptying. As one interviewee reported,

"Sir, why to bother so much. Our pit is 30 feet deep. I have made it and my son's son would never need to empty it"

5 Findings of research into the manual scavenging profession

Manual scavenging, although made illegal in 2013, is still thriving and widely used throughout West Bengal. They gain emptying work by making early morning visits to areas where they know there is a demand for their services and search for customers.

> *"Every week those guys come and wander the streets in the early morning. You can hire them for any kind of labor including to empty your pits. I don't have anybody's contact number but surely they would come. I am seeing this for over 20 years "*

Pit emptying forms part of their daily cycle of trying to earn a living, but it is not their only source of income and they will perform any form of unskilled labor.

> "*Throughout the year except may be just after the rainy season , the [pit empting] work is erratic, and hence I also do all kind of labor work like collecting garbage , working as a porter at the market to supplement my earnings*"

Once they find a customer they undertake the work immediately and empty using a rope and bucket. They usually dump the waste on any nearby unoccupied ground, unless there is some local neighborhood sensitivity around dumping, or a high risk of neighbor dispute, or impossible due to lack of land. In such circumstances they carry the waste a short distance to a more convenient and less controversial dumping location. They charge extra for such haulage.

The manual scavengers charge by depth of waste removed with a typical charge being Rs. 100 ($1.5) to Rs 200 ($3) per foot. As pits are usually between six feet and three feet deep, the cost of pit emptying typically range from Rs 600 ($9) to Rs1000 ($15). One key factor that determines the speed and price of the emptying process is the effort required to haul the larger containers to the dumping ground, as maneuvering heavy containers of waste on a hand cart through narrow pathways over uneven ground can be hard work. Emptying a pit close to a vacant place, road or a river, enables quicker and easier disposal of the waste, so the price will be lower. Agreeing the price involves a lot of hard bargaining.

Manual scavengers have what is essentially a perfect business model. They have low capital start-up costs, low transportation needs, easy to maintain equipment, no sludge transport costs, no advertising or promotional costs and everybody knows how to find them. Their main competitor is the households which self-empty as oppose do any form of tanker based service. They are deeply established and ingrained within society and although they are technically illegal, they are ignored by the authorities.

Pits can be as much as thirty feet deep and require a team of manual scavengers. The teams comprise of two to four people and they prefer to work at night, especially in neighborhoods with a discriminating attitude towards their work, but not because of any government law enforcement activities. They work by torchlight or big lamps and the shape and size of the pit / tanks and the density of sludge means that they cannot be emptied with the operators remaining on the surface and many times they have to stand inside the pit to fill the bucket with a fellow team member hauling the bucket to the surface. They generally do

not own or wear any protective clothing such as gloves, boots or face-masks, but sometimes they place plastic bags over their hands as a substitute for gloves or shovels. The emptying process begins by pouring kerosene oil into the pit in a bid to override the smell of the excreta. They also drink liquor in a bid to dull their senses to the stench. They first remove the thin watery sludge using a bucket on a rope which they report as accounting of 60% to 90% of the total contents in a typical tank / pit. On occasions they report that the sludge is "too thin" and their solution is to keep the pit exposed to the air for two to three days and sprinkle bleaching powder on to the surface. This dries the sludge and it becomes easier to collect. The buckets are emptied into large plastic drums mounted on a handcart which is then wheeled to the dumping site. They report that this is typically 50m or 100m from the latrine. The remaining 10% to 40% of thicker sludge is fluidized by adding water and stirring, after which it is removed with a bucket and dumped in a similar fashion. The emptiers report that sludge at the bottom of a pit / tank can hardened and be as 'tough as concrete', and can only be removed with a shovel

The manual emptiers are paid in cash after the work has been completed and it is divided among the team, after the expenses have been deducted. The expenses usually total around 25% of the income and include fees for hiring shovels, Kerosene, drums, buckets, hand-cart and may include a small fee (bribe) for dumping into the drain or for the owner of the land.

Some spillage is inevitable as none of the containers are closed, and this in combination with the unavoidable smell, can result in completing and obstruction by nearby residents. This is the main reason for carrying out emptying activities at night.

The manual emptiers reported that they inherited their pit emptying techniques from their fathers or through 'on-the-job' training and generally follow their own instincts whilst cleaning. A few NGOs have apparently given them safety training and protective equipment / clothes, but they still retain their traditional methods as they have found these to be easier to use and more efficient.

All the manual emptiers interviewed expressed a disliked for the job because of the low social status associated with the work. They all desired to come out of scavenging. Manual pit emptying does not carry any social respect and some reported that they were hated by the higher social groups,

> *"If scavenging is not looked down upon and is considered a mainstream work like regular labor jobs then I have no problem in continuing this work as I make double the money for being just little filthy"*

They reported that they did not have any social interaction with the higher castes and most would like to change profession, even if it meant receiving less income. Their main aspiration was to start a trading business or training for trades such as masonry or carpentry, but they also stated they would need some form of assistance to achieve this. Their preferred jobs would not be considered by most to be aspirational and included garbage collection, peon, sweeper, or any possible job for their [limited] qualifications.

Although the pit emptiers knew of the health risks involved with their work, they did not express this as a major problem and instead thought the more pressing issues were householders delaying payment, the lack of tools and equipment and the physical hard nature of the work.

The manual emptiers are trapped. Pit empting pays better than regular unskilled worked, but it lacks any form of respect. They would prefer to leave pit emptying, but cannot afford to do so. They also thought they were trapped in a generational inability to escape poverty. They wanted to have other jobs for their children, but due to unemployment and their monetary needs, they have to tell their children to accept manual scavenging in the same way that they had to.

6 Research in to municipal council pit emptying service provision

Previous research into pit emptying business opportunities in West Bengal - see report *Rural FSM development in West Bengal Steven Sugden, Water for People, for PSI. June 2015,* concluded that

> *"Sites where septic tanks discharge into ditches, empty into fields and empty into vacant building plots are common and can be easily found, even in what appears to be the more wealthy and newer developed areas of the city. In rural areas with a more disbursed population and harder to catch emptying events, the possibilities of any form of effective enforcement in the near future is remote".*
>
> *'The prohibition of employment as manual scavengers and their rehabilitation act, 2013' made it illegal to employ Manual Scavengers, i.e. a person who directly handles fresh faces as part of their employment. This appears never to be enforced in West Bengal and the practice is openly carried out in most areas.*
>
> *"…that the sludge transport and treatment process are most likely to be commercially viable in higher density areas which have started to develop in ribbon sprawl manner. This is type of development seems to be occurring within Block Headquarters and market towns and therefore one of these is the most likely candidates for the second test bed area. A rapid survey will be undertaken to find the most suitable location"*

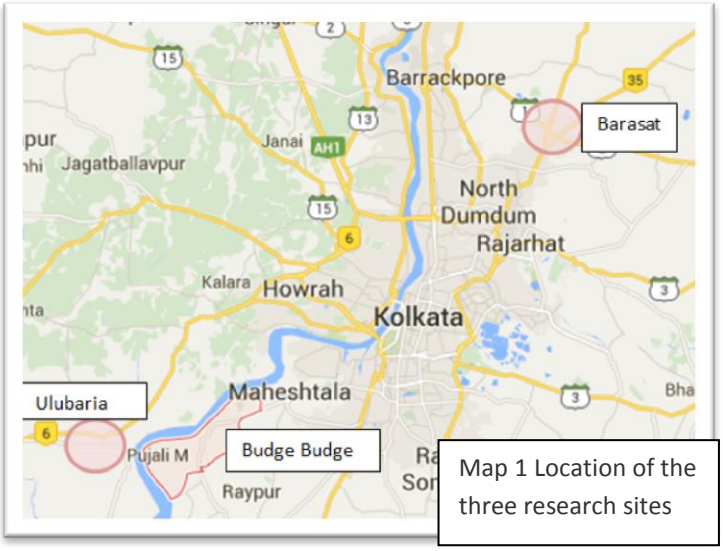
This study will search for emptying business opportunities in higher density areas than rural areas. Urban areas are defined by the government of India in accordance the Census of India 2011 as,

> *(a) All statutory places with a municipality, corporation, cantonment board or notified town area committee, etc.*
> *(b) A place satisfying the following three criteria simultaneously:*
> *i) A minimum population of 5,000*
> *ii) At least 75 per cent of male working population engaged in non-agricultural pursuits*
> *iii) A density of population of at least 400 per sq. km. (1,000 per sq. mile)*

Three areas were selected near Kolkata in which to undertake the research,

1. Barasat - population of 278,435
2. Ulubaria – population of 222,240
3. Budge Budge - population of 99,874

Their approximate locations in relation to the main city of Kolkata can be seen in Map1



Map 1 Location of the three research sites

6.1 Research Methodology

The practices and approaches used by the municipal councils were researched using semi- structured interviews with key informants such as government municipal officers, tanker owners, manual scavengers, households, etc. . The household survey was performed by taking a public bus along the main road, getting off at every stop, and surveying 5 households on alternate sides of the road at every location. The survey was undertaken by Samrat Gupta, Water for People between July and November 2015.

6.2 Research findings into the provision of pit emptying services through municipal councils

This aspect of the research proved to be difficult as there is no set method for Municipal Councils providing emptying services and the way that they are provided is often far from transparent. As the lead researcher found “Every place has a new story.” The lack of transparency is partly due to the rent seeking behavior of government employees who are ingenious, inventive and persistent in finding new ways to extract money from any system in order to supplement their salaries. India is making great efforts to reduce corruption, but the practice has become so ingrained within the government culture that it will take many years for it to be removed and for the population to regain its trust in their government staff. As an indication of government salary levels, the average annual salary for a primary school teacher is Rs195,491 ($2900) per year whilst a systems engineer in IT earns an average annual salary of Rs542,317 ($8,217) (source: payscaledata.com). Corruption practices can also be disguised by euphemisms such as ‘administration fee’ or ‘transaction cost’, making it difficult for an outsider to differentiate between a genuine official government charge and a bribe. The costs reported in this section must therefore not be regarded as the ‘facts’, but what can be best described as a fuzzy interpretation of the facts.

Ulubaria and Budge Budge 1 municipal councils do not own any vacuum tankers, but instead have entered into a form of tanker leasing arrangement with a local entrepreneur. This avoids one-off large capital costs, spreads payments evenly over the financial year, and removes municipal responsibility over major maintenance bills. Budge Budge 2 have not entered such an agreement, but the tanker of Budge Budge 1 is

used to also serve households in this area. In Barasat, the municipal corporation has purchased and operates its own tankers.

The management of human resource with regard to FSM in the municipal council is informal and varied. Some uses its own pay rolled staff to operate the tanker and provide emptying services whereas others hires labours on contractual basis. In West Bengal there is a strong union culture within the municipalities which leads to pit emptying operatives receiving a controlled monthly salary for the work they undertake, regardless of the workload. The private sector operators tend to pay on a 'per trip' output basis. The tanker owner not employing their own drivers or operators has the advantage that they avoid any complications with unions and having to manage service provision.

When a household wants their tank emptying using the municipal service they followed the following process,

1. Visit municipal offices to book an emptying visit. The council has a set tariff rate based on location of the house, the type of pit / tank to be emptied, and the distance to the official dumping site. The charges range from Rs100 ($1.5) to Rs 1,000 ($15), with a reported average of around Rs 700 ($10.60)
2. If the household needs are urgent and they request a quick service, it is possible to unofficially pay the clerk an additional amount to gain priority. This could range from Rs 200 ($3) to Rs 400 ($6)
3. The tanker arrives at the house and the operator assesses the difficulty and extent of the work. They then negotiate an additional fee with the householder to allow for the extra work involved. For example, the price will increase if the house is a long way from the tanker access point or if the tank is large and filled with thick sludge. It may cost the household an additional Rs 1,000 ($15)
4. At the end of the work the householder is "expected to tip generously", say Rs 200

The total cost to the householder could be between Rs 2,000 ($13.20) and Rs 2,300 ($15.18) to empty a 4 m^3 septic tank. Emptying a similar tank using a directly contracted private operator would cost around Rs 3,500. The difference can be accounted for the private sectors need to make a profit and the municipal council indirectly subsidizing the purchase, operation and maintenance of the vehicle.

Ulubaria, Barasat and Budge Budge 1 all reported that their tanker was busy, but not working every day. This would seem to indicate that supply was currently meeting demand. Private tanker based empting services were not found in any of the research municipal council areas.

It was reported that occasionally the tanker could not gain access to a septic tank and on these occasions the operator employed manual scavengers to empty the tank using ropes and buckets. In such cases they usually dumped close to the house and do not utilize the tanker for transport.

The municipal council in Barasat manages a special disposal grounds around 10 Km from the office where the waste is supposed to be dumped. The sludge is dumped in the pits and covered with ash or soil. A municipality official Barasat stated that

> "*The human excreta collected are transferred by tanker to trenching grounds for composting with solid waste*"

In practice the operators reported they dumped the waste into roadside ditches, streams, nearby vacant farmland or water bodies, if the distance to the official designated dumping site was too far. The key criterion for choosing where was 'safe' to dump was based on the local housing density with unpopulated areas being deemed as suitable. The operators in Barasat also reported that they had in the past disposed of waste in the Kolkata sewer network system.

6.3 Results of the household survey

This section presents the key results of the house survey in Ulubaria, Barasat and Budge Budge.

6.3.1 Types of tank or pit used for latrine waste disposal

The study found all the households had a toilet and used one of three types of disposal system, the single pit, double pit or septic tank, in the proportion outlined in table 1 below,

Table 1

Figures in %	Barasat	as a %age	Ulubaria	as a %age	Budge budge	as a %age	Total	as a %age
Base (n)	50	100%	50	100%	50	100%	150	100%
Single pit	41	82%	39	78%	34	68%	114	76%
Double pit	3	6%	7	14%	11	22%	21	14%
Septic tank	6	12%	4	8%	5	10%	15	10%

Pit latrines are the most commonly used form of waste disposal with 90% of respondents possessing such type of disposal system and little variation across the target towns.

6.3.2 Who empties according to latrine type

Table 2

135 of the 150 (90%) respondents used **pit latrines**		
How emptied?	Pit latrine owner	As a % age
Emptied by manual scavengers	40	30%
Emptied by government agency	5	4%
Emptied by private company	0	0%
Self-emptied by householder	26	19%
Not emptied in last 5 years	64	47%
Total	135	100%

15 of the 150 (10%) respondents used **septic tanks**		
How emptied?	Septic tank owners	As a % age
Emptied by manual scavengers	2	13%
Emptied by government agency	8	53%
Emptied by private company	3	20%
Self-emptied by householder	0	0%
Not emptied in last 5 years	2	13%
Total	15	100%

Combined all respondents method of emptying		
How emptied?	Septic tank owners	As a % age
Emptied by manual scavengers	42	28%
Emptied by government agency	13	9%
Emptied by private company	3	2%
Self-emptied by householder	26	17%
Not emptied in last 5 years	66	44%
Total	150	100%

From these results, manual empting (both through manual scavenging and self-emptying) accounts for 106 of the 111 (95%) pits that have been emptied in the last five years. Emptying by some form of vacuum tanker accounts for 11 of the 13 (85%) septic tanks that have been emptied in the last five years.

The three interviewees who responded that they had their septic tanks emptied by a private company are something of an anomaly as there are no such private companies operating in the area. One explanation is that the respondents would have had their tank emptied by a vacuum tanker, but were confused about its ownership. A more likely explanation is that they paid the driver of the government leased tanker to work privately without going through the municipality hiring or accounts system. This is a common way globally for tanker drivers to make additional money. These jobs were the highest valued work recorded in the survey so probably involved emptying large septic tanks with multiple tanker trips.

Another interesting finding was that pit latrines seem to have a lower emptying frequency than septic tanks. 64 (47%) of the 135 pit latrine owners reported not having their pit emptied in the last 5 years, compared to 2 (13%) of the 15 septic tanks owners. The possible explanations are that either the latrines had deep pits in which case a fill up rate of above 5 years would not be out of the ordinary, or that the respondents used the service of manual emptiers and did not want to declare this technically illegal action to the enumerator.

6.3.3 Amount paid for emptying pits to different service providers

The self-reported figure for the mean, highest and lowest amounts paid for the emptying service are given in table 3,

Table 3

Amount paid for emptying services (Rupees)				
	Number of times used	Highest reported	Lowest reported	Mean
Manual scavenger	42	1300	500	742
Government agency	13	1600	650	1,135
Private operator	3	3500	2400	2,867

The mean for manual emptying is reported to be around 65% of the mean for engaging the government subsidized tanker emptying service, although care has to be taken over such a comparison as the volume of waste removed by the tanker will generally be greater. The survey data does not allows for unit volume comparisons.

6.3.4 Number of respondents engaged in agriculture.

Many think that there are advantages of disposing of fecal sludge by using it as a soil improver. West Bengal, where the attitudes to faecal sludge are 'relaxed', is a good setting in which to explore whether this could be made into a commercially viable part of the FSM value chain or at least, whether it could generate income to off-set the high cost associated with transporting waste. Indian communities are entrepreneurial in seeking out added value in every aspect of their lives. The current practices in the three selected sites should provide a good indicator as to the potential of using sludge as a fertilizer, and this is most likely to occur if they are actively involved in agriculture. The survey contained two questions to establish this information and the results are recorded in table 4 below,

Table 4

Number of respondents engaged in agriculture								
Figures in %	Barasat	as a %age	Ulubaria	as a %age	Budge budge	as a %age	Total	as a %age
Base (n)	50	100%	50	100%	50	100%	150	100%
Engaged in agriculture	38	76%	31	62%	27	54%	96	64%
Using waste as manure	6	16%	4	11%	3	8%	13	9%

96 of the 150 respondents (64%) were involved in agricultural activities with only 13 households the 150 (9%) using the waste as a soil improver, or 13% of the self-reported agricultural based households. This low proportion would seem to indicate there was currently no market for sludge as a soil improver.

The proportion involved in agriculture also gives an insight into the types of area within the study. The aim was to survey urban municipal areas which may be poorly served by tankers, but the actual results showed that technically, in accordance with the government definition, all of the areas surveyed were rural and not one had "at least 75 per cent of male working population engaged in non-agricultural pursuits". This probably gives the three areas the vague classification of 'peri-urban'.

6.3.5 Awareness of sludge disposal methods

The findings over the respondents awareness of how sludge is currently disposed is given in table 5,

Table 5

n = 150, 50 for each area	Barasat		Ulubaria		Budge budge		Total	
	Number	As a %age	Number	As a %age	Number	As a %age	Number	As a %age
Taken to sewage disposal unit	16	32%	11	22%	17	34%	44	29%
Dumped in the nearby pit/ground	12	24%	21	42%	15	30%	48	32%
Dumped into a nearby pond	6	12%	5	10%	8	16%	19	13%
Sold as fertilizers	1	2%	0	0	1	2%	2	1%
Famers use it in their fields	5	10%	4	8%	3	6%	12	8%
Do not know	10	20%	9	18%	6	12%	25	17%

44% were aware their waste was dumped in a pond, pit or nearby ground. No follow up questions were asked as to what represented a satisfactory method of disposal.

6.3.5 Best service provider for FSM and willingness to pay

The respondents were asked, "Who would be the best service provider for FSM? ". The results are given in table 6,

Table 6

n = 150, 50 for each area	Barasat		Ulubaria		Budge budge		Total	
	Number	As a %age	Number	As a %age	Number	As a %age	Number	As a %age
Government	27	54	30	60	32	64	89	59%
NGO	4	8	8	16	4	8	16	11%
Private company	13	26	9	18	9	18	31	21%
Community driven initiatives	3	6	2	4	3	6	8	5%
Don't know	3	6	1	2	2	4	6	4%

The government is currently regarded the main provider of emptying services with 59% of respondents indicating that they would be the best service provider.

Willingness to pay exercises are notoriously inaccurate as respondents are rarely totally honest about the amount they will pay. The respondents were asked what they would be willing to pay for a service which removed the waste from site and the finding are presented in table 7 below

Table 7

Row Labels	Sum of Less than 500	Sum of 500 to 1000	Sum of >1000 to 2000	Sum of >2000
Barasat	**6**	**36**	**8**	**0**
Double pit	0	2	1	0
Septic tank	0	0	6	0
Single pit	6	34	1	0
Ulubaria	**12**	**32**	**6**	**0**
Double pit	0	6	1	0
Septic tank	0	0	4	0
Single pit	12	26	1	0
Budge budge	**11**	**31**	**8**	**0**
Double pit	1	9	1	0
Septic tank	0	0	5	0
Single pit	10	22	2	0
Grand Total	**29**	**99**	**22**	**0**

Row Labels	Sum of Less than 500	Sum of 500 to 1000	Sum of >1000 to 2000	Sum of >2000
Double pit	1	17	3	0
Septic tank	0	0	15	0
Single pit	28	82	4	0
Grand Total	**29**	**99**	**22**	**0**

The willingness to pay results show that septic tank owners, who already use the tanker emptying services are willing to pay between Rs1000 and Rs2000, which is in line with their current emptying experiences. 7 out of 36 (19%) of pit latrine owners, also stated they were willing to pay between Rs1000 and Rs2000, which is above the Rs742 mean they are currently paying for manual emptying. No responded indicated that they would be willing to pay more than Rs2,000 per trip.

6.4 Discussion of results and municipal council pit emptying service delivery.

Although well intentioned, the way the municipalities subsidize and manage their pit emptying services distorts the market by forming a barrier to private sector entry and keeping prices for using a vacuum tanker artificially low. The subsidy is mainly in the form of paying the basic salaries for operators and

drivers, although these are supplemented by 'tips' given by the household. The net result is the householder with a septic tank pays Rs 2,000 ($13.20) and Rs 2,300 ($15.18) to empty a 4 m^3 septic tank, whereas the free market cost using a directly contracted private operator would be around Rs3,500 ($55.68).

The household has higher transaction costs in obtaining municipal emptying services as it requires a visits to the council offices and filling in a form, whereas a private sector provider can be contracted using a mobile phone. The significant lower charges counteract the extra effort required.

Private sector involvement currently takes the form of equipment leasing through an empanelment process and has advantages for both the leasee and leasor. This may be the foundation on which to build a new approach.

The three research areas were initially considered to be 'urban' as they all formed part of a larger conurbation, all had municipal councils and populations well in excess of 5,000, but the fact that an average of 64% of the households engage in some form of agriculture would seem to preclude them from this category and they are therefore 'rural'. A better category is possibly the vague term of 'peri-urban'. The rurality of the areas is reflected in the type of household toilet facility and waste disposal methods, with 90% of the respondent using some form of pit latrine, 95% of which are emptied by manual scavenger and an with emptying frequency in excess of once every 5 years. Just 10% of the respondents used septic tanks, 73% of which were emptied by vacuum tankers.

The willingness to pay results are in line with existing charges where the mean rate for manual emptying was found to be Rs742 and Rs1,135 for a vacuum tanker based emptying service. The willingness to pay findings reflect a lower than expected rate for vacuum tanker emptying, probably due to the fact that households are used to receiving subsidized rates. At these rates, it is unrealistic to think that improving FSM in such peri-urban areas can be achieved by simply introducing more efficient private sector operated services; competing against a subsidized system is just too larger gap for efficiency savings to fill. In addition, 59% of the respondents thought the government was the best FSM service provider, probably with the expectation that such services are usually free or heavily subsidized. The solution, if there is one, would seem to be to build on and expand the existing accepted municipal approach as opposed to setting up a new one in competition. This will involve working with municipal government bodies and moving away from a pure market based approach.

According to census data, Budge Budge contains 18,055 household, around 60% of which own a toilet, giving a total of 10,833 toilets in the municipality. According to the survey, 10% of these households own septic tanks, giving a total of 1,083 tanks and if their emptying frequency is once every 5 years, would give a need for 217 emptying trips per year. This roughly agrees with the reported usage of the municipal tankers. The figures also equate to 90% use of pit latrines, or 9,750 households with some form of pit latrine in Budge Budge. If these require emptying every 8 years, this means 1,219 pits are been emptied per year by the manual scavengers with the waste being dumped in nearby ponds or ditches. Out of a total an estimated of 1,435 empting processes the subsidized tankers are only being used for 15% of the time.

The irony of the whole municipal approach is that the government subsidy is been captured by septic tank owners who are generally the wealthier members of the community whilst the poorer pit latrine using households are paying the full economic rate for a lower quality manual pit emptying process. In addition the manual emptying process comes with increased public health and environmental risks, the very risks that the government should be subsidizing to eliminate.

The reason usually given for using public subsidy is to protect public health from the private actions of individuals. However, the health impact of the current approach to applying the emptying subsidy must be negligible as the vast majority (85%) of the highly pathogenic pit sludge generated in Budge Budge does not benefit from the subsidy and is not prevented from entering the environment close to households.

The FSM challenge which Water for People, and similar organizations, have to tackle is not how to compete for the 15% of the emptying market currently served by the Municipal tankers, but how to compete and improve on the 85% emptying market served by the manual emptiers. The fact that manual scavenging is illegal does not seem to have affected the ubiquitous nature or the ease of accessing such a service. If the balance is going to change, any new approach will have to complete on the one thing that Indian households really seem to care about, the price.

With the aim of developing an alternative to the manual scavengers, it is first worthwhile looking at the economics of a standard Indian tanker business.

6.4.1 The economics of tanker business

The purchase of a tanker is relatively cheaper in India than in Africa and are given in table 8,

Table 8

Tanker and equipment purchase costs			
Capital costs		RoE $	64
	Vehicle purchase	700,000	$ 10,938
	Sludge tank, air pump, hoses, mounting, etc	300,000	$ 4,688
	Insurance, road tax, etc	50,000	$ 781
	Total capital costs	1,050,000	$ 16,406
Loan repayments			
	Bank loan interest rate	12.5%	
	Loan period in months (reducing balance)	60	
	Total monthly repayment	23,623	$ 369

Operational costs per trip (assuming 5.5 km round trip to dumping site) (rupees)		
Fuel cost @ INR 10/km	110	$ 1.72
Repair and maintenance @ INR 2/km	22	$ 0.34
Equipment maintenance	10	$ 0.16
Disposal charges INR 50/per trip	50	$ 0.78
Operator costs	250	$ 3.91
Total operational costs per trip	442	$ 6.91

Based on the a tanker charging an average of Rs 1,400 per trip and make 35 trips per month, the financials for the running of a tanker business is outlined in table 9 below,

Table 9

Monthly profit and loss			
	Number of trips per month	35	
Expenditure			
	Monthly Loan repayment	23,623	$ 369.11
	Total operational costs per trip	15,470	$ 241.72
	Total monthly expenditure	39,093	$ 610.83
Income			
	Charge per trip	1400	$ 21.88
	Total monthly income	49,000	$ 765.63
Income against expenditure		9,907	$ 154.80

In reality, the tanker owners are informal businessmen and do not take bank loans for their businesses or consider the depreciation of their assets within any part of their costings. They simply look at how much money they can make by buying a tanker. If the loan repayments are taken out of the above calculation, the monthly income per tanker in the same scenario increases to Rs33,550 ($524)

6.5 Proposed viable tanker based business model to complete with the manual emptiers

The above analysis indicates that the majority of emptying charges relate to the purchase of the tanker and payment of interest. The first step is therefore to reduce the capital costs and Water for People-India has recently imported prototype micro-vacuum based emptying equipment from South Africa. It reduces capital costs by using a small vacuum pump which sucks out waste into a small pressure vessel before it enters the main bulk tank under gravity. This simple modification uses less power without sacrificing suction capacity and enables the use of light weight plastic bulk tanks, which in turn allows for the use of smaller lower cost tractors. The first micro-tanker is currently been built in Kolkata with an estimated selling cost, including pulling unit, of Rs500,000 ($7,813).

Tanker and equipment purchase costs			
Capital costs		RoE $	64
	Vehicle purchase	250,000	$ 3,906
	Sludge tank, air pump, hoses, mounting, etc.	200,000	$ 3,125
	Insurance, road tax, etc.	50,000	$ 781
	Total capital costs	500,000	$ 7,813

The plan is for this unit to be purchased by an existing empaneled contractor and leased to a municipality at a 20% margin to the contractor over a 60 month period. This will cost the municipality Rs 13,243 ($207) a month.

Income for tanker owner			
	Profit margin	20.0%	
	Lease period in months	60	
	Total monthly repayments	13,243	$ 207

The municipality will subsidize the micro-tanker in a similar fashion to existing larger tankers. The exact costs are not known, but estimated to be as follows,

Operational costs per trip (assuming 5.5 km round trip to dumping site)			
	Fuel cost @ INR 10/km	90	$ 1.41
	Repair and maintenance @ INR 2/km	22	$ 0.34
	Equipment maintenance	10	$ 0.16
	Disposal charges INR 50/per trip	subsidy	
	Operator and driver costs	subsidy	
	Total operational costs per trip	122	$ 1.91

In the survey the average charge for a manual emptier was found to be Rs 742, and to compete, the most any new service could charge would be Rs 800. Using this figure and the above costs, the breakeven point for the municipality service, using the existing system for subsidizing the process, is calculated to be 20 pits. With municipality support in promoting the service, this is an achievable target.

Monthly breakeven point for Municipality			
	Number of trips per month	20	US$
Expenditure			
	Monthly lease fee	Rs 13,243	$ 207
	Total operational costs per trip	Rs 2,440	$ 38
	Total monthly expenditure	Rs 15,683	$ 245

Income			
	Charge per trip	Rs 800	$ 12.50
	Total monthly income	Rs 16,000	$ 250
Income against expenditure		Rs 317	$ 4.95

In Budge Budge, with 90% of households using latrines, the size of the pit emptying market is around 1,219 pits per year. If they worked at the same efficiency as their tankers and emptied around 217 pits a year, six micro-tankers would be needed to serve the whole of the Budge Budge market.

In accordance with the assessment framework work laid out in section 2, this improvement would take a high risk level one activity and turn it into a level three activity. This is a significant improvement.

Once a micro-tanker system has been established it will be possible to track their activities and search for some form of neighborhood dewatering / treatment process based around micro-filtration membranes currently being developed by the WASH Institute in Tamil Nada. This would result in a level 5 risk level which could be easily replicated and scaled across other Indian towns.