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# Landscape Analysis and Business Model Assessment in Fecal Sludge Extraction and Transportation Models in India

**Final Report**

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# Executive Summary

## Study context

Rapid urbanization in India in the past three decades manifested itself in many quality of life challenges, including sub-optimal sanitation services. By 2011, about 30 million urban residents are likely to be without access to toilets. Although centralized underground piped sewerage systems are preferred by most cities in India, the coverage is so limited that over 95% of the towns have to depend mainly on onsite sanitation. Considering public investment constraints and the huge demand supply gap, it is unlikely that sewerage system will cover the entire population even in big cities and consequently on-site sanitation requires greater policy attention and funding support. This study on landscape analysis and business model assessment in fecal sludge extraction and transportation models in India covered a sample of 1200 households in three cities viz. Delhi, Jaipur and Madurai. These cities were selected based on an assessment of current household connectivity to sewerage systems at the state level. Discussions were held with officials vested with the responsibility of sanitation services and detailed business assessment of sampled emptying service providers were also carried out.

## Septic tanks

Septic tanks are made using independently or in combination with plastic, concrete, bricks, stones and mud. A wide range of septic tank sizes are used in individual houses. Community toilets are rare to find and mostly dysfunctional. With open defecation increasingly being looked down upon, coupled with constraints of open space, households are compelled to have minimal sanitation facilities within their premises. A large number of single chamber tanks in the urban poor settlements in Delhi are deliberately designed with the mouths open to drain out excess water, on each use. Septic tanks in Jaipur are distinctly different in size, shape and structure. In addition to the commonly used single chamber septic tanks, the other widely used septic tank equivalents consist of pits, outlined with cylindrical concrete frames with holes around them to allow percolation. Households in Madurai prefer double chambered septic tanks, if affordable and the sizes are much larger compared to Jaipur and Delhi. Sizes vary depending on space availability and affordability. The quality of emptying service is also superior in Madurai.

## Emptying business model

The emptying business is completely in the hands of private service providers. The emptying vehicle used is a tractor or a mini truck with a tank attached. Manual emptying in Jaipur and Madurai is conspicuously absent. In Delhi it is practiced to a limited extent, but with active support from the central government sponsored schemes, manual emptiers are being rehabilitated by providing them alternate vocation opportunities. The implication of this is that manual emptying will have completely phased out in the next three to five years.

Emptying frequencies vary across cities. Emptying is done only when the tank is overloaded or chocked. The wide spread of private emptiers in the informal sector, is the reflection of the inability of public service providers to meet existing demand. Public owned emptying facilities have a very limited reach; they cover mainly public facilities. There are no fecal sludge treatment plants in the three cities surveyed. However, some micro level experiments on pilot basis do exist. Viewed purely from the business perspective, all the existing emptiers are in profits, although profit margins are relatively lower in Jaipur and Madurai in comparison with Delhi. The market is a competitive one, where all the players have a level playing field.

Emptying services is not the business of 'first choice' of entrepreneurs. Their motivation to be in the business arises out of the need to discard the traditional drudgery of scavenging and move up the value chain. The mechanical nature of the extraction business also lends some social respectability. Inward migration of other business owners to this extraction business is rarely observed. However, the reverse is more frequent. Government support is completely absent, because of the informal nature of the business. License to run the business is not a pre-requisite, except for holding a driving license for the vehicle being driven. No formal or informal relationships exist with municipal authorities and other government agencies. Promoting investments in septage treatment infrastructure is urgently needed. There are no officially designated dumping sites. One option is promoting public private partnerships for which land can be provided by the respective municipal bodies and investments coming from private entrepreneurs.

**FS Production and Emptying**

In all the three cities, gap exists between fecal sludge production and the volume actually emptied. By volume, this gap is 10% in Jaipur, 21% in Delhi and 54% in Madurai. This gap is an indication of the larger market size that lies hidden to be tapped. People are also willing to pay higher than the current market rate for emptying service, subject to improvement in the quality of service.

## Regulation

Separate regulation for septage in the surveyed cities does not exist. The current laws deal with diverse water, wastewater and sanitation services. By constitution, establishing local regulations to govern sanitation is the responsibility of local governments. In the absence of policy or norms on fecal discharge or management, local governments have no direct control on fecal sludge. Frequency of septic tank emptying in individual houses is left to the discretion of house owners and disposal is in the hands of emptiers, with no guidance or enforcement. Septage management is not covered in a holistic manner except prohibition of its discharge into water bodies. Even this prohibition works only in theory.

State pollution control boards have a role in enforcing environmental regulations; they can make significant contributions in educating all stakeholders including emptiers. Educating general public on scientific design and construction of septic tanks and the need to regularly emptying them supported by enactment and enforcement of regulations will further strengthen the market potential.

## Business Potential

The current gap between fecal sludge production and collection indicates that emptying business holds investment potential in all the three cities, but it is confined to the city peripheries. The core areas of all the three cities are covered (or planned to be covered in the near future) by centralized piped sewerage system, with some pockets left uncovered for reasons of technical infeasibility. However, such pockets in the three cities are small in numbers and spatially spread out that they do not justify specific areas-wise investments. Such areas can be covered by emptiers reaching out from the city peripheries or nearby areas. Profitability of the existing business owners is also reasonably good, with Delhi falling in the higher band, Jaipur in the middle and Madurai in the lower band.

## Access to finance

Operators rely on a blended model of self financing, bank financing and the informal borrowing. The financial analysis of emptying business in all the three cities indicates that it is a viable business in areas where it is needed most. However, bank loans are difficult to come by and the loans cover only part of the equipment. Tractors are generally financed under agriculture category. This creates entry barriers to those who do own land. Public sector financial institutions need to remove these entry barriers and facilitate easier funding mechanisms. Because public sector bank finance is difficult to come by, most business owners raise loans through private sources, where the interest rates are much higher and repayment conditions are rigid.

## Key Recommendations

Emptying service is pressed into service only when hydrological overloading takes place and tanks start overflowing. Waste water from these systems is drained out to the open drains daily. To make any noticeable improvement in sanitation, this needs to be improved before initiating any improvements in emptying services. Septic tank technology is outdated. Any fecal sludge emptying improvement, in the absence of investments in sanitation technology, including fecal sludge treatment will not result in significant improvement.

The number of septic tank owners in the core parts is shrinking but increasing in the peripheries and demand for emptying services in these areas has shown an increasing trend. These peripheral areas need immediate attention on fecal sludge management. Emptying business today stands on its own. Price is normally decided by the overall market phenomenon and negotiated between the service provider and the service receiver. Spatial spread of emptiers is almost even in the three cities.

Alternate financing models need to be promoted to support the business. Provisions made under the septage management sub-plan component of the National Urban Sanitation Policy can be leveraged for this purpose. Convergence of funds available under the National Safai Karmacharis Finance & Development Corporation can benefit a large number of emptying business owners.

In the absence of strong regulatory environment, it is not possible to separate septage from solid waste. The waste management services in all the three cities are dismal, despite the procedure for collection, transportation, treatment and disposal of solid waste being laid down well in the law. The key challenge is to achieve a balance between promoting emptying business and regulating the treatment and disposal of septage. Municipal corporations, therefore, need to provide designated places and facilities for septage dumping and promote fecal sludge treatment methods.

Awareness regarding scientific aspects of septic tank design and the need for regular emptying and upkeep of the tanks is poor across stakeholder categories. The national building codes are not entirely adhered to even by the public sector. Efforts are needed to update the codes to respond to the changing needs and educating all stakeholder groups. This will help in improving the quality of emptying business significantly.

# 1 Country FSM background

The 2011 Census of the Government of India puts the provisional estimate of India's population at 1210 million. The level of urbanization increased from 17.3 percent in 1951 to 35 percent in 2011. The household toilet coverage in urban areas grew from 61% in 2001 (Census of India) to 75% in 2008 (JMP 2010 estimate based on NFHS-3, 2005-06). NSS Survey 65$^{th}$ Round, Government of India, 2009 indicates that 77% households have septic tank/flush latrines, 8% pit latrines, 1.6% service latrines, 1% other latrines, and 11% without any latrines. About 58% households have latrines for own exclusive use (individual), 24% households use shared, and 6.5% use community/public latrines (balance 11% without any access). Thus, about 30 million urban residents (base population Census 2001) are without access to toilets. Accounting for population growth, about 40 million urban residents are likely to be without access to toilets in 2011.

Typically, settlements in urban India are grouped under seven categories, allowing for some state-specific variations i) Approved colonies ii) Urban villages iii) Unauthorized colonies iv) Resettlement colonies v) Notified slums (JJ clusters) vi) Non-notified slums and vii) Industrial areas. While both notified slums and non-notified slum face sanitation neglect, it is the non-notified slums which face the extreme neglect.

Sanitation system in urban India is of four major types viz. i) urban-specific centralized sewerage systems ii) stand alone septic tank systems (private or public) iii) water seal compost latrines and iv) simple pits. Those who are not covered by any of the above systems are compelled to choose open defecation.

Although centralized underground piped sewerage systems are preferred by most cities in India, their coverage is so limited that over 95% (4929 out of 5161) of the towns depend on septic tanks or other types of toilet services for sanitation (including open defecation).

**Table 1-1: Towns with underground sewerage connection**

| Number of towns | Towns with underground sewerage connection | Towns without underground sewerage connection |
|---|---|---|
| 5161 (100%) | 232 (4.5%) | 4929 (95.5%) |

Source: National Institute of Urban Affairs, 2010

A 2009 study of 498 Class I and 410 Class II towns conducted by Central pollution Control Board (CPCB), reported that while sewage generated was more than 38,000 MLD (million litres per day), treatment capacities were only about 12,000 MLD (31% of generation). The million-plus cities (35 in number) have 68% of the total installed wastewater treatment capacity (11,787 MLD) but nearly 39% of the treatment plants did not conform to discharge standards into water bodies. Most of the cities have only primary treatment facilities. Thus, the untreated and partially treated municipal waste water finds its way into water sources such as rivers, lakes and ground water, causing water pollution. More than 37% of the total human excreta generated in urban India, is unsafely disposed off (CPCB, 2009).

Septic tanks are most common sanitation option in urban poor settlements of tier one cities (with a population of more than a million), tier two and tier three towns in India. By constitution, local governments are mandated with the responsibility of providing sanitation services, including safe handling and disposal of septage. Establishing local regulations to govern septage handling is also their responsibility.

Septic systems are the most neglected sanitation aspect in the country. They are maintained by individual owners. Awareness about operation and maintenance of septic tanks is sub-optimal. Emptying is not carried out at regular frequencies, a task completed only out of compulsion, when the system starts overflowing. Septage is then let out in the environment either in low lying areas, vacant plots or water bodies. Manual emptying is prevalent in many cities in India, although a decreasing trend has been noticed in tier 1 and tier 2 cities. However, in tier 3 and other smaller towns of many states, the practice continues. Despite the enactment of 'Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act 1993 Manual Scavenging, it is estimated that about 1.3 million people are employed in the practice in the country. The sizes and designs of septic tank vary from one place to another. Type and size of septic tanks are largely influenced by i) space availability ii) cost iii) local construction standards and iv) skill levels of masons.

Vacuum tankers of various sizes are also deployed to carry out emptying. If a vacuum tanker is not available, or unaffordable the sludge is cleared manually using buckets or gulpers. As most septic tanks are rarely emptied, they tend to be too full to perform the intended treatment, and instead serve as holding tanks. When tanks are emptied, septage, from septic tanks, is indiscriminately disposed into water bodies, drains, landfills, and vacant lands due to the lack of septage treatment plants and inadequate enforcement. This septage contains constituents that may result in serious environment degradation, risk to public health and/or unpleasant odours. (POLICY PAPER ON Septage Management in India, MAY 2011)

Normally emptying frequencies vary. In majority of cases emptying is done when the tank is full or chocked. The sludge is generally transported through trucks or tractors. The emptying trucks or tractors play the role of a "mobile sewer network" for onsite sanitation systems. Septage is transported in tanks attached to tractors or tanks mounted on trucks in large towns and in smaller towns it is not uncommon to see septage being transported on carts, rickshaws etc.

Septic tanks in Indian cities are made using independently or in combination with plastic, concrete, bricks, stones and mud. The size of a septic tank in individual houses ranges from 3 to 8 m3, the size of a septic tank in office or apartment buildings are much larger and vary widely in size depending on the users. Depending on the size of the family and affordability, single pit septic tanks and double septic tanks are most commonly used.

The World Bank estimates that of the 350 million people living in cities in 2007, 30% flush their waste into a septic tank and 40% to a sewerage system. In some states close to 80% of toilets are connected to septic tanks. Private household investments in septic tanks and pit latrines in urban areas are a major contributor to increased sanitation coverage in urban areas. The World Bank (World Bank, 2006) estimates that the number of people using septic tanks will reach about 148 million by 2017.

Septage management receives very little attention and funding. Separate regulation for septage management in India does not exist. Guidelines on sepatge treatment and enforcement laws are completely absent. However, the provisions for regulating sewage management exist under environmental laws. All the current laws deal with diverse water, wastewater and sanitation services. Septage management is not covered in a holistic manner except prohibition of its discharge into water bodies. By default, septage management gets covered under Municipal Wastes (Handling and Management) Rules 2000. Private emptiers do not need a profession-specific license to operate

Fecal Sludge management is the biggest challenge due to inadequate sewage network and lack of STPs, especially in unrecognized urban poor settlements. In the low-income settlements

septic tanks are emptied by private service providers and discharged without any control. Since there is no policy or norms on FS discharge/management, municipality has no control on FS sludge. Under the existing provisions of Sanitation bye-laws a municipality can only penalize households if they create unhygienic conditions in the community.

Considering the above facts, it is unlikely that sewerage system will cover the entire population even in big cities and consequently on-site sanitation requires greater policy attention and funding support. A combination of all of the above factors underlines the importance and relevance of septage management in Indian cities.

# 2 Methodology

## 2.1 Literature review

The key features of the three cities surveyed are presented below.

**Delhi**

Delhi is a situated in the northern part and it is the capital of the Union of India. It is located between the latitudes of 28°-24'-17" and 28°-53'-00" North and longitudes of 76°-50'-24" and 77°-20'-37" East. The territory of Delhi is stretched over an area of 1483 square kilometres. Delhi shares borders with Uttar Pradesh in the east and Haryana on other three directions. The city has an area of 1,483 sq. Km, with a maximum length of 51.90 km and greatest width of 48.48 km. The river Yamuna runs through the eastern part of the Delhi. The topography of Delhi can be divided into three different parts i.e. the plains, the Yamuna flood plain, and the ridge. Delhi recorded 47.02% of decennial growth rate during 1991-2001. New Delhi city is organized under three municipal structures i) New Delhi Municipal Corporation (NDMC), ii) Delhi Cantonment (DCB) and iii) Municipal Corporation of Delhi (MCD). This study covers the settlements in the MCD area as the Cantonment exclusively serves defense establishments and NDMC provides municipal services in the institutional and residential areas belonging to the Union Government of India. MCD covers about 97% of the geographical area in Delhi and it supports close to 96% of the population, majority being migrants from across India. All areas under MCD, except for non-notified (unrecognized) areas are served with piped sewerage facilities. Yamuna is the major receptacle of treated, partly treated and untreated sewage. In the past decade or so, many urban poor settlements have mushroomed in the Yamuna flood plain area and the sanitation infrastructure inadequacy has become pronounced. This is one of the reasons for selecting this area for carrying out household surveys.

**Jaipur**

Jaipur is located on 26° 55' north latitude and 75° 49' east longitude. The city is surrounded by Aravali hill ranges. The southern end of the city is open to plain and stretches far and wide towards Sanganer and beyond. The walled city was originally located on the rocky street to provide an easy drainage system on either side of the city but expansion of the city took place on the south and west and beyond.

The general slope of the Jaipur city is from north to south and then to south-east. Nearly all the ephemeral streams flow in this direction. Higher elevations in the north exist in the form of low, flat-topped hills of Nahargarh (587 meters). Further in the south, topographical levels of the plain areas varies between 280 meters in the south to some 530 meters in the north east.

Jaipur is located in the semi-Arid Zone of India. It has characterized by high temperature, low rainfall and mild winter. The mean temperature of Jaipur is 36°C varying from 18°C in winter to 40°C in summer. The normal rainfall of Jaipur is 600 mm; nearly 90 percent of which takes place from June to September, the rest comes from the winter cyclones.The natural drainage of the city shows intense gully erosion particularly in the northern hilly region. Dhund river and Amanishah drain a form a fork like drainage pattern in the confluence zone of which the major part of Jaipur city is situated. The Amanishah drain, which originates from the western slopes of Jaigarh hills, flows northwards in the upper reaches, turns south and south-west in its middle course and flows towards east with a broad semi-circle. Another small drainage system in the

north foothills discharges the city's waste effluents into an artificially impounded lake called the Jal Mahal (Man Sagar).

**Madurai**

Madurai is the oldest inhabited city in the Indian peninsula. It is a temple city in the South Indian state ofTamil Nadu situated on the banks of river Vaigai, which flows across the city. Due to pilgrimage the city witnesses floating population throughout the year. Madurai city has an area of 52 km², with an average elevation of 101 meters above mean sea level. The coordinates of the city are 9.93°N and 78.12°E. The weather of Madurai is warm and precipitations mostly take place during the months of October to December. The maximum temperature during the summer months rises close to 40°C and minimum settles around 26°C. The mean yearly precipitation is approximately 85 cm. The density of population is 17,925/km2. The drainage system in Madurai Corporation area is inadequate and does not effectively drain the flood water during heavy rains. This results in stagnation of rain water in many low lying areas of the city and creates sanitation related problems. An integrated drainage system covering all the areas in the 72 wards of the Madurai Corporation is currently underway.

Documentation of FSM practices specific to India is very limited and data on FSM is difficult to come by. Only normative data used by the Draft Policy Paper on Septage Management in India developed by Centre for Science and Environment is available. A large inventory of data on general sanitation coverage and status on sanitation are accessible both on the internet and on paper. However, the data provide by various government sources conflict with each other, significant mismatches exist between the data provided by government sources and actual study data provided by NGOs and academicians. For example, data cited by the Ministry of Urban Development on sanitation accessibility vary considerably from the figures quoted by individual states. Similarly, census data do not tally with data mentioned in City Development Plans. A large number of sanitation related documents, publications and papers (e.g. City Development Plans, National Urban Sanitation Policy Document, Draft Policy Paper on Septage Management in India) indicating sanitation coverage and accessibility were studied prior to the finalization of cities to be surveyed. City-specific data on toilets and sanitation coverage are not available. However, the available data on state-wise coverage of sewerage facility was used as the basic criteria for the selection of cities (refer rationale for selection below).

**Rationale for selection of cities/towns**

In many cities and towns in India, centralized piped sewerage system and individual septic tanks co-exist. The reach of the sewerage system within a given city determines the existence of septic tanks. As the data shows in the following table, Gujarat as a state, ranks at the top with the highest percentage (69%) of households having accessibility to sewerage facility and Rajasthan, the neighbouring state, ranks lowest with only 7%. The national average stands at 27%.

**Table 2-1: Accessibility to sewerage facility in different state**

| *State* | *% of households having access to Sewerage Facility* | *Relative Ranking in descending order* | *Position* |
|---|---|---|---|
| Delhi | 75% | 1 | Top ranking states |
| Gujarat | 69% | 2 | |
| Maharashtra | 58% | 3 | |
| Punjab | 49% | 4 | |
| Uttaranchal | 41% | 5 | |
| Uttar Pradesh | 41% | 6 | |
| Karnataka | 36% | 7 | Medium ranking states |
| Tamil Nadu | 32% | 8 | |
| West Bengal | 18% | 9 | |
| Andhra Pradesh | 17% | 10 | |
| Madhya Pradesh | 10% | 11 | Poor ranking states |
| Chattisgarh | 10% | 12 | |
| Orissa | 8% | 13 | |
| Rajasthan | 7% | 14 | |
| National Average | 27% | - | - |

Source: WB Report on Water and Sanitation in India, 2002

Based on the above state-wise distribution, one large city from the top ranking states was selected for the study. Delhi happens to be a 100% urbanized state and therefore became a natural choice. Being the national capital, as per the ToR, it was also pre-selected. One tier-two town from the medium ranking states (Madurai in Tamil Nadu) and one town from poor ranking states (Jaipur in Rajasthan) was chosen. Thus three cities in three geographical regions of the country were picked for the study. Relevant data from Census, National Sample Survey and from city specific studies (e.g. CSP of Hoshangabad by WSP, City Development Plans, and JNNURM reports) were also compiled and analyzed to map the overall situation.

## Situational Analysis methodology

### Household Survey Design

The household survey areas in all the three cities were finalized after consultations with officials of the respective municipal corporations and select NGOs working in the city. This was followed by reconnaissance visits to the areas where on-site sanitation systems are predominantly in use. In all the three cities (Delhi, Jaipur and Madurai), core areas of the city are covered by the piped sewerage network. City level secondary data indicates that the sewerage network coverage rangesfrom75% in Delhi to 80% in Jaipur. In Madurai it is estimated to be about 84%. (Source: Census 2001 for Delhi, and CDP, 2006 for Jaipur and Madurai) It was observed that in all the three cities the areas dominated by onsite sanitation are defined by certain typical characteristics, such as serviceable and non-serviceable households and spatial isolation of non-serviceable areas. The serviceable and non-serviceable households are determined by technical feasibility of providing sewerage connection. They may i) be newly developed inhabitations ii) be located in low lying areas or iii) be settlements in the peripheral limits of the city.

Purposive Sampling was the chosen methodology to select specific areas for the survey. Areas serviced by sewerage network (or to be covered under the expansion plans) were excluded from the study and only areas having non-serviceable households or unrecognized colonies

were selected. These geographically separated areas were selected on the basis of data inputs received from municipal officials and as assessed during the reconnaissance visits.

At the subsequent level, random sampling method was used for the selection of sample households within each cluster of settlements. Following the preliminary identification of clusters, rough road maps were drawn and lanes and bye lanes were marked. Houses in the selected areas in Delhi and Jaipur do not bear any property numbers or any formal identification marks. Therefore, informal methods such as discussion with local leaders, observations by the survey takers were used for mapping the area. Since all houses in these low income colonies (except in Madurai) are built on almost uniform plot size of about 25 sq yd (20 sq mtr), no distinction was made based on plot size for selection of sample households. A sample of size of 300 households was covered in the peri-urban areas of Jaipur and Madurai. In Delhi a larger sample of 600 households were covered.

In the selected lanes, houses were further chosen randomly while walking in the lanes/roads. A set of criteria were used for selection of sample households viz. i) no more than two households are selected from each lane ii) no two houses facing each other were selected iii) houses located in the extreme parts of the lane were excluded. In the event of the selected respondent was reluctant or unable to respond, the sampled household was replaced by the adjacent household.

In Jaipur and Madurai the septic tank areas within the corporation limits and mostly on periphery were divided into four quadrants, namely north, south, east and west. The number of samples to be surveyed per zone was broadly arrived at based on the size of the population. Identification of households with in the selected areas was done randomly. This approach was necessary to spread the sample size of 300 HH as much uniformly as possible.

The surveys in all the three cities were carried out between June 9, 2011 to July 15, 2011 by a team of three local survey takers per city and a field supervisor. The survey takers were given one day training on the concept of FSM and the contents of the survey instruments. Manual observation of septic tanks, their size, capacity and status of on-site sanitation systems were conducted by the respective supervisors. The number of households per survey taker per day was capped at eight.Daily quality checks were run by the field supervisors by randomly visiting about 10% of the surveyed households. All unclear entries were cross checked and validated through repeat visits and doubtful or incomplete questionnaires were discarded and replaced. Interviews of officials, interview of service providers and income investigations of service providers were carried out by the supervisors and the expert team members. Focus Group Discussions were carried out in the communities to validate survey findings. Data entries were centralized for Delhi and Jaipur in Jaipur. For Madurai, it was done locally for logistics reasons. Excel worksheets were used for data entry. The socio-economic expert of the team provided supervisory role for data entry and analysis.

**Figure 2-1: Surveyed districts and localities in Delhi**

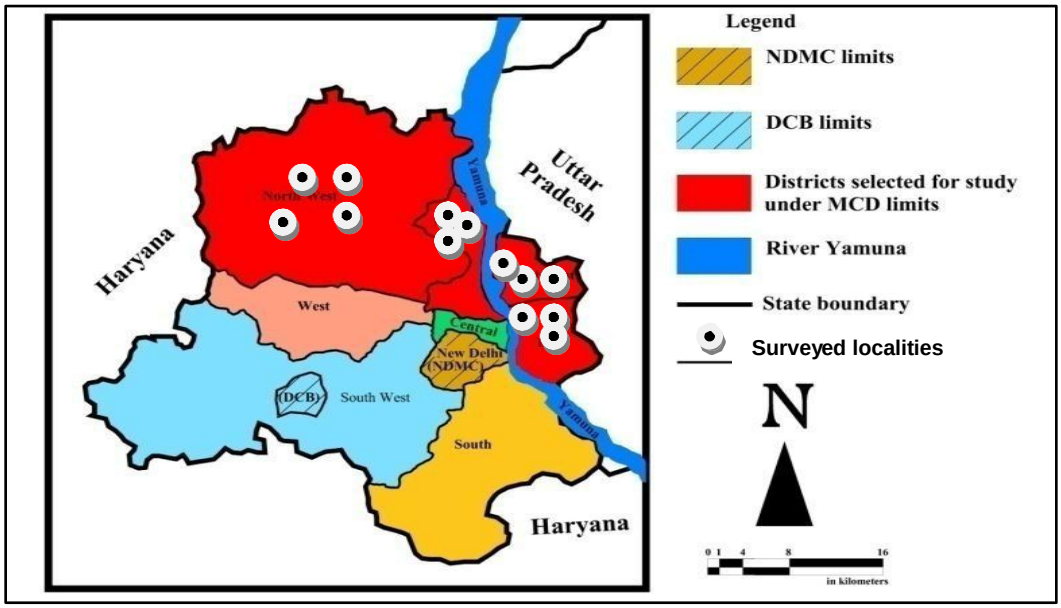



**Figure 2-2: Surveyed areas in Madurai**

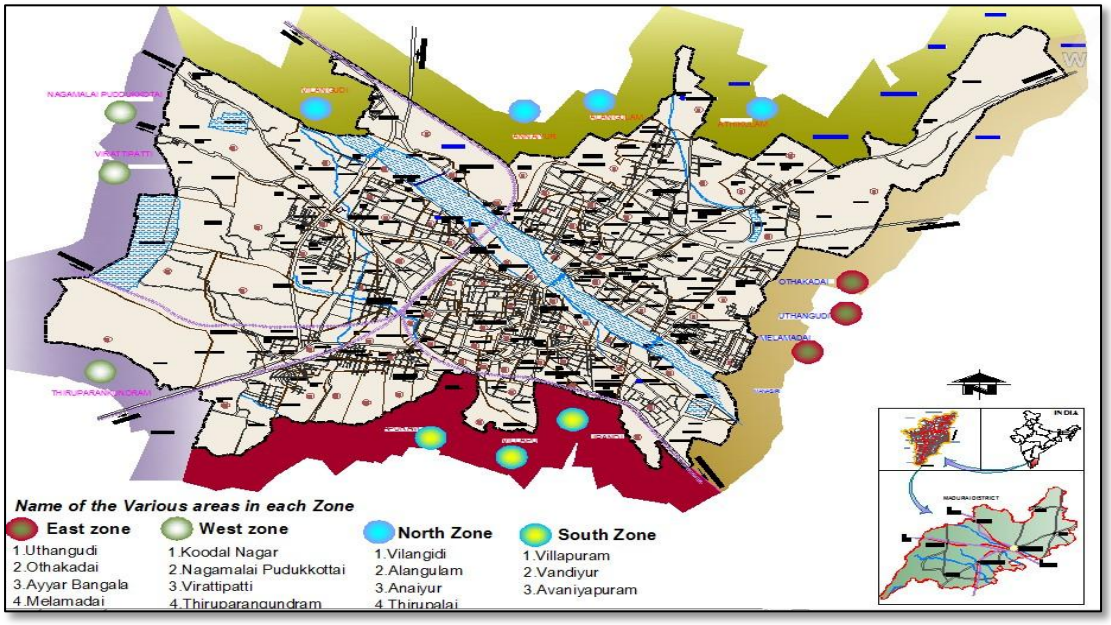


**Figure 2-3: Surveyed areas in Jaipur**


Note: These maps are of low resolution; serve the purpose of indicative presentation. During the survey, a large map in hard copy was obtained from the corporation.

The number of households having onsite sanitation in relation to the total number of households in each of the three cities and the number and percentage of households surveyed in relation to the total number of households in the surveyed areas are presented in the table below (Table No:2.2).

Row 1 represents the total number of households in the cities, where as row number 2 presents the number of households dependent on Onsite Sanitation (OSS). Row number 3 specifies the percentage of households dependent on OSS to total households. Row 4 presents the number of households actually surveyed. Row 5 specifies the percentage of households surveyed in relation to households dependent on OSS.

Because of the huge number of households, the sample size is low in Delhi (0.14%) and slightly higher in Jaipur (0.29%) and Madurai (0.84%). Despite the sample size being low, given the uniform composition of households (type of dwelling units, assets owned, overall income level, sanitation practices etc) the confidence level of this sample size representing the overall fecal sludge management practices of the area is reasonably sound.

**Table 2-2: Details on households with onsite sanitation and survey sample size**

| | | Delhi | Jaipur | Madurai |
|---|---|---|---|---|
| 1 | Total number of households in the city | 1700714 | 508571 | 224209 |
| 2 | Households with on site sanitation (tanks and pits combined) | 424857 | 101714 | 35873 |
| 3 | % of households to total households in the city with onsite sanitation | 25.0% | 20.0% | 16.0% |
| 4 | HH survey sample size | 600 | 300 | 300 |
| 5 | % of sampled households to total number of households in the surveyed area | 0.14% | 0.29% | 0.84% |

Source: For Delhi: Census of India 2001; For Jaipur and Madurai: CDPs, 2006, For estimation of HHs with OSS: Household survey

## FSM practices and data collection

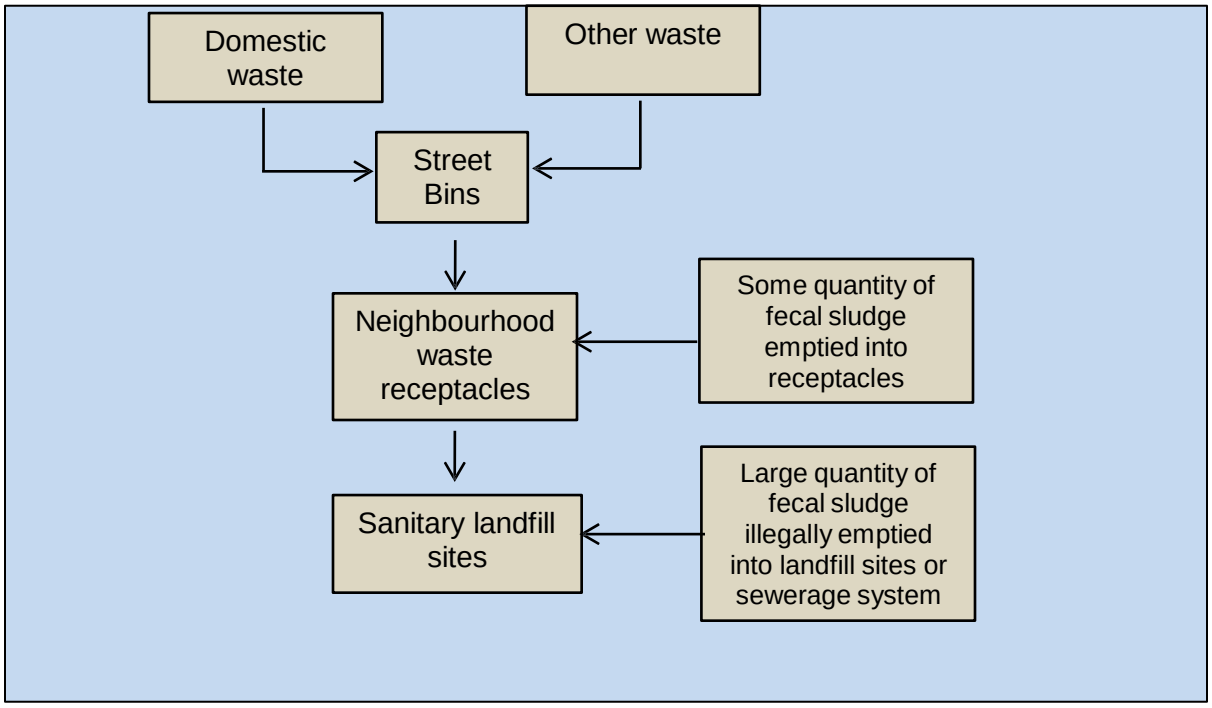
Data on current FSM practices in the three surveyed cities were collected from both primary sources and secondary sources. Primary source was the assessment of FSM practices through household surveys. House hold surveys captured data on water supply situation, sanitation status, type of sanitation facility, emptying frequency and practices, type and technology of emptying services used, payment structure and methods, willingness to pay for improved services, management of waste water, awareness on legal and other implications of poor FSM practices, understanding of the role of local authorities etc. Secondary data sources included interviews and FGDs with local municipal officials, water and sanitation utilities, pollution control board officials, elected representatives, interviews with emptying service providers etc.

Scientific FSM practices are not existent in all the three surveyed cities as well as in other cities across the country. The major emphasis of water and sanitation utilities to install and run centralized sewerage systems. Areas not covered by the sewerage systems are left unattended. Actions of local government authorities terminate at enabling the construction of toilets (under various government schemes). Sanitation in cities is the mandate of urban local bodies (corporations, municipalities and towns). Investments are heavy towards building centralized sewerage systems and wastewater treatment plants in the larger cities. Investments and management of household latrines are entirely in the private hands in an unregulated environment.

The National Family Health Survey-3 (2005-2006) showed that 24% of urban Indian households share toilets; more than 5% of the households let out untreated fecal matter into the environment even with household arrangements like septic tanks and pit latrines. This situation is confirmed by our household survey, in all the three cities. Urban sanitation is generally neglected. However, with the launching of the National Urban Sanitation Policy and the sub-plan on FSM, fecal sludge management activities are likely to receive greater attention.

The following flow chart broadly indicates how FS is dumped into landfill sites or forced into piped sewerage system, in an unregulated environment. Also, large quantities of FS are let into the open environment.

**Figure 2-4: FS dumping**




### Methods to validate financial data

In the household surveys the financial data was validated through various cross verifications. The surveyors paid specific attention to the reported figures and did sanity checks such as household expenditure will be equal to or lower than income, compatibility with income and household assets, possible underreporting or over reporting of income and expenditure etc. The financial information obtained from the emptiers were validated through interviews carried out with owners, employees (when they are separate), peer operators (mainly for validation of mileage data and expenses on repairs and maintenance), household members who have used emptying services, mechanics who carry out minor repair works of tractors etc. None of the emptiers maintain books of accounts, nor do they issue any receipts for payments and all transactions are made in cash. Therefore, it was not possible to directly verify their accounts.

### Treatment Plant/Dumping sites model

No city in India has officially designated fecal sludge dumping sites. It is either dumped in open drainages or in isolated open spaces and occasionally let into let into the piped underground sewerage systems through manholes. In some towns, (e.g. Musiri in Tamil Nadu) NGO initiated local level FS treatment techniques are being experimented. Land fill sites are widely used for waste disposal.

Delhi uses landfill sites to dispose municipal solid waste. The Delhi landfill sites typify many cities of similar size, although the extent and coverage of dumping sites vary significantly. Both Jaipur and Madurai do not have officially designated dumping sites. Therefore, waste is dumped in various locations within the two cities.

As described in the flow chart above, Delhi has three basic types of waste receptacles i) Neighbourhood *Dhalaos* (covered structures more or less protected) ii) Street dustbins of different design and sizes and iii) open sites in some locations. There are 2,600 waste receptacles (*Dhalaos*, street dustbins and open dumps) within Municipal Corporation of Delhi

(MCD). MCD maintains about 400 trucks and 100 loaders for transportation and secondary collection of waste from various waste receptacles. In addition, the zonal offices of MCD maintain and operate vacuum suckers for cleaning community toilets and public institutional level toilets.

## Determination of financial flows and key stakeholders

The stakeholders in the study were enumerated as follows:

- Users of onsite sanitation systems
- Onsite sanitation system emptiers
    - Owners
    - Employees
- Municipal Corporation Officials
- Urban Development Department Officials and WSS Board officials
- Pollution Control Board officials
- Some NGOs

Interaction between the owners of on-site-sanitation system and other stakeholders, especially municipal officials and other officials is weak and disconnected. The relationship is slightly stronger and two sided between the on-site-sanitation system owners and emptiers, but it is entirely need based. On the other hand, there is limited one-way interaction between on-site-system owners and municipal officials; the expectation of support from them is also low by the owners. Pollution Control Board does not have the resources, capacity or willingness to regulate on-site-system owners. The huge size of system owners makes it nearly impossible to ensure compliance to even basic norms. Direct business related financial support to emptiers from the formal banking system is lacking, although limited “surrogate” financing, using schemes under agriculture does take place. For example, agriculture is a priority financing sector and tractor loans get covered under agriculture financing. Therefore, bank financing does not form an integral part of the business environment. In effect, on-site-sanitation systems work independently in an unregulated, non-supportive environment, leaving emptiers and on-site-sanitation owners to work out their own mechanism of defining service quality and pricing mechanisms. This relationship pattern is depicted in the figure below.

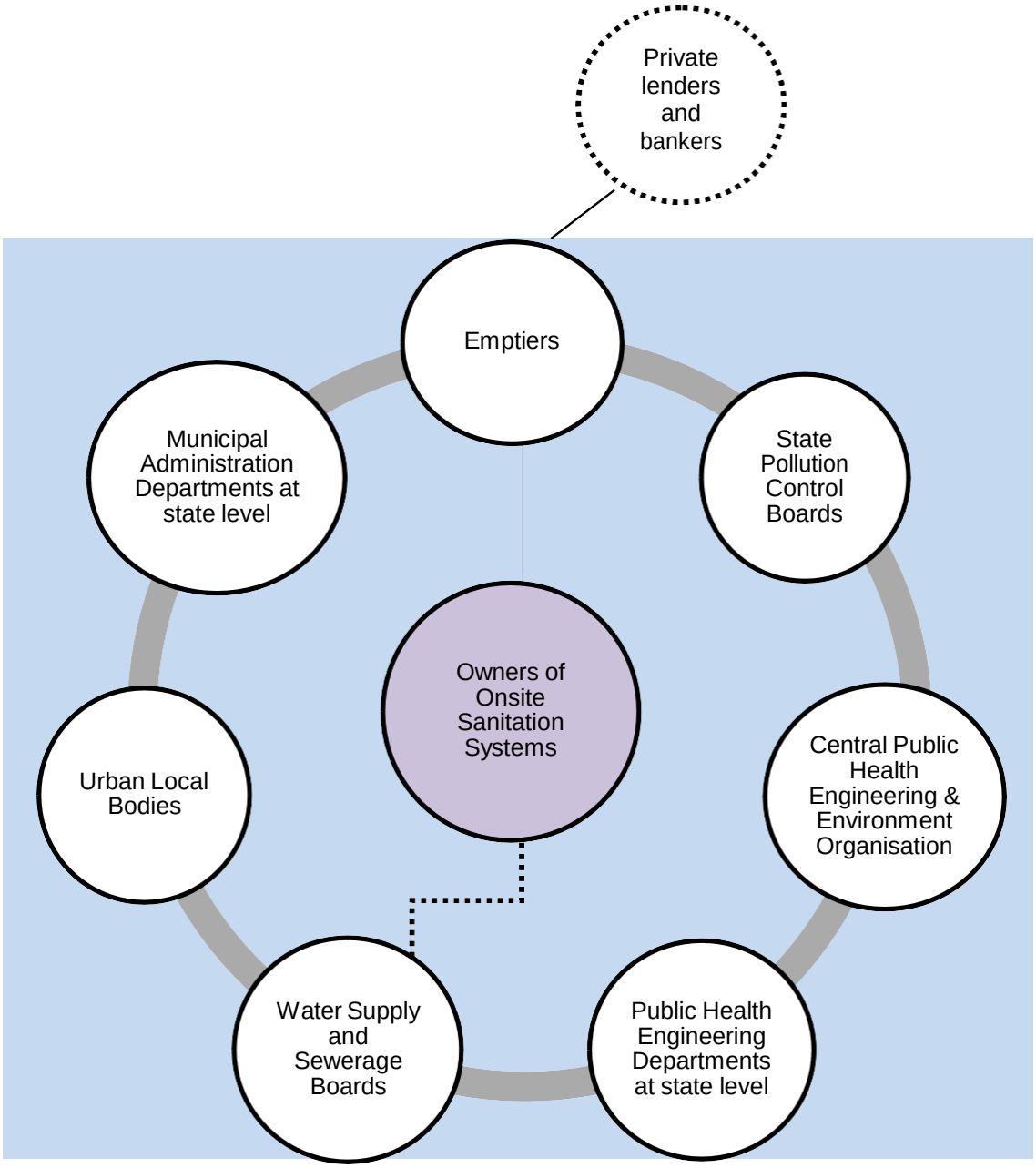



**Figure 2-5: Relationship of OSS owners with other stakeholders**

The emptying business is completely in the hands of private service providers. The financial flows were determined based on the transactional relationship of emptiers and consumers, which normally get activated only when septic tanks become full and the need for emptying can longer be postponed. The emptiers charge certain fee for emptying. The data on financial flows was developed using the standard templates provided by the Foundation.

## Market size calculation method

### FS production and collection computation

The size of the market is calculated using the following parameters:

| Sn. | Parameters |
|---|---|
| A | Total population |
| B | Average household size as arrived at by the survey |
| C | % of population having onsite sanitation system (estimated figure obtained during interviews of officials) |
| D | Total number of septic tanks – (A/B)*C |
| E1 | % of septic tanks as pits (as estimated in the study) |
| E2 | % of septic tanks as tanks (as estimated in the study) |
| F1 | Total number of pits – D*E1 |
| F2 | Total number of tanks – D*E2 |
| n-x | Emptying Frequencies: n-.5 years, s-once a year, t-once in 2 years, u-once in 3 years, v-once in 4 years, w-in 5-10 years (average 7.5 years taken), x-over 10 years (single point taken as 10) |
| $G_{n-x}$ | % of pits with emptying frequencies as n to x (calculated using survey data) |
| $H_{n-x}$ | % of tanks with emptying frequencies as n to x (calculated using survey data) |
| K1 | Typical volume of pits (as arrived by interviews) |
| K2 | Typical Volume of septic tanks (as arrived at by interviews) |

The market size is estimated as for an year using the above parameters as per the following equation:

| | |
|---|---|
| Total number of pits to be emptied in an year – L1 | $\sum_{i=n \text{ to } x} (F1*G_i)/i$ |
| Total number of tanks to be emptied in an year – L2 | $\sum_{i=n \text{ to } x} (F2*H_i)/i$ |
| Yearly Market Size = | L1 * K1 + L2 * K2 |

The theoritical market size is also calculated for the reference and comparison purposes. It is calculated in following manner:

| | |
|---|---|
| Theoritical voume of sludge produced per per person per day for pit | M1 |
| Theoritical voume of sludge produced per per person per day for tanks | M2 |
| Yearly Sludge produced theoriticaly | F1*B*M1*365 + F2*B*M2*365 |

The collection computation is carried out using following parameters of number of emptying vehicles operating in the city, their average emptying trips per day, the average capacity of emptying vehicle's sludge holding containers and number of working days in a month:

| | |
|---|---|
| Number of emtying vehicles operating in the city (as assessed during interviews with emptiers) | N |
| Average number of septic tanks emptied per day (as assessed during interviews with emptiers) | O |
| Avergae capacity of sludge holding container of the emptying vehicle(as assessed during interviews with emptiers and household survey) | P |
| Average number of working days per month | Q |
| Total volume of sludge emtied per year | N*O*P*Q*12 |

## Financial Analysis methodology

The financial analysis of those operating in the fecal sludge emptying business is carried out by developing the income statements through focused discussions with the business owners and employees. The interviews are carried out using the standard templates provided by the client and analyzed for various parameters such as fixed expenses, variable expenses, income statements, cash flow statements, internal revenue rates, discounted cash flows, projected statements. Sensitivity analysis is done using the financial analysis model provided by the client.

# 3 Results and analysis of urban FSM practice

## Situational analysis of extraction/transportation

Extraction and transportation of septage in all the three cities are entirely in private hands. The business is unregulated and not well organized. Extraction and transportation of septage is done by deploying tractor powered suction pumps and the septage is collected in tanks of varying size. After emptying, septage is transported and dumped untreated in the open environment, wherever space is available. In Delhi, solid waste land filling sites also act as receptacles of septage in a clandestine manner.

### Demographics of the three cities

The demographic profile of the three cities is characterized by phenomena unique to each city. For example, in Delhi the urbanization has been so rapid that the rural areas surrounding Delhi are shrinking. Migration into Delhi has overtaken natural growth by about 1.3 times in the last two decades The city is big and diverse in nature in terms of geographical i.e. landscape and demographic profile. The number of rural villages has decreased from 314 in 1921 to 165 in 2001. The percentage of rural population of Delhi has also declined from 47.24% in 1901 to 6.99% in 2001. Close to 95% of the population in Delhi is urban, with a mixed geographic and social profile. The density of population, 9,294 persons per sq. km. Delhi supports a population of 10,204,284 (2001 census) with average family size of six. Normally there are more than two earning members in the family. Dwellings are built on small plots, back to back, leaving very little space for toilet construction. Literacy level stands high at 82% (surveyed households recorded 78.75%). The gender ratio is 827 females per 1000 males.

Jaipur shares some of the demographic characteristics of Delhi, but the per capita income levels are much lower and the dwelling units are larger. Population of Jaipur Municipal Corporation is estimated to be 3560000 (Source: City Development Plan, 2006); the average family size of seven is larger than Delhi. Single earning member households are more in number. The population mix dominated by people from various parts of Rajasthan and less from other parts of the country. With 886 women for 1000 men, gender ratio is highly skewed towards men. The literacy rate is about 67%; male literacy being significantly higher (74%) than female literacy (59%).

Madurai being located in the southern part of the country, in terms of demographic profile the city stands out differently as compared to Delhi and Jaipur. Since the pressure on land is not so intense, houses are built on relatively larger plots with some open space. The population of Madurai is 1121043 (JNNURM document 2009), and the average household size of five is lower than Jaipur and Delhi. The population density is 213 persons per Ha. The old city areas of Madurai are densely populated (above 1000 persons per Ha). The gender ratio is about 978 women for 1000 men, higher than the national average of 944. In terms of gender balance, this places Madurai in a much better position than Delhi and Jaipur. The city has an average literacy rate of 78%. The gap between male and female literacy is narrower with male literacy of about 82%, and female literacy of about 73%.

### Drinking water supply coverage

Stark contrast is observed in drinking water supply situation between the three cities. The house hold survey data indicates taht piped system connected to households is the highest in Jaipur (46%); lowest in Delhi (4%). In Madurai, coverage is low (14%) (Source: Household Survey), but rates better than Delhi. The households surveyed in Delhi are poorly serviced by piped water supply because of their settlement status (mostly unrecognized colonies) and they are also not provided with public taps. In such a scenario, their options are restricted to bore wells and/or

water supplied through water tankers managed by the Delhi Jal Board (DJB), an independent board that provides water and sewerage system services in Delhi. Dependence on other sources of water supply (bore wells and DJB water tanker) in the surveyed areas in Delhi stands at extremely high at 92%. (Source: Household Survey). It is pertinent to note that this is applicable only to surveyed areas and cannot be extrapolated to the overall city situation. While the quality of water supplied by DJB through tankers is reasonably assured, the quality of bore well water is always a suspect, as articulated by many respondents during the household survey.

Dependence on bore wells is also high in Madurai (46%) (Source: Household Survey). This is the result of the inability of the Madurai Municipal Corporation to provide piped water supply in the outer periphery of the city. The water supply situation however, is considerably different in the core areas of the city. The core areas of the city are serviced with better water delivery and sewerage systems by the municipal corporation.

**Table 3-1: Water supply in surveyed areas in three cities**

| Type of water supply | Delhi | Jaipur | Madurai |
|---|---|---|---|
| HH with piped systems to household | 4% | 46% | 14% |
| HH using piped systems connected to public taps | 0% | 14% | 26% |
| HH using wells | 0% | 12% | 1% |
| HH using private vendors & public taps | 4% | 16% | 13% |
| Other sources | 78%(bore well) 14% (DJB water tanker) | 12% | 46% (bore well) |

Source: Household Survey

## Sanitation coverage

Over 99% of the households in the surveyed areas in Delhi are not connected to piped sewerage system. Only insignificant number of households (1%) has reported that they are connected to the piped sewerage system. In Jaipur and Madurai, in the areas surveyed no households are connected to piped sewerage system. As described under section 2.2.1, since understanding septage management is the focus of the study, areas not covered by piped sewerage were specifically chosen. The percentage of households with no sanitation is higher in Jaipur (7%) (Source: Household Survey), as compared to the other two cities. Households that do not have sanitation facilities within their dwelling units are compelled to go for open defecation or use community toilets. Community toilets are rare to find and mostly they are in disused condition. Open space being a major constraint in Delhi, it prevents households from going for open defecation and they are compelled to have some minimal sanitation facilities at home. For the extremely low income households, these facilities mean having at least a pit latrine at home. Pit latrines are predominantly used by households in Delhi (51%). (Source: Household Survey) They are generally small holes dug in the ground, with some cover for privacy. The outflow from these pit latrines are directly off loaded to open streams and the streams are cleared periodically by municipal sanitation workers in some areas. In areas, where the streams are not cleaned regularly, the waste forms into a cess pool.

Septic tanks prevalence in the surveyed areas of Delhi (46%) and Jaipur (93%) are high. Septic tanks are mostly single chambered (over 60%) and the sizes of these tanks vary within and

between settlements, depending on space availability, family size and affordability factors. Normally, a household with six members opt for septic tanks of three sizes i.e. 4ftX4ftX3ft, 4ftX6ftX6ft, or 4ftx8ftX8ft. These are what generally suggested by local masons. With total disregard to inherent environmental risks, a large number of single chamber septic tanks in the urban poor settlements are deliberately designed with the mouths open to drain out excess water, on each use. In the perception of users this delays filling up of septic tanks and saves them time and money.

Septic tanks in Jaipur are distinctly different in size (6ftX4ftX4ft; 8ftX6ftX6ft) and structure. In addition to the commonly used single chamber septic tanks, the other widely used septic tank equivalents consist of pits, outlined with cylindrical concrete frames with holes around them to allow percolation. The dimension of these structures vary within a range of 0.75ft radiusX10ft and 0.75ftX12ft. The soil structure of Jaipur easily permit such structures to be sunk deep in the soil. Similar to double chamber septic tanks, single chamber tanks also aid anerobic digestion of fecal waste and therefore, considered as septic tanks.

Households in Madurai generally prefer double chambered septic tanks, if affordable and the sizes are much larger. Size of these tanks varies from 6ftX5ftX4ft to 4ftX8ftX8ft. Land availability, higher affordability of many middle class households are the driving factors. Because of the use of mini trucks, the quality of emptying service is also superior in Madurai.

**Table 3-2: Type of sanitation in all three cities (applicable only to the areas with onsite sanitation system)**

| Type of Sanitation | Delhi | Jaipur | Madurai |
|---|---|---|---|
| % HH with no sanitation | 2% | 7% | 3% |
| % HH with direct connection to sewer network | 1% | 0% | 0% |
| % HH with Septic Tank | 46% | 92% | 97% |
| % HH with holding tank/cesspools | 0% | 0% | 0% |
| % HH with pit latrines | 51% | 1% | 0% |

Source: Household Survey

## Institutional and legal framework

In India, toilet, septic tank, and sewer design and maintenance are regulated through the 1983 National Building Code of India, Part IX Plumbing Services, Drainage and Sanitation. Chapter VI, Section A covers “Drainage and Sewerage” and specifies the sizing and design of septic tanks, sewers, toilets and other sanitation devices. More specifically, IS 2470: 1985 Code of practice for installation of septic tanks applies to construction of septic tanks. However, it is pertinent note that these exist only in theory; in practice there is no system to ensure these standards are actually applied.

Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act, 1993, prohibits manual scavenging, or the physical cleaning of septic tanks and sewers. Even after the Act came into force in many States by 2001, progress has been poor. Reliable estimates of numbers are hard to come by. However, some sample surveys (Source: NSS Report No.534, 2009) conducted pitch the current figure of manual scavengers at one million.

Guidelines for sludge management do not exist. In Delhi, the Delhi Pollution Control Committee (DPCC) is the agency vested with the responsibility of deciding norms and in Jaipur and Madurai, it is the responsibility of respective State Pollution Control Boards. However, regulations for empting tanks are prominently absent. They are largely understaffed and more preoccupied with licensing of industries and commercial establishments.

To cite an instance, in 2009, under the Delhi Municipal Corporation Act, the Delhi Cleanliness and Sanitation and Bye-law was enacted for regulating all matters connected with the collection, removal and disposal of solid waste. The Delhi Jal Board (DJB) has been set up by the Delhi Jal Board Act, 1998 to provide for the establishment of a Board to discharge the functions of water supply, sewerage disposal and drainage. The Board constitutes of 17 members. In addition to water supply, DJB is responsible to collect, transmit, treat and dispose waste water and for operation & maintenance of sewer system within the MCD area.

Separate regulation for septage or sewage management in the surveyed cities does not exist. Guidelines on septage treatment and enforcement laws are completely absent. All the current laws deal with diverse water, wastewater and sanitation services. Septage management is not covered in a holistic manner except prohibition of its discharge into water bodies. By default, septage management gets covered under Municipal Wastes (Handling and Management) Rules 2000 or under existing environment laws. Private Service providers do not need profession-specific licenses to operate. The institutional arrangements can be broadly represented as follows.

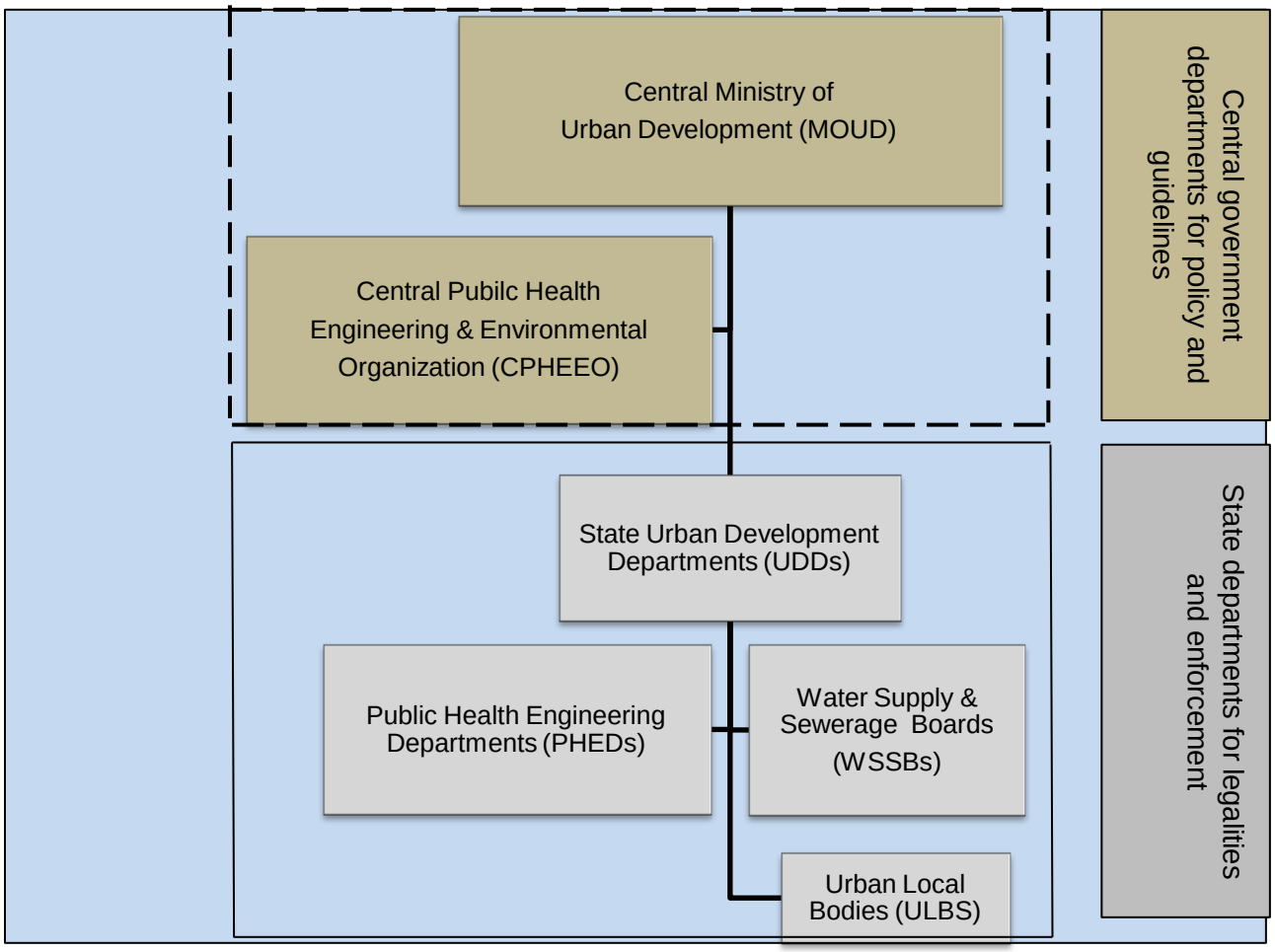



**Figure 3-1: Institutional arrangement**

### Flow of money chart for FSM transactions

The FSM transaction comes into existence when the septic tank gets full and the services of fecal sludge emptier are hired for emptying the same is solicited by the septic tank owner. The emptier charge fee for such services which includes the job of empting the septic tank and transporting away the emptied sludge from the site. A generalized flow chart of transactions and business processes as applicable to all the three cities is presented in the page below.

**Figure 3-2: FS Business transaction 1**

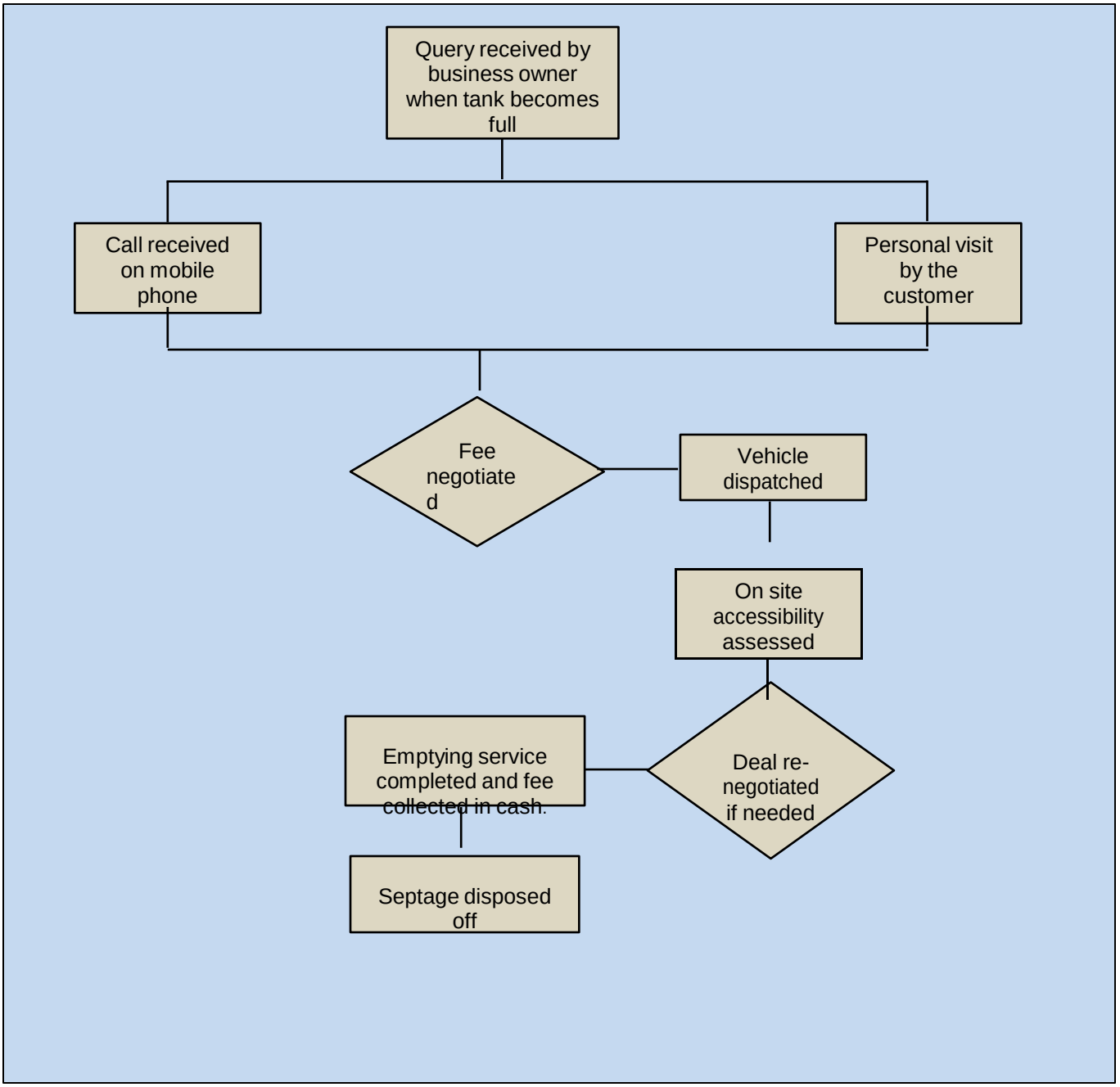
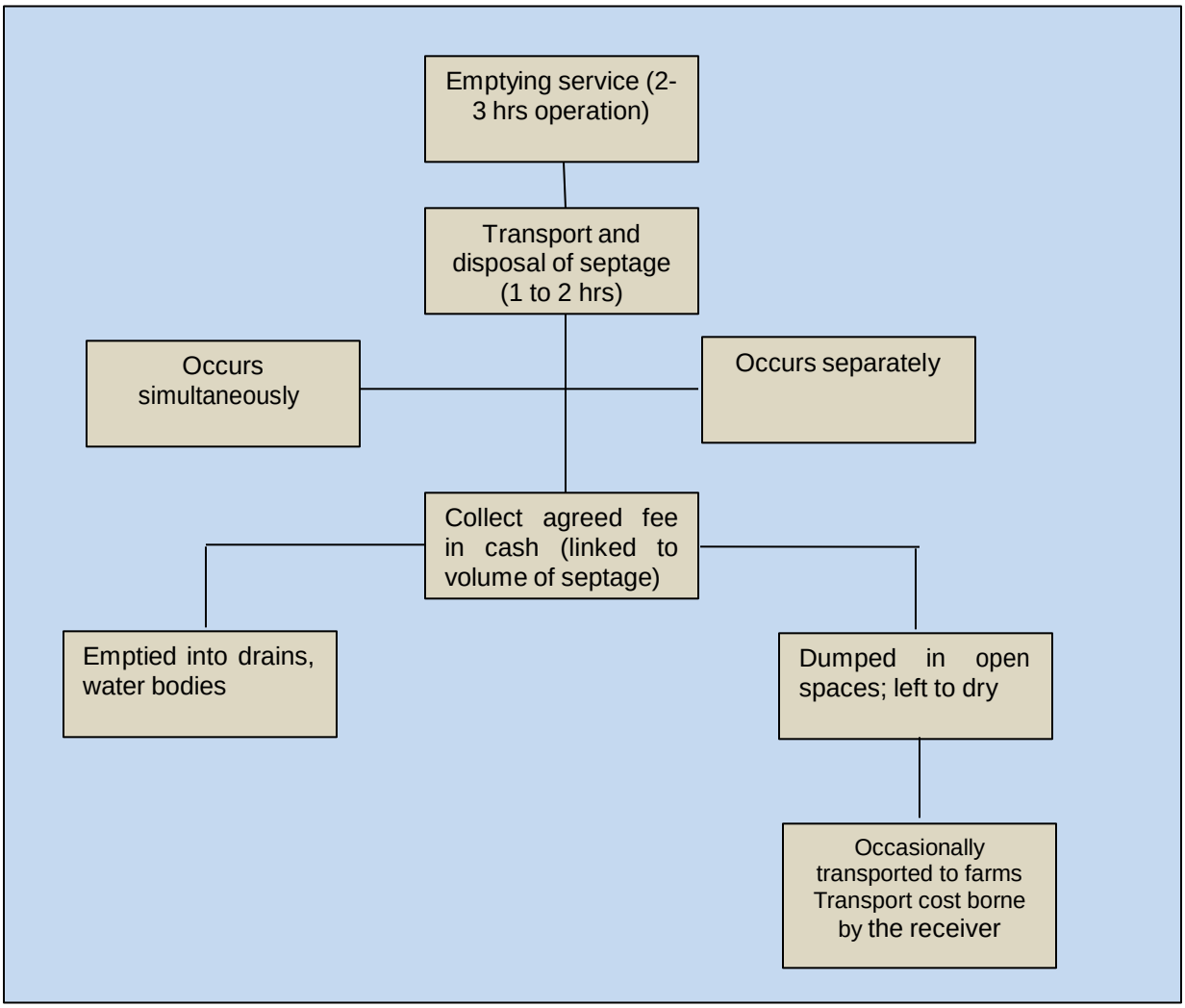


**Figure 3-3: FS Business transaction 2**



## FS emptying business owners' profile

**Delhi:** Mechanical emptying service in Delhi is dominated by small operators, with single unit ownership, mostly on self-employment basis. There are some exceptions though, where double unit ownership exists. However, such instances are rare and limited to ownership of two units. Most of the businesses are in existence for the past three to five years. The vehicle used for this business is locally manufactured tractors (Mahindra or Sonalika), of 50 to 60 bhp. The tractor is attached with a trailer, with a closed metal tank of 2000 to 4500 litres carrying capacity. The accessories used are hose pipe of about 10 meter length and a pump mounted on the tractor. There are about 35 mechanical operators in the urban poor settlements in Delhi.

While tractors are bought from the outlets of tractor dealers of popular manufacturers (Mahindra, Fergusson etc), tanks are fabricated in Faridabad, a light engineering manufacturing hub near Delhi. Pumps and hose pipes are separately bought and then assembled or fitted to the unit. There are some cases of such units being bought on second ownership basis. The preference of these tractors over large trucks is based on the fact that these tractors are low cost, work well in the extraction business and can be driven through narrow lanes, from where most of the business comes from. Trucks even at the low end cost a minimum of Rs 3,000,000 (US 66,000) and the current volume of business does not justify such an investment.

Approximately 10% of owners run their businesses on part bank finance; balance 90% use own funds. The banks finance only the tractor units and not the tankers and other accessories. Loans to tractors generally covered under agriculture financing and therefore, in one sense this comes as surrogate financing. However, land title deeds are required to be hypothecated for obtaining the loan. Investment for tanks and other accessories comes from own sources or borrowings from the open market. The open market interest rates are as high as 24% per annum.

**Jaipur:** The fecal sludge emptying business in Jaipur is carried out by mechanical emptiers. Manual emptying is not practiced. The emptying vehicle used by mechanical emptiers is a tractor with an attached container. A suction pump mounted on the tractor produces vacuum energy to suck out the fecal sludge from the septic tank using a hose. One end of the hose is connected to the tank and the other end is lowered into the septic tank. The tank volume is mostly in the range of 2.5 – 3.5 cubic meters. Single tractor ownership is twenty in number and double tractor ownership are nine in number. Thus in total about 38 tractors, owned by 29 business owners are in use.

About 60% of the emptiers, run their business on self financing mode. Of the balance 40%, distribution of loan source between formal banking system and informal lending is 50:50. Loans to tractors are also covered under agriculture financing and therefore, in one sense this comes as surrogate financing. Agriculture financing is considered as priority sector, which makes borrowing easier for operators. However, land title deeds are required to be hypothecated for obtaining the loan.

The fecal sludge emptiers are mostly those who have been in the sanitation sector or those who are retired or separated from the municipality. All of these businesses are in profits. Most of them operate from the road side corners and have no permanent offices. They mostly employ only one helper, owner doubling as driver. Their business is largely unorganized. They do not any bill books and by default are excluded from service tax regulations. Most operators register tractors as vehicles used for agricultural purposes in order to save registration costs. Agriculture vehicles are given rebate in the vehicle registration fee. Only a small number of emptiers avail

formal bank loans, since they prefer to borrow money from traditional money lenders, since it is an easier option and minimum documentation is required. Painted advertisements with contact numbers and random dropping of business cards at colonies are the preferred modes of business promotion. They also get business through local sweepers and municipal corporation referrals.

**Madurai:** Faecal Sludge emptying service in Madurai is dominated by mechanical emptiers. There are no manual emptiers in the city. The mechanical emptiers are small scale operators with single vehicle ownership. There are no large scale operators with more than one vehicle ownership. They are first generation entrepreneurs who have entered the business during the recent past, i.e., within the last three to four years. The vehicle used for this business is locally manufactured mini trucks (such as TATA 407, Eicher), wherein the rear part of the truck is replaced by the tanker and the supporting machinery. The tanker fitted with the lorry measures about 2000 – 5000 litres, which is generally remodelled from the pre-owned vehicles. The accessories used are hose pipe of about 10 meter length and a pump mounted on the tractor.

Approximately 10%of owners run their business on part finance from banks and private financiers; balance depending on own funds. The bank permits financing only the mini trucks and not for the tanks and other accessories. Bank finances up to 75% of the vehicle cost (if new); pre-owned vehicles loan eligibility reduces to 50% with an interest rate of 13.75% to 14%. Duration of loan is generally extended up to ten years. Despite the private market interest rates go as high as 18 to 24% per annum, many operators prefer to go for private financing because of less cumbersome procedures. Mini trucks are not covered under agriculture financing. Therefore, mini truck operators in Madurai opt for loans from private lenders.

**Figure 3-4: Typical emptiers in Delhi, Jaipur and Madurai**

## Household survey results and analysis

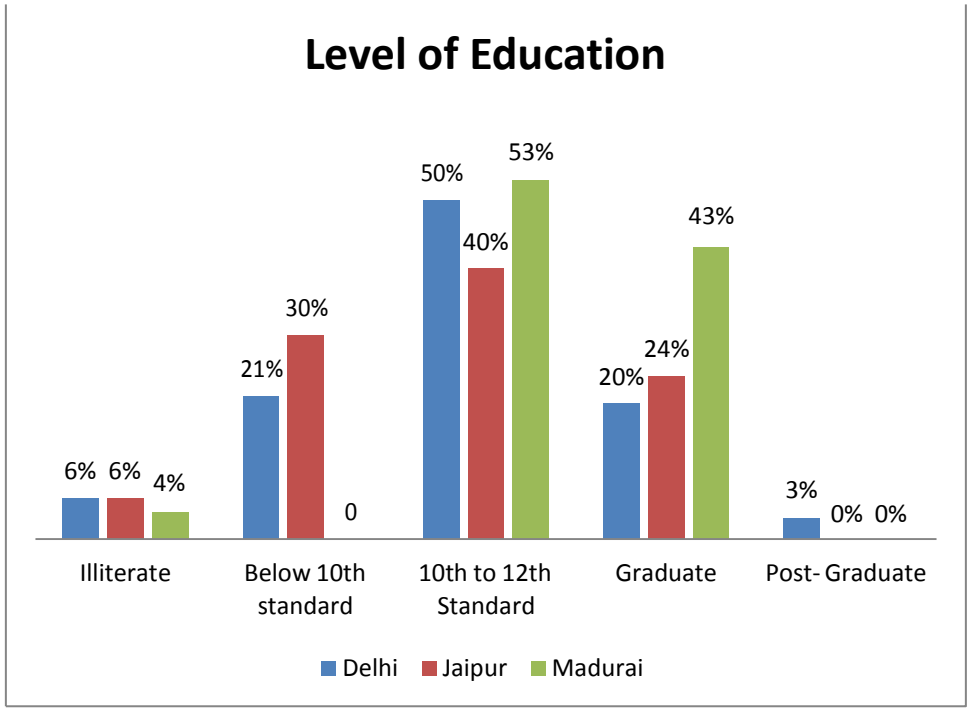
### Level of Education:

The survey findings indicate that the percentage illiteracy amongst the household heads range between 4% and 6% in the three cities. Jaipur has relatively lower level of education attainments, with 30% of the household heads having attained education levels below standard 10. Standard 10 is a critical transition level from school to higher level of education. As the figure indicates Madurai is relatively better off with 43% of the household heads having attained graduation, while Delhi has a small percentage of (3%) of household heads who have attained post graduate qualification. However, because multiple factors such as low income levels, lack of space, high density in settlement areas etc, it is not possible to establish any positive correlation between level of education and adoption of improved FSM practices.

| City | Illiterate | Below 10th standard | 10th to 12th Standard | Graduate | Post-Graduate |
|---|---|---|---|---|---|
| Delhi | 6% | 21% | 50% | 20% | 3% |
| Jaipur | 6% | 30% | 40% | 24% | 0% |
| Madurai | 4% | - | 53% | 43% | 0% |

Source: Household survey

**Figure 3-5: level of education**




Source: Household Survey

Private sector is the dominant employer in all the three cities (84% in Jaipur 51% in Delhi and 44% in Madurai). Government employees residing in these urban poor settlements are primarily low level government servants, who are engaged in long-term contracts or on regular employment. Amongst the three cities Madurai has the highest government employment share

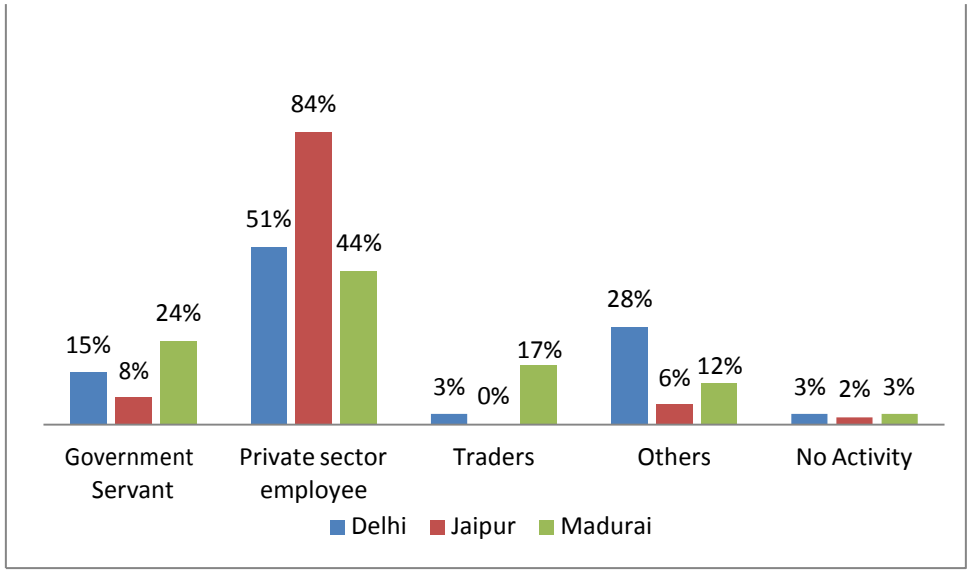
(24%) and Jaipur the lowest (8%), with Delhi falling in between (15%). A substantial percentage constitutes 'Others', ranging from 6% at the lowest and 28% at the highest. These are mainly lowly paid daily wage workers, taxi drivers, sales people, road side mechanics, office clerks. 'Others' category also includes farmers in Jaipur. With the limited scope of the survey, it is not possible to establish any link between category of employment and FSM practices.

**Type of employment**

| City | Government Servant | Private sector employee | Traders | Others | No Activity |
|---|---|---|---|---|---|
| Delhi | 15% | 51% | 3% | 28% | 3% |
| Jaipur | 8% | 84% | 0% | 6% | 2% |
| Madurai | 24% | 44% | 17% | 12% | 3% |

Source: Household Survey

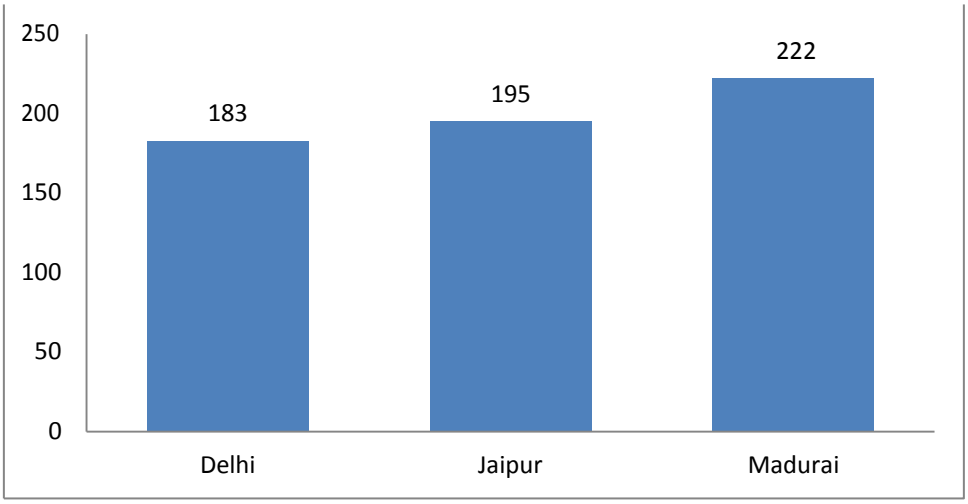
**Figure 3-6: Type of Employment**




Source: Household survey

### Monthly expenses on telephone

**Figure 3-7: Monthly average income in US $ ($1=`45)**

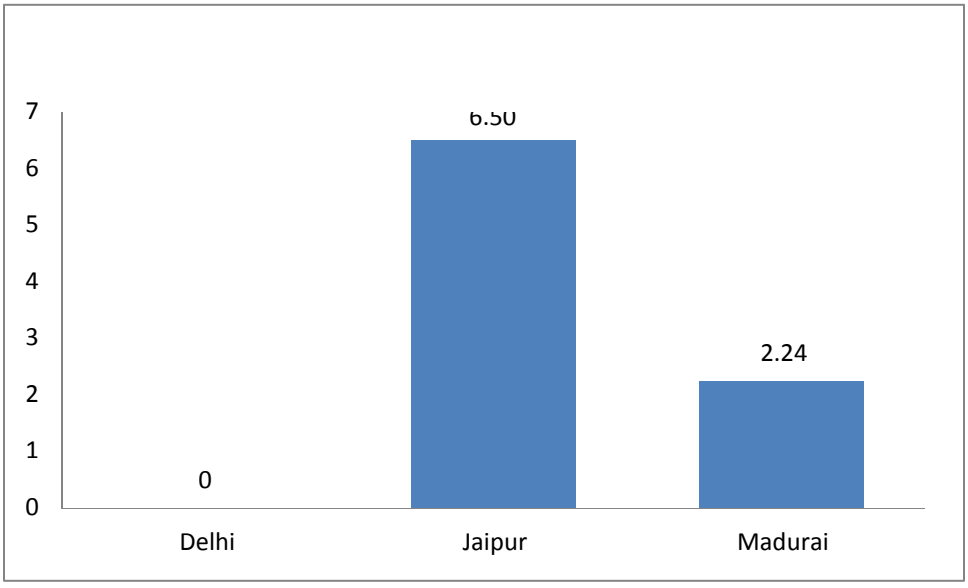



Source: Household survey

### Monthly expenses on water

In the surveyed areas in Delhi, piped water connection is absent. However, water is supplied through DJB owned tankers free of charge at pre-determined frequencies. In other places, where piped supply is available, the rate is linked to consumption, which ranges from Rs 600 pm ($ 13) to Rs 1200 ($ 26). The household survey also shows that 78% of the households depend on bore well sources. Because of inadequate and undependable public water service delivery system, the dependency on bore wells is a coping mechanism that the households adopted. The monthly expenses on water in Jaipur are higher ($6.50) as compared to Madurai ($2.24), although the monthly average income levels are in the reverse order in the two cities.

**Figure 3-8: Monthly water bill**




Source: Household survey

### Emptying services

There is a great deal of variation on how frequently emptying done in the three cities surveyed. The vehicles used are almost similar to each other in Delhi and Jaipur, where as Madurai stands out by using higher capacity mini trucks. Tractors are preferred over trucks in Delhi and Jaipur because of i) narrow lanes make entry difficult for trucks and ii) lower capital and running costs. About 67% of the households in Delhi reported that they have never emptied their septic tanks till now. The reasons for this are three i) many households owning septic tanks have migrated only about eight to ten years ago in search of employment opportunities and shifted from open defecation practices to relatively safer option of using septic tanks ii) people with higher affordability construct oversized septic tanks to avoid frequent emptying (an option pushed by local masons) and iii) lack of awareness about the need for periodical emptying. In Jaipur and Madurai the percentage of households not emptied stand lower at 35% and 21% respectively.

Highest number of households that reported emptying at least once so far is in Madurai (79%). and lowest in Delhi (33%). Jaipur has also reported a reasonably higher percentage at 65%. Overall higher awareness of the need to regularly empty septic tanks is reflected in this higher percentage. This is also clearly evident in the higher percentage of households opting for emptying at more frequent intervals as compared to Delhi.

**Table 3-3: FS emptying frequency**

| Emptying Frequency | Delhi | Jaipur | Madurai |
|---|---|---|---|
| HH that have Emptied at least once | 33% | 65% | 79% |
| Never emptied | 67% | 35% | 21% |
| 2-3 times / year | 0% | 14% | 18% |
| Once per year | 0% | 23% | 20% |
| Once every 2 years | 0% | 9% | 19% |
| Once every 3 years | 5% | 8% | 0 |
| Once every 4 years | 4% | 0% | 0 |
| Between 5 - 10 years | 25% | 11% | 22% |

### Type of emptying service

Some variance is noticed in the emptying services used in Delhi and the other two cities. While in Delhi about 1% of the households employ manual emptiers, in Jaipur and Madurai manual emptiers are completely absent. One of the reasons for this is the enactment and enforcement of Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act 1993, by both the states. Although Delhi also has enacted the law, the provisions are not strictly enforced and therefore manual emptiers continue to operate. In addition, inward migration of rural population into urban poor settlements in Delhi is so high that the supply of low skilled human resources far outweighs demand. Consequently, availability of limited vocational options compel migrant population belonging to the lower rungs of social hierarchy to take up manual emptying jobs.

In Jaipur and Madurai, dependence of households on mechanical emptying services is total. However, in Madurai, about 23% of the household toilets are emptied by the family members themselves, lack of affordability being the driving factor. In Delhi this figure stands far lower at

3% and in Jaipur it is near zero. Households in Jaipur prefer not to do the empting themselves mainly because emptying and all sanitation related tasks are considered to be non-honourable tasks, to be carried out by people belonging to lowest social strata.

**Table 3-4: Type of emptying service**

| Method of emptying per survey | Delhi | Jaipur | Madurai |
|---|---|---|---|
| % HH that use manual emptiers | 1% | 0% | 0% |
| % HH that use mechanical emptiers | 96% | 100% | 77% |
| Others(mainly family members) | 3% | 0% | 23% |

**Service selection criteria**

In all the three cities, the key determining factor for choosing a service provider is the quality of service. This criterion ranks top in Jaipur with about two third of the respondents choosing the quality of service option. This is followed by Delhi and Jaipur in that order with about 49% and about 39% of the households quoting quality as the determining factor. Cost constitutes the next important criteria in Delhi (37%), where as in Madurai it gets switched to availability of service providers (30%). Households constituting 'Other' category range from 1% each in Delhi and Jaipur to 17% in Madurai. 'Other' includes referrals by known people who have used the service, and service providers known to the households or just convenience. Madurai is a smaller city amongst the three cities and social class mix is less diverse. Therefore, referrals become one of the key deciding factors for choosing a service provider.

**Table 3-5: Service selection criteria**

| Type of Service | Delhi | Jaipur | Madurai |
|---|---|---|---|
| Cost | 37% | 18% | 14% |
| Availability | 13% | 19% | 30% |
| Quality of service | 49% | 62% | 39% |
| Others | 1% | 1% | 17% |

Source: Household survey

**Willingness to pay for improved quality:**

Willingness in Delhi is lower than the current market, normally charged by emptier ($ 45). In Jaipur, 64% of the respondents have indicated that they are willing to pay more than the current market charges of Rs 531 ($12), getting good quality of service being the prime motive. In Madurai, market rate of FS emptying service is $20 and their willingness to pay more than the current market price is again driven by the motive of obtaining improved quality of service. Almost 100% of the households have shown their willingness to pay more than the current service charges. This willingness to pay more is the result of two combination of factors i) public emptying service does not exist and therefore they have to be dependent on private service providers and the rate of emptying service is far lower than other towns and ii) higher ability to pay because of relatively higher level of household income.

**Service fee**

**Table 3-6: Cost of emptying services**

| Cost of emptying | Delhi | Jaipur | Madurai |
|---|---|---|---|
| Average annual manual emptying cost per household | $4.7 | 0 | 0 |
| Avg. annual mechanical emptying cost per household per service | $9.0 | $12.33 | $17.77 |

Source: Household Survey

Note: Expenditure for emptying service per year is estimated based on the reported emptying frequencies, reduced annually

**Quality of service/ satisfaction with the service**

Overall, satisfaction with service providers across cities has been very high. For example, in Delhi, 94% of the households were content with the quality of service provided. Balance 6% of the households raised concerns over the quality of service provided. The main reason for this dissatisfaction is that on many occasions they experienced that the emptier left the cleaning job half-done (i.e. not emptied completely). In Jaipur, about 98% of the septic tank users are satisfied with the quality of service provided. In Madurai, over 98% of the households expressed their satisfaction on the quality of the emptying service provided and the payment method. However, they articulated their concern over lack of support from the municipal corporation for providing sludge treatment facilities, including collection and disposal mechanisms.

**Awareness of Legal Requirement & Adherence**: The survey results indicate that awareness and knowledge on FSM is poor across cities. However, there is an appreciation of the need to respect legal requirements.

### FSM emptying technologies used: Manual and Mechanical

In Jaipur only mechanical emptiers carry out emptying job. The emptying vehicle used is tractor with tank attached. There is a suction pump mounted on the tractor which produces vacuum pressure to suck out the fecal sludge from the septic tank. One end of the pipe is connected to the tractor container and the other end is lowered into the septic tank. The tank volume is mostly in the range of 2.5 – 3.5 cubic meters.

With the exception of Delhi, manual emptying in other two cities (Jaipur and Madurai) is completely absent. Municipality data reports that there are 1085 manual scavengers across the city in Delhi, over 96% of them are in east and north east Delhi. All of them are currently being rehabilitated by providing them alternate vocation opportunities. It is pertinent to note that these manual scavengers do not engage themselves in full time emptying business; they do perform lower order sanitation tasks such as cleaning drainage, unblocking sewerage lines, daily cleaning of toilets etc.

Vacuum tankers of various sizes are also deployed to carry out emptying. Two major types of mechanical emptying vehicles are used. One, tankers of 2000-2500 litre capacity mounted on a tractor trailer and the other medium sized trucks with tankers of 3000 -4000 litre capacity. If a vacuum tanker is not available, or unaffordable the sludge is cleared manually using buckets or gulpers. The faecal sludge is thus collected is heaped and left to dry for a day or two, or immediately disposed off, untreated into water bodies, drains, empty plots etc.

As most septic tanks are rarely emptied, they tend to be too full to perform the intended treatment, and instead serve as holding tanks. Effluent flowing out of septic tanks enters waterways which contaminates the nearest surface water-body. (POLICY PAPER ON Septage Management in India, MAY 2011).

Normally emptying frequencies vary. In majority of cases emptying is done when the tank is full or chocked. It is typically considered best practice to empty the tanks once every three to five years, or when the tank becomes one third full. Studies have shown that after this period, sludge decomposes, solidifies, and can no longer be removed by suction alone. Frequent emptying also helps to reduce the pollution levels in the liquid effluent, which typically enters waterways untreated. Septage is transported in tanks attached to tractors or tanks mounted on trucks in large towns and in smaller towns it is not uncommon to see septage being transported on bullock carts, rickshaws etc.

Throughout the country, private entrepreneurs play a major role in providing emptying services. Their wide spread presence demonstrates the inability of public service providers to meet existing emptying needs. Public owned emptying services have a very limited reach; they cover mainly public facilities. Most operators provide emptying services at the household level, but they hardly comply with environmental norms. Septage as a manure is not popularly accepted by farmers. They illegally dump septage do not make necessary investments, and ignore health and safety regulations. Cities do not have the capability and resources to regulate private service providers, nor do they form strategic public-private partnerships. There are no Fecal sludge treatment plants in Delhi, Jaipur and Madurai.

Sewerage Treatment Plant: All the three surveyed cities have sewerage treatment plants (STPs). The number of STPs and their combined capacities are presented below.

**Table 3-7: Number of STPs and total capacities**

| City | Number of STPs | Total Capacity |
|---|---|---|
| Delhi | 19 | 2823 MLD |
| Jaipur | 6 | 262 MLD |
| Madurai | 1 | 26 MLD+73 MLD is being added |

Source: DJB 2009, CDPs of Jaipur and Madurai

The utilization of capacities of STPs is sub-optimal for multiple reasons. For example, of the six sewerage treatment plants in Jaipur, some are fully operational, some are partly operational and some are currently under development. The sewerage treatment capacity of the fully operational plants is 89.5 MLD, and of the partly operational plant is 50 MLD. Partial operation is primarily due to incomplete linkages of both the sewerage network with the treatment system and incomplete water supply systems.

## FS end reuse in the three cities

As described earlier, fecal sludge is disposed off indiscriminately. There are no fecal sludge treatment plants across India, except for a very micro level, small scale initiatives. Solid Waste is collected from households by the municipalities (either directly collected or outsourced to private contractors), transported through trucks, tractors or rickshaws and disposed off in landfill sites. For example in Delhi, there three large landfill sites. However, all of them have outlived their life. In many cities, including Delhi the landfill sites also double as fecal sludge receptacles (in clandestine).

In the surveyed areas, emptiers dump emptied fecal sludge wherever they find convenient open space or they let it into open drains.

Planned fecal sludge treatment and use of treated sludge is non-existent. Dried sludge is sometimes procured by farmers in the neighbouring villages, mainly free of cost. The practice of emptiers paying some consideration money to farm owners to allow them to dump septage in their farms is observed in some cities. However, this practice is not observed in the three surveyed cities and reuse of septage rarely happens in an organized manner.

## Market analysis per city

Use of septic tanks and pit latrines in the three cities surveyed is widespread. The survey indicates that in Delhi it is 25% (20% septic tanks and 5% pits); in Jaipur a combination of single chambered tanks, double chambered septic tanks and cylindrical concrete structures are used, bringing the use of tanks to a total of about 20%. In Madurai use of septic tanks is 15% (all conventional septic tanks). The total number of households and the households having septic tanks and pits in the city in total are presented in the table below.

**Table 3-8: Number of septic tanks and pits**

| | Delhi | Jaipur | Madurai |
|---|---|---|---|
| Population | 10204284 | 3560000 | 1121043 |
| Number of HH in city | 1700714 | 508571 | 224209 |
| Number of HHs with septic tanks | 345409 | 20343 | 35873 |
| Number of HH with pits | 79448 | 81371 (cylindrical structures) | 0 |

Source for population and household data: Delhi: Census of India 2001; Jaipur: CDP, 2006 and Madurai: CDP 2006; Source for septic tanks and pits Household Survey

#### 3.2.1.1 Emptying frequency

The emptying frequencies of septic tanks as revealed during the survey are tabulated below.

**Table 3-9: FS Emptying frequency**

| **Emptying Frequency** | Delhi | Jaipur | Madurai |
|---|---|---|---|
| % HH that have emptied at least once | 33% | 68% | 79% |
| % Never emptied | 67% | 32% | 21% |
| 2-3 times / year | 0% | 15% | 18% |
| Once per year | 0% | 22% | 20% |
| Once every 2 years | 0% | 12% | 19% |
| Once every 3 years | 5% | 9% | 0 |
| Once every 4 years | 4% | 3% | 0 |
| Between 5 - 10 years | 24% | 6% | 22% |
| Over 10 years | 0% | 0% | 0% |

Source: Household Survey

The FS production per year per city, based on the household survey data is presented in the table below. For the theoretical market size estimation, following assumptions per day per

person are considered, separately for septic tanks and pits. This assumption differs from city to city.

**Delhi:** Pits are mainly dry type; sludge production is taken as 0.2 litres per person per day. Majority of the septic tanks are made of single chamber; they do not receive grey water; sludge production is taken as 0.7 litres per person per day.

**Jaipur:** The pits are made up of cylindrical concrete frames with holes through with liquid seep to the adjoining ground. This form of sanitation system is a hybrid of pit and septic tank and functions as septic tank in substitute. For such pits, theoretical value of sludge produced per day is taken as 0.3 litres. The septic tanks in the city do not receive grey water and most of the septic tanks are made of single chamber. Therefore, for septic tanks production of sludge is assumed to be 0.9 litres per person per day.

**Madurai:** Septic tanks in the city are single chamber and multi chamber. They receive grey water. Therefore, per capita sludge production is taken as 1.05 litres per day. There are no pits in Madurai.

The data indicates that there is huge gap (about 82.5%) between fecal sludge produced as per the survey (P1) and the theoretical calculation (P2) in Delhi, but the gap is much lower in Jaipur and Madurai. Existence of a large number of pit latrines (dry and wet) and the practice of letting the water freely flow out in to open drains contribute significantly to this difference. Septic tanks with open mouth that flow into the open drains are a common phenomenon in the surveyed areas in Delhi.

Fecal sludge collected as compared to P1 data in Delhi and Madurai are much lower (about 45% in Madurai and about 78.6% in Delhi) than P1, where as in Jaipur it is much higher (89.9%). The practice of selling fecual sludge as farm manure is insignificant in all the three places. Socio-cultural attitudes of treating human waste as to be totally discarded (as against cattle waste) and poor social acceptability of using human waste as manure are the main reasons behind this. The detailed calculation is attached in Annex 2.

**Table 3-10: FS production calculation**

| Production per Year | Delhi | Jaipur | Madurai |
|---|---|---|---|
| Based on survey data = **P1** | 98806m³ | 126004m³ | 66212m³ |
| Theoretical calc = **P2***(state assumptions used)* | 564310m³ | 129940m³ | 68742m³ |
| **FS Collected per year =C** | 77700m³ | 113400m³ | 30000m³ |
| What % is dumped in open | 100% | 100% | 100% |
| Where is it dumped | Open drains, vacant plots | Open drains, sewerage line, vacant plots, isolated open spaces | Vacant plots, flowing rivers, water bodies |
| What % is sold to users? And price received per m3 | Not sold. Occasionally, dry sludge is transported to farms free of cost; only transportation cost is charged to receivers | Not sold | Not sold |

Note: For detailed calculation and formulae refer Annex 2.

A Policy Paper titled "POLICY PAPER ON Septage Management in India (May, 2011)", published by the Centre for Science and Environment puts the average national norm of sludge production per septic tank, with average user size of four per tank at 2.5m³. This is the only reliable source of information that is available in India on septage production. The P1 calculation, in comparison with the CSE norm for each of the three cities is presented below. This represents the FS production for the entire households in the cities that are dependent on OSS.

**Table 3-11: FS Calculation**

| | Delhi | Jaipur | Madurai |
|---|---|---|---|
| Septic tanks | 345,409 | 20,343 | 35,873 |
| Pits | 79,448 | 81,371 | 0 |
| Total | 424,857 | 101,714 | 35,873 |
| User per tank/pit | 6 | 7 | 5 |
| Septage production as per CSE norm (only septic tanks; pits not counted) | 863,522m³ | 254,285m³ | 89,683m³ |
| P1 estimation as per survey data (including pits) | 98,806m³ | 126,004m³ | 66,212m³ |
| P2 estimation as per survey data | 56,4310m³ | 129,940m³ | 68,742m³ |
| Differential between P1 estimation and CSE norm | 65% of CSE norm | 51% of CSE norm | 77% of CSE norm |

Source: Septage Management in India, CSE, May 2011 and Household Survey

The difference between CSE norm and P1 calculation is pronounced in Jaipur and Delhi and less pronounced in Madurai. This can be explained as follows:

a) CSE norm is a generalized national norm; it does not account for location specific variations
b) CSE norm is applicable only for septic tanks and not when a mix of septic tanks and pits co-exist
c) This is reflected clearly in Madurai figures, where P1survey estimates are closer to CSE norm

Based on the survey data, the following scenario has been sketched for the three cities.

**Delhi:** In Delhi, about 424,857 households have on-site sanitation in which 67% (284,654) of the pits/septic tanks have not even emptied once, at least 3.5% (15,000) pits/septic tanks have been emptied by manual method and the rest 29.5% (125,333) pits/septic tanks have been emptied by mechanical emptiers.

Yearly market size of FS is 98,806$m^3$, Collection of FS by both mechanical and manual is 77,700$m^3$. Percentage difference in production and emptying is 21.34% (21,106m3 short in collection). This shows that the collection is far lower than production.

FS emptiers in Delhi work for 250 days in a year and maximum of two trips per day (as one trip takes about 3 hrs) and load per emptying is about 2.5$m^3$. Therefore, market holds the potential for 79 tractors, where as currently only 32 tractors are in operation. Further, when the rest 62% of the pits/septic tanks become full, the septage production increases to 56,4310$m^3$ (as most of the newly constructed pits/septic tanks are of larger size). In such a scenario, the requirement increases substantially.

The cost of mechanical emptying is about $9 per year and average household income is $183. In some areas in north Delhi, the average household income is even less (about $111). About 37% of the households expressed concern over high cost of emptying service, although about 50% preferred mechanical emptying service due to better quality of service. Over 91% of the households prefer to pay in a single transaction.

All the existing emptiers are in profits and all are equal players in the market. There is no single player who is large enough who can dictate the market price of services. This market in the city offers a level playing field for all operators and since the technology across emptiers is uniform, there is no differentiator in terms of quality of service.

Delhi Jal Board which handles water supply and piped sewerage collection has been planning to expand its service in many unauthorised regularised areas of Delhi. This plan may hinder the business expansion of current service providers or new service providers planning to enter into FS emptying business. No official dumping site in the city within close proximity, no parking areas to the tractors, increasingly tougher environment norms not allowing dumping of fecal sludge into the open environment further discourage the business. On the other hand, the pits/septic tank latrine system is boon as it is easy to install and maintain, this has helped people to transit from open defecation relatively safer practices. But this kind of toilet systems requires drainage. In Delhi, less than 30% of the pits store grey water. Septic tanks do store grey water but the amount of water drained out of the system daily is significant. In the surveyed areas, 68% of the households let grey water into open drainage. About 5% let waste water into neighbouring plots and 26% into open spaces. These unsafe practices compel people to demand piped sewerage system. This is also likely to result in shrinking of market size.

Yearly market size of FS in Delhi is 98,806m3, Collection of FS by both mechanical and manual is 77,700m3. Percentage difference in production and emptying is 21.34% (21,106m3 short in collection). When the 67% of the pits/septic tanks (who have not yet been emptied) become full, the septage production increases to 564,310m3 (as most of the newly constructed pits/septic tanks are of larger size). This figure is a fair representation of FS being produced by Delhi households depending on OSS.

**Jaipur:** The yearly septage required to be collected is 97% of the theoretical value of septage produced. The septage collected by the emptier in the city is about 90%. This amounts to a short collection of 12604 $M^3$. Taking the average trips per day as 3 per tractor and 300 days of yearly operations and the average sludge load per trip as 3$m^3$, there will be demand for 14 more tractors for emptying sludge currently left uncollected. But with the current technology, emptying solidified septage from the bottom layer of the onsite sanitation system is tough. Therefore this shortfall in sludge collection cannot be construed as true demand for deploying more tractors.

When the same assessment using the theoretical value of septage produced (including 32% of the onsite sanitation system that have not been emptied so far) is applied, emptying demand changes. The difference between the theoretical value of septage produced and the septage amounts out to be 16540 $m^3$. Assuming that collection efficiency of 95% (5% at the bottom layer cannot be emptied), the potential demand is taken as 15,713 $m^3$. To address this demand about 17 more tractors will be required. But this will become a 'real demand' only when those septic tanks which have never been emptied become full, and demand for emptying service surfaces.

The monthly average income of the households as ascertained by the survey is $195 and the annual household expenditure on emptying comes to be $7.4. 97% of the households pay the emptying fee in one time and almost all of them (99%) are happy over the payment method and quality of the service provided. The survey also indicated the only about 18% of households consider cost as the emptying service selection criterion. About 62% of households give weight to the quality of service and 19% decide upon the emptier availability. Since most of the people are satisfied with both the service fee and quality of service these two cannot act as differentiator for any new entrant in the business of sludge emptying.

The other important aspect to take note is the profitability of emptying business. All the existing emptiers are in profits and some of them have expanded their fleet from single unit ownership to two unit ownership. About 69% of the emptiers own single tractor and remaining own two tractors each. However, there is no single player who is large enough to determine the market price of services. This market in the city seem to be a perfectly competitive market where all the players are equal in terms of service quality and the market forces of competition mainly determining the emptying service.

With the continued expansion of piped sewerage system across the city, there is a concern amongst emptiers that their business is likely to shrink and therefore hold back on investments. With this, not many of them are further keen on expanding their fleet. Therefore in Jaipur it may be risky, to promote investments in emptying business. However, what is immediately needed is promoting investments in septage treatment infrastructure. There are no officially designated dumping sites in the city. The sludge gets dumped into the open environment as well as gets pumped into the existing piped sewerage system. The latter alters the constitution of the sewage thus adversely impacting the treatment. Therefore, septage treatment facility needs to be explored further. One option is promoting public private partnerships for which land can be provided by the municipal body.

The per capita water supply as per the CPHEEO norms for the city like Jaipur is 135 liters per day. Assuming that 80% of it gets converted into sewage, the everyday sewerage generated by the city comes out to be 384 MLD (million litres per day). City level data indicates that Jaipur has a combined capacity of sewerage treatment to the tune of 262 MLD. Out of which 139.5 MLD is operational and remaining is at the development stage. Therefore, it is observed that 68% of sewerage generated by the city will get treated by theses plants. Further in the interviews with it was estimated that about 30% of city population is outside the underground sewerage system network. 20% of city population use the onsite sanitation systems and 10% openly defecate which again is an environmental hazard.

The survey and interviews also found out that onsite sanitation systems mostly do not receive the grey water. The survey showed that waste water drains into open space in majority of the cases, which is calculated to be at 78% of the total households. Only 15% of respondents reported to have drainage channel for the waste water management. The problem of grey water can be addressed only by sewerage connectivity unless people invest in diverting grey water also into the septic tanks. This is very unlikely to happen, because the general public demand is for piped sewerage connectivity to be provided by the city administration.

Similar to Delhi, all the existing emptiers are in profits. About 69% of the emptiers own single tractor and remaining own two tractors each. However, there is no single player who is large enough to influence the market price of services. This market in the city seem to be a perfectly competitive one, where all the players are equal in terms of service quality and the market forces mainly determine the emptying service fee.

**Madurai:** In Madurai, about 35,873 households use septic tanks as on-site sanitation facility. 77% (27,622) of the septic tanks are emptied by mechanical emptiers and the rest 33% (8,251) septic tanks are emptied by family members.

Yearly market of FS is 66,212$m^3$; collection of FS by mechanical emptiers is 30,000$m^3$. The gap in production and collection is 54.7% (36212$m^3$), once again indicating collection is far lower than production.

At present, 10 mini trucks are in the business of providing emptying service. In the existing scenario, market potential indicates that there is space for at least 12 more trucks (assuming 300 working days a year, 2 trips per day and average tank capacity of 5$m^3$). The gap between FS production and theoretical value is marginal.

The emptying frequency shows that18% of households empty twice a year, 20% once a year, 19% once in two years, and 22% five to ten years. Balance 21% of the households not yet emptied. Since most of the tanks in Madurai are designed to receive grey water, it is necessary that they are emptied at periodical frequencies. This adds to the market potential. However, one key point that needs to be factored in is the ambitious plan of Madurai Municipal Corporation to cover the entire city with piped sewerage system, under its phase 3 expansion plan. This is likely to affect the market and further push the emptying business to the peripheries. About 47% of the households dispose the sludge in the open area, 9.5% let it into neighbouring plot. Most of them demand that the corporation should improve sludge collection, treatment and disposal mechanisms or provide centralized sewerage system.

Average monthly income of households is $222. Annual emptying service spend per household is $18.Only about 10% of the households mentioned cost as a determining factor.. A very high percentage of households (98%) expressed satisfaction over the quality of service provided. At

the same time, about 29% of the households showed willingness to pay more than the current market price, provided there is further improvement in the services provided.

## Service delivery models review

### Overview of existing models

#### Manual emptying service

Manual cleaning services exist only in Delhi, that too in the outer peripheries. Manual emptiers use equipments such as wicker buckets or plastic buckets, brooms, small tin scraper, spade, small shovel, drum, ropes and bare hands. They generally cart the refuse to disposal grounds fairly a long distance away. Carting is done is using bullock carts and/or rickshaw. These equipments, except for ropes, bullock cart and/or rickshaw are self-owned. Ropes, bullock cart and/or rickshaw are hired on need basis at Rs 40 to 50 per day (US $ 1) for rickshaw and Rs 10 per day (US $ 0.25) for a rope of about 10-15 feet in length. All the equipments and tools are re-used. Some of the equipments are put to multiple uses such as garbage collection, and transportation of solid waste

By and large, a group of two to three manual emptiers, cover an estimated 15,000 households in a five to ten km radius. Of the 15,000 households the demand comes from about one-third of the households. The demand for manual emptying services has drastically come down in the past decade or so because of two primary reasons i) increased awareness amongst clientele ii) abolition of scavenging through a formal Act (Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act, 1993) and iii) preference of households for mechanical emptying over manual emptying due to cost and speed of service factors. Many customers find manual emptying service as more efficient in terms of quality of cleaning.

Finding customers are now restricted to locations within a given settlement, where mechanical emptying is not feasible (lack of accessibility). Word of mouth by past customers and referrals by municipal supervisors are the only methods of finding business.

Competition mainly comes from mechanical emptiers, because of speed of service and convenience to the users of service. Competition from within the manual emptier community is almost non-existent. For example, during the nineties and early two thousand, there were over 50 to 60 manual emptiers per colony; now it has shrunk to five to six emptiers.

#### Mechanical emptying service

Mechanical emptying service in Delhi is dominated by small operators, with single unit ownership, mostly on self-employment basis. There are some exceptions though, where double unit ownership exists. However, such instances are rare and limited to ownership of two units. Most of the businesses are in existence for the past three to five years.

The vehicle used for this business is locally manufactured tractors (Mahindra or Sonalika), of 50 to 60 bhp. The tractor is attached with a trailer, with a closed metal container of 2000 to 4500 litres (3 $m^3$) carrying capacity. The cost of each unit ranges from Rs 600,000 (US $ 13,000) to Rs 750,000 (US $ 16,500), including all accessories. The accessories used are hose pipe of about 10 meter length and a pump mounted on the tractor.

While the tractor is bought from the outlets of tractor dealers of popular manufacturers (Mahindra, Fergusson etc), tanks are fabricated in Faridabad, a light engineering manufacturing hub near Delhi. Pumps and hose pipes are separately bought and then assembled or fitted to the unit. There are some cases of such units being bought on second ownership basis. The preference of these tractors over large trucks is based on the fact that these tractors are low cost, work well in the extraction business and can be driven through narrow lanes, from where most of the business comes from. High upfront investment in heavy duty trucks and the current volume of business does not justify switching to such vehicles. In addition, procuring low cost loans is also extremely difficult.

Approximately 75% of owners run their business on part bank finance; balance 25% use own funds. The banks finance only the tractor units and not the tankers and other accessories. Loans to tractors generally covered under agriculture financing and therefore, in one sense this comes as surrogate financing. Investment for tanks and other accessories comes from own sources or borrowings from the open market. The open market interest rates are as high as 24% per annum.

Bank finance works as follows:

a) Loan-Up to 80 to 85% of the tractor cost (if new)
b) Own finance: Balance 15 to 20%
c) Interest rate: 14%
d) Duration of loan: Generally it is extended between 5 to 10 years (refer income and expenditure statement)

Entrepreneurs in the business are affiliated to the lowest rung of social lineage. They are known by different social identities at different places; nomenclature varies even within the city. This is generally not the business of their first choice. Apparent “pull factor” in this business is entirely missing. Nevertheless, their motivation to be in the business arises out of the need to discard the traditional drudgery of scavenging and move up the value chain. Increasing awareness amongst users, regulation prohibiting manual scavenging (Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act, 1993), relative convenience etc are the other “push factors”. The mechanical nature of the extraction business also lends some social respectability. Inward migration of other business owners to this extraction business is rarely observed. However, the reverse is more frequent.

Government support is completely absent, because of the informal nature of the business. License to run the business in Delhi is not required, except for holding a tractor driving license. No formal or informal relationships exist with municipal authorities and other government agencies. Since it is not a registered business, no specific business related taxes are applicable. No formal business associations exist; informal territorial agreements are in operation

Business is promotion is done entirely through informal channels i.e. word of mouth and referrals by satisfied customers. No advertising, no formal promotion, no sign boards or distribution of billboards. The name and phone numbers of the owner are painted on the tanker is the only form of publicity. Some operators do opt for house-to-house distribution of business cards. Competition is not fierce because of limited number of operators in the area. Mostly it is ‘monopolistic’ in nature. No formal business associations are reported. However, informal arrangements of allotting specific territories to individual operators do exist.

The tractor is also used for other purposes such as tiling the land, hauling construction material etc on demand, which brings in some additional revenue (refer income and expenditure table). But the tank is used solely for the purpose of septage hauling.

Around 500 to 600 households in a year are served by a single business operator. Customers are primarily unauthorized colony residents in the urban poor settlements. The plot size of these residents is about 25 sq yard (30 sq meters), with some rare exceptions of 50 sq yard (41 sq

One driver and one helper make up the crew and they normally work six days a week, if the business is good. The emptying business is subject to seasonal variations. Monsoon and winter months (June-August and December-March) are peak months; during other months business is slack. During peak months, emptiers do log more trips (up to 4 trips); other months lower trips. Some days they go without business. On an average this works out to be 2 trips per day over 250 days in a year in Delhi and about 300 days in Jaipur and Madurai. During slack season tankers are dislodged from the tractors and are partly deployed for other businesses such as haulage of construction material and agriculture purpose in Delhi and to some extent in Jaipur. In Madurai, because mini trucks are built differently, they cannot be deployed for any secondary use.

In all the three cities, no formal relationship between the service providers and municipality exists, leaving the business completely unregulated. Other departments (police, environment) do harass them occasionally. Most operators are ignorant of legal requirements. However, many of them aware that indiscriminate disposal of septage poses a major health hazard. They also place the blame on local authorities for not providing any official sites for safe disposal of septage.

Sepatge disposal is done in a completely unregulated environment. It is dumped by the road side, let into drains or water bodies, dumped in the ‘municipal dhalaos’ in the neighbourhood or in the landfill sites (if they are nearby). Sometimes they are also used for land filling. Since this business is unregulated and unorganized, there is no need for authorization. Although the official position of the local bodies is that such a dumping is not permitted or does not occur.

Sludge reuse is not done in an organized manner. Some framers in the adjoining rural settlements ask for dried sludge free of cost. Only transportation cost, ranging from Rs 200 to Rs 300 (US $7) per load is charged. There is no other revenue generation out of sludge sale.

Awareness of emptiers regarding risks is restricted to the potential release of hazardous gas from the tanks while at work. They also understand that sludge affects their skin and creates respiratory problems.

A large majority of emptiers are in the extraction business out of compulsion and lack of other business skills. However, they aspire to move up the ‘value chain’ in the business by owning mechanized emptiers. To realize this, low cost financing is required. Banks in the public or private sector do not extend any financial assistance to the ‘unrecognized’ profession. Avenues of alternate vocation are very limited and the path of vocational mobility is very steep.

They believe that the municipalities are unable to meet the demand for emptying services in inaccessible pockets and therefore, municipalities should extend financial and regulatory help to set up their businesses.

Almost all operators articulated the need for properly demarcated space for dumping sludge. This will reduce harassment from the police. They also need help from local municipality for developing their business. For example, they can make regular emptying of septic tanks mandatory through regulation and by educating septic tank owners.

Service charges are negotiated after an initial visit to examine the location. It is decided on a combination of three primary factors i) size of the tank (estimated quantity of septage) ii) distance to emptying location and iii) number of trips. In addition, other factors such as accessibility to the tank, time of emptying service also contribute to the negotiation process. The fee is primarily decided by the emptier and households do not have great influence in this decision making. The emptying service fee is summarized in the table below.

### 3.3.2 Comparing with Solid waste management service model

The per capita solid waste generation in cities in India increased from 150 - 350 gm/day during seventies to about 320 - 530 gm/day in the eighties. The survey conducted by the Central Pollution Control Board (CPCB) puts the current estimate at a range of 350 to 800 gm/day (CPCB, 2006). Landfill sites quite a distance away from the city areas are the most used options to manage solid waste in India. Many experiments are being done by different urban local bodies for landfill-gas-to-energy (LFGE) conversion, primarily using public-private-participation mode.

The Okhla Landfill site is one such example. The landfill has approximately 6.8 million tons of waste in place, and is projected to reach a capacity of about 7.71 million tonnes when it closes in mid-2011. An LFG generation model was used based on waste disposal, waste composition. The outcome of the model indicated that LFG recovery at 50% of generation is projected to reach a maximum of approximately 2,278 cubic meters per hour ($m^3$/hour) in 2010 and decline after site closure.

In the current scenario, it is difficult to strictly separate septage from solid waste. World Bank in its report on Improving Solid waste Management in India cites that in many cities, municipal solid waste (MSW) contains human and animal excrement as well as hazardous chemical pollutants. In terms of service delivery, municipalities have the responsibility for solid waste management in their cities. However, most of them are currently unable to meet even average service delivery standards. Because of deficient collection services, uncollected waste—often also mixed with human and animal excreta—is dumped indiscriminately in the streets and in drains. (World Bank Institute, 2006)

The Municipal Solid Waste (Management and Handling) Rules lay down the steps to be taken by all municipal authorities to ensure management of solid waste according to best practice. Municipal authorities are required to follow the compliance criteria and procedure laid down in the rules. The procedure for collection, transportation, treatment and disposal of solid waste are laid down well in the law.

However, an expert committee appointed by the Supreme Court of India identified many deficiencies in the SWM in India. The list includes improper storage of waste at source, partial segregation of recyclable waste, poor primary collection of waste at the doorstep, irregular street sweeping, transport of waste in open vehicles, lack of treatment facilities and inappropriate disposal of waste at open dumping grounds

The solid waste generated in Indian cities is, by and large, not treated but is directly dumped in open dumpsites. Waste disposal is a neglected practice in India. Waste is dumped in low-lying

areas that are within or outside the cities and that are designated as dumping grounds or in unauthorized areas on the outskirts of the city. Sometimes waste is even dumped on the approach roads to rural areas, which do not have their own land for disposal of waste. Sweeping is the most common method adopted in India for primary collection of wastes deposited in the streets. However, they are not swept regularly. Slow speed mechanized vehicles after being used in some big cities. Moreover, there is no uniform benchmark for street sweeping. In some places, sweepers are allotted work in terms of a given amount of road length, usually 250 meters to 1 kilometer. In other places, measurement is on the basis of square meters. In such places, a sweeper maybe allotted 3,000 square meters or more. In still other places, allotment is made on the basis of a sweeper-to-population ratio: 1 sweeper per 250,500 or more people. The area allotted is swept in the first half of the day, and the street sweeper then carries the street sweepings to the designated waste storage places. It is the erstwhile sanitation workers or street sweepers who constitute the bulk of FS emptiers, in almost all the cities.

## 3.4 Financial and business model analysis

**Company level financial analysis: (for small mechanical business)**

A typical emptying service provider employs one person as a helper and the owner himself doubling as driver. The business size is small in all the three cities and operates for 250 to 300 days in a year. The financial analysis of atypical small sized emptier (without loan and with loan) is tabulated below. Detailed analysis of all emptiers in the three cities from whom financial data were collected are presented in Annex 3.

**Company level financial analysis (without loan)**

**Table 3-12: Financial analysis of company without loans**

| Year | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Total Investment including accumulated | 796,120 ($17,692) | 986,218 ($21,916) | 1,196,624 ($26,592) | 1,428,757 ($31,750) | 1,684,140 ($37,425) |
| Bank Loan | 0 | 0 | 0 | 0 | 0 |
| Own Investment (in Rs) | 796,120 ($17,692) | 986,218 ($21,916) | 1,196,624 ($26,592) | 1,428,757 ($31,750) | 1,684,140 ($37,425) |
| Gross Revenue (in Rs) | 800,000 ($17,778) | 856,000 ($19,002) | 915,920 ($20,354) | 980,034 ($21,779) | 1,048,637 ($23,303) |
| Net Present Value (5 years) (in Rs) | 484,600 | 10,769 | | | |
| Avg 5 yr monthly cash to operator | 17652 | $ 392 | | | |
| Return on Equity (5 years) | 22% | | | | |
| IRR Pre-tax | 52% | | | | |
| IRR Post Tax | 43% | | | | |

**Company level financial analysis (with loan)**

**Table 3-13: Financial analysis of company with loan borrowing**

| Year | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Total Investment including accumulated profits (in Rs) | 649,022 ($14,423) | 684,864 ($ 15,219) | 733,180 ($16,293) | 794,639 ($17,659) | 869,930 ($19,332) |
| Bank Loan (in Rs) | 425,746 ($9,461) | 340,402 ($7,564) | 242,313 ($5,385) | 129,575 ($ 2,879) | 0 |
| Own Investment (in Rs) | 223,276 ($4,962) | 344,463 ($ 7,655) | 490,867 ($10,908) | 665,065 ($14,779) | 869,930 ($19,332) |
| Gross Revenue (in Rs) | 680,000 | 727,600 | 778,532 | 833,029 | 891,341 |
| Dollars | 15,111 | 16,169 | 17,301 | 18,512 | 19,808 |
| Net Present Value (5 years) (in Rs) | 236841 | $ 5263 | | | |
| Average Monthly Cash to Operator (5 years) (in Rs) | 7207 | $ 160 | | | |
| Return on Equity (5 years) | 48% | | | | |
| IRR Pre-tax | 98% | | | | |
| IRR Post Tax | 74% | | | | |

**Role of public sector in business sustainability:**

The public sector plays no role in the business sustainability. JMC does not have any relationship with the private sludge emptier. The municipal body has neither any regulation for them nor there is any business registration requirement. The governments and government owned departments also do not have any schemes for the sludge emptier.

**Business analysis of Treatment Plants in the cities**:

There are no fecal sludge treatment plants in the cities surveyed.

## Recommendations for sustainable business models per city:

All the existing mechanical emptying operators in the city are profitable. Even at the current size of the market, the business is sustainable. However, the risk for business comes from the expanding piped underground sewerage system. With this, the operators will be pushed consistently towards the city periphery. This perhaps is the reason that even after being profitable, the number of tractors owned by most of the businesses is still single. The other reason is that although the market is a competitive one, the market offers limited space for new players. The existing business practices are also very completive since most of the operators operate with minimal overheads (office expenditure and personnel cost), with owners doubling

as drivers. These factors lessen the monthly outflow and make these businesses profitable. Therefore, it would be judicious to let the current business model continue unaltered.

**Access to finance**

There is mix of sources of finance. Operators rely on self financing, bank financing and the informal lending market. The bank finance interest rates range from 10-14% and loan repayment tenure is generally extended to a maximum of seven years. Mortgaging of property papers, as surety is in vogue. Also required is the submission of income tax returns for the past three years. Most operators are semi-literate and none of them pay income tax and therefore they cannot produce income tax payment certificates. Consequently, they are compelled to borrow money from informal lenders at significantly higher rates (up wards of 24% per annum; also see section 3.4.1.4.below).

**Role of public sector in business sustainability**

Public sector needs to play an important role in promoting and sustaining emptying business in India. Although sanitation is a state subject in India, state level agencies play more critical role. Some of the critical players at the state level are i) state urban development departments ii) state pollution control boards iii) state health departments iv) urban local bodies and v) public sector banks.

While the urban development departments engage in enacting laws, it is the responsibility of the urban local bodies to enforce rules and regulations. For example, urban local bodies need to ensure that the provisions of National Building Code are compiled with for all toilet constructions. They also need to provide public space for FS treatment sites/dumping sites and facilitate adoption of modern technology. For example, the outdated tractor mounted tanker technology needs to be changed and more modern methods of septic tank emptying and haulage of septage needs promotion. Similarly, septage treatment methods need to be introduced by incentivizing interested business owners. The Septage Management sub-component of the National Urban Sanitation Policy can be effectively used for this purpose. State pollution control boards have a role in enforcing environmental regulations; they can make significant contributions in educating all stakeholders including emptiers. Educating the general public on the need to regularly empty septic tanks and enactment and enforcement of regulations will further strengthen the market potential.

The financial analysis of emptying business in all the three cities indicates that it is a viable business and there is a huge demand supply gap. However, bank loans are difficult to come by and the loan is extended to emptiers partly i.e. only to the tractor component, where tractors are used. Most public sector banks extend loans for tractors to the extent of 75% of the investment at an interest rate ranging from 13% to 14% per annum. Hypothecation of tractors/trucks to the bank is a pre-requisite. Accessories are not financed. Tractors are generally financed under agriculture category, thereby promoting surrogate financing. This creates entry barriers. Public sector banks can remove these entry barriers and facilitate easier funding mechanisms. Because public sector bank finance is difficult to come by, most business owners raise loans through private sources, where the interest rates are much higher (close to 24%) and repayment conditions are rigid.

The State Urban Development and PHED/Water and Sanitation departments are responsible for supporting their urban areas with planning, financing, implementing, and monitoring sanitation related infrastructure and services. Under Jawaharlal Nehru National Urban Renewal Mission (JNNURM), cities are supported to propose their investment requirements based on City Sanitation Plans (CSPs). This is another window of opportunity for the cities to seek funding

from the Central Government. Although there is no direct source of finances for urban sanitation plans, the MoUD is assisting states and cities to source financial assistance from public, donor, and private sources.

Another public sector finance corporation that can play a major role in promoting business sustainability is the National Safai Karmacharis Finance & Development Corporation-NSKDC (National Sanitation Workers Finance & Development Corporation). It is fully owned by the Government of India and mandated to act as an apex institution for all round socio-economic development of sanitation workers and their dependents across India. The Mission of NSKFDC is to empower sanitation workers and their dependents to break away from their traditional occupation, depressed social condition and poverty and leverage them to work their own way up the social and economic ladder with dignity and pride. NSKFDC extends low cost finances, through state level channelizing agencies. Four types of loans that are extended include i) term loan ii) bridge loan iii) working capital loan and iv) micro-credit finance. The interest rates are subsidized and range from 3% to 6% per annum and the loan period can go up to 10 years. Easy quarterly repayment methods are a part of the financing strategy. Financing of emptying equipments can be covered under term loan categories. It also provides grants for skill development and entrepreneurial development of sanitation workers, which can be leveraged for skill development of emptying business owners.

Eligibility conditions for loans are well laid down. The beneficiary could be a Safai Karamchari or dependents duly identified under the National Scheme for Liberation and Rehabilitation of Scavengers (NSLRS) or a registered co-operative society of Safai Karamcharis or legally constituted association or firm promoted by the target group. The applicant must produce a certificate from the local Revenue Officer or an officer of local municipal office. No income limit is fixed for availing financial assistance. Financial viability, income-generating capacity of the project is considered while evaluating the project for financing.

### Business analysis of treatment plants in the cities

No FS treatment plants exist in the three cities surveyed. One micro level drying bed FS treatment model implemented by a small town Musiri in Tamil Nadu serves as a good example. Musiri town is located in the neighbouring district of Madurai.It is developed by using external donor funds and currently it works on anon-commercial mode. Therefore, commercial viability of such an experiment remains untested (refer annex for details)

### Recommendations for sustainable business models per city

## Country level (across cities)

The study indicates that there exists a good business potential for emptying business. The emptiers make reasonably good profits in all the three cities; more so in Delhi and Jaipur, despite using low end technologies.

### Difference in parameters across three cities

The difference in business parameters across Delhi and Jaipur are minimal. The technology and vehicles used in both the cities are comparable. Profit margins are nearly similar to the investment made. The business processes and business volume per emptier are also almost identical. But Maduari is set apart in terms of business processes, business volume and profitability. The technology adopted in Madurai is superior; vehicles used are mini trucks instead of tractors. Average distance logged per trip by emptiers in Delhi is about 58% to 62% higher than Jaipur and Madurai. However, marginally higher cost of diesel and lower fee levels

in Maduari neutralizes this apparent advantage of lower distance travelled. Time taken for emptying in Delhi and Madurai are closer to each other, where as in Jaipur is much lower. This is directly related to the type of tanks used in Jaipur (cylindrical structures) an holds as an advantage to Jaipur operators, purely from the angle of emptying process.

In Delhi and Madurai all operators are small operators with single truck ownership, where as in Jaipur, close to one third of the operators own two vehicles (tractors). Large operators with more than five vehicles do not exist in all the three cities.

Vehicles capacities in Delhi and Jaipur are lower at 2.5 to 3.5 m3, where as in Madurai it is much larger at 3 to 6 m3. Typical age of emptying vehicles is closer to each other (5 to 10 years) in Delhi and Jaipur, where as in Madurai they are relatively newer (5 years).

In Delhi business runs for about 250 days in a year with an average of two trips per day, where as in Jaipur it is 300 days with an average of three trips per day and in Madurai it is for 300 days with an average of two trips per day.

## Current service levels

## Current profitability

Return on Equity (RoE) and Internal Rate of Return (IRR) of emptier in the three cities is summarized below. All the operators in all the three cities (except for one Operator in Madurai) have healthy ROEs and IRRs. Higher number of operators in Delhi (4 out of 7) have recorded RoE 50% and above. In Jaipur 2 of the 5 operators fall in this bracket, where as in Madurai not a single operator has recorded 50% and above RoE; most of the operators in Madurai (3 out of 4) fall in the lower range i.e. less than 30%, with one operator making losses. The primary reason for this is the lower fee and higher operational cost. It is important to note that operators in Jaipur and Madurai make more number of trips per year (300 trips),as against 250 trips in Delhi.

In terms of IRR, similar picture emerges, with operators in Delhi and Jaipur recording relatively higher IRR. Five of the seven operators in Delhi recorded a very healthy IRR at 50% and above. Similarly, in Jaipur 4 out of 5 operators recorded 50% and above IRR. In Madurai, operators falling in this bracket are low at 1 out of 4. Of the other three, one is making losses, having recorded negative IRR and the other 2 have recorded IRR less than 30%.

**Table 3-14: RoE in all cities**

| City | Negative | Less than 20% | 20-30% | 30-40% | 40-50% | 50% and above | Total |
|---|---|---|---|---|---|---|---|
| Delhi | 0 | 0 | 2 | 0 | 1 | 4 | 7 |
| Jaipur | 0 | 1 | 1 | 1 | 0 | 2 | 5 |
| Madurai | 1 | 2 | 1 | 0 | 0 | 0 | 4 |

**Table 3-15: IRR in all cities**

| City | Negative | Less than 20% | 20-30% | 30-40% | 40-50% | 50% and above | Total |
|---|---|---|---|---|---|---|---|
| Delhi | 0 | 0 | 0 | 1 | 1 | 5 | 7 |
| Jaipur | 0 | 0 | 1 | 0 | 0 | 4 | 5 |
| Madurai | 1 | 1 | 1 | 0 | 0 | 1 | 4 |

## Projected profitability in 3-5 years

The projected profitability of operators over five years indicates that the rate is much higher in Delhi, as compared with Jaipur and Madurai. In Delhi, it ranges from a minimum of 22% to a maximum of 64%. In Jaipur, it falls anywhere between 19% and 53% and in Madurai it is much lower at (-) 9% (one operator) to a maximum of 27%. Therefore, Delhi holds greater potential for business investment as compared to Jaipur and Madurai. Jaipur falls in the middle range amongst the three cities surveyed and Madurai in the bottom range.

# 4. Conclusions

Based on the analysis presented in the above sections, the conclusions and recommendations from the study are summarized below:

**Technology**

- The use of pits and single chamber septic tanks is in vogue in many urban poor settlements in Delhi. Septic tank design guidelines do exist but they are hardly enforced. Emptying service is called for only when hydrological overloading takes place and starts overflowing.
- Septic tanks are generally are oversized to the size of the plot (mainly in Delhi), with the basic premises that the bigger the size, lesser is the emptying frequency. This, in the perception of households saves their annual maintenance cost.
- The waste water from these systems is drained out to the open drains daily. To make any noticeable improvement in sanitation, this needs to be improved before initiating any improvements in emptying services.
- Pits are conspicuously absent in Jaipur and Madurai. In Jaipur, a hybrid type of septic tank system (cylindrical, concrete structures) is widely in use, where as Madurai the preference is for septic tanks. Because of the seepage provided in the design, the hybrid system used in Jaipur pollutes adjacent soil, in addition to contaminating groundwater. Hybrid system is not an environmentally friendly option. Any fecal sludge emptying improvement, in the absence of this outdated sanitation technology upgrading, will not result in the overall improvement.

Given the above situation, improvements in the toilet system design must precede investments in improving fecal sludge emptying services.

**Emptying business, financial support and regulation**

On-site-sanitation system owners and emptying business owners operate in an unregulated, unsupported environment. The number of septic tank owners in the peripheries of the cities is rapidly growing. So is the number of emptiers. However, with the increased preference of the cities (tier one and two) in India to opt for centralized piped sewerage systems, the emptying business has been shrinking in the city centres and they are pushed to the periphery, where they have seen growth in the business. These areas need immediate attention on fecal sludge management.

Emptying business owners operate “informally” in the market, in an unregulated environment. Public sector financing is not dependable, private money borrowing is an expensive proposition.

- The business today stands on its own. A positive feature of the business is that no single emptier is dominant enough to significantly influence pricing decisions. Price is normally decided by the overall market phenomenon and negotiation between the service provider and the service receiver Therefore, pricing and revenue flow is neutral to the size of the fleet. Spatial spread of emptiers is almost even in the three cities. There is an informal arrangement amongst emptiers in Delhi to draw territorial lines of operation. This is also observed to an extent in Jaipur and Madurai. This has both positive and negative aspects.
- Cooperative or micro-financing models need to be promoted to support the business. Provisions made under the septage management sub-plan component of the National Urban Sanitation Policy can be leveraged for this purpose. Convergence of funds available under the National Safai Karmacharis Finance & Development Corporation can benefit a

large number of emptying business owners. A concerted effort at coordinating and influencing towards this end is needed.

The municipal corporations in all the three cities are not yet ready to lay down regulations nor are they able to provide any support to emptying business. On-site-sanitation systems are outside the purview of WSS Boards. Emptying business fills the gap and meets the market need perfectly well, without the need to be concerned about environmental considerations. Under these circumstances, the key challenge is to achieve a balance between promoting emptying business and regulating the treatment and disposal of septage.

**FS treatment**

- Fecal sludge is emptied in to the open environment; no treatment is done. No official dumping sites are earmarked by the municipal corporations in all the three cities; no emptying frequency is defined or enforced. Lack of officially designated space to dispose off septage is the major constraint faced by all emptiers. In Delhi, official landfill sites to some extent double as fecal sludge receptacles and alter the waste composition. In Jaipur, it is let into the sewerage system in a clandestine manner, resulting in complexities in sewage treatment plant.
- In the current policy scenario, it is not possible to separate septage from solid waste. In all the three cities, municipal solid waste is unknowingly mixed with fecal sludge. In terms of service delivery, municipalities have the responsibility for solid waste management in their cities. However, most of them are currently unable to meet the growing demand and provide dismal level of services, despite the procedure for collection, transportation, treatment and disposal of solid waste being laid down well in the law. To ensure more scientific management of fecal sludge, this problem needs to be addressed on priority.
- Municipal corporations, therefore, need to provide designated places and facilities for septage dumping and promote fecal sludge treatment methods. In this context, the pilot experiment being conducted by Musiri town panchayat holds promise for replication. FS treatment can also be tried on PPP mode with some support from the state urban development departments across three cities.

**Capacity building and community awareness**

Awareness regarding scientific aspects of septic tank design and the need for regular emptying and upkeep of the tanks is poor across stakeholder categories. The national building codes are not up-to-date to meet the changing needs. They are not entirely adhered to even by public sector organizations. Concerted efforts needed to revise the codes and educating all users, in the public sector domain as well as in the communities. This will help the emptying business significantly.

**Annex 1**

## Assessment of FS management in all three cities

| | City 1 (Delhi) | City 2 (Jaipur) | City 3 (Madurai) |
|---|---|---|---|
| Population | 10204284 | 3560000 | 1121043 |
| Number of HH in city | 1700714 | 508571 | 224209 |
| Number of HHs with septic tanks | 345409 | 20343 | 35873 |
| Number of HH with pits | 79448 | 81371 | 0 |
| Number of HH with holding tank/cesspools | 0 | 0 | 0 |
| HH survey sample size | 600 | 300 | 300 |
| What number of HH is the city does this sample represent? | 0.14% | 0.29% | 0.84% |

**Access to Drinking Water**

| | City 1 (Delhi) | City 2 (Jaipur) | City 3 (Madurai) |
|---|---|---|---|
| % HH with Piped systems to household | 4% | 46% | 14% |
| % HH using Piped systems to public taps | 0% | 14% | 26% |
| % HH using Wells | 0% | 12% | 45% |
| % HH using Private vendors | 4% | 16% | 13% |
| % using Other sources- specify please (Bore wells+ DJB Tanker) | 92% | 12% | 2% |

**Type of sanitation facilities**

| | City 1 (Delhi) | City 2 (Jaipur) | City 3 (Madurai) |
|---|---|---|---|
| % HH with no sanitation | 2% | 7% | 3% |
| % HH with direct connection to sewer network | 1% | 0% | 0% |
| % HH with Septic Tank | 46% | 93% | 97% |
| % HH with holding tank/cesspools | 0% | 0% | 0% |
| % HH with pit latrines | 51% | 0% | 0% |
| % HH with VIP | 0% | 0% | 0% |
| % HH w septic tanks to sewer network | 0% | 0% | 0% |
| % HH w pits to sewer network | 0% | 0% | 0% |
| % HH with Other (describe "other") | 0% | 0% | 0% |

**Usage of Sanitation facility from surveyed areas**

| | Delhi | Jaipur | Madurai |
|---|---|---|---|
| Number of people per HH | 6 | 7 | 5 |
| average users per toilet | 6 | 7 | 5 |
| % Pits/tanks that receive grey water | Not captured | Not captured | Not captured |

**Emptying Frequency**

| | City 1 (Delhi) | City 2 (Jaipur) | City 3 (Madurai) |
|---|---|---|---|
| % HH that have Emptied at least once | 33% | 68% | 79% |
| % Never emptied | 67% | 32% | 21% |
| % that do not know | | | |
| 2-3 times / year | 0% | 15% | 18% |
| Once per year | 0% | 22% | 20% |
| Once every 2 years | 0% | 12% | 19% |
| Once every 3 years | 5% | 9% | 0 |
| Once every 4 years | 4% | 3% | 0 |
| Between 5 - 10 years | 24% | 6% | 22% |
| Over 10 years | 0% | 0% | 0% |

**Method of emptying**

| | Delhi | Jaipur | Madurai |
|---|---|---|---|
| % HH that use manual emptiers | 1% | 0% | 0% |
| % HH that use mechanical emptiers | 96% | 100% | 77% |
| Other | 3% | 0 | 33% |

**Monthly income**

| HH Survey Data : HH expenses | Delhi | Jaipur | Madurai |
|---|---|---|---|
| Average income (USD/HH/month) (1$ = `45) | $183 | $195 | $222.22 |

**Cost of other services**

| | Delhi | Jaipur | Madurai |
|---|---|---|---|
| average water bill (USD/month) | Free supply in surveyed locality | $6.5 | $2.24 |
| average phone bill (USD/month) | $7.50 | $8.8 | |
| average electricity bill (USD/month) | $19 | $32.6 | $8 |
| average solids waste collection bill (USD/month) | 0 | 0 | 0 |

**Annual emptying cost**

| | Delhi | Jaipur | Madurai |
|---|---|---|---|
| Avg annual manual emptying cost per household | $4.7 * | 0 | 0 |
| Avg. annual mechanical emptying cost per household per service | $9 * | $7.4 | $17.77 |

**In Delhi average emptying frequency of 33% of hhs who have emptied works out to be once in 5 years. Therefore, average annual cost per household works out to be $9*

**FS Production Rate**

| | **Delhi** | **Jaipur** | **Madurai** |
|---|---|---|---|
| **PRODUCTION per YEAR** | | | |
| Based on survey data = **P1** | 98806m³ | 126004m³ | 66212m³ |
| Theoretical calc = **P2***(state assumptions used)* | 564310m³ | 129940m³ | 68742m³ |
| **FS Collected per year =C** | 77700m³ | 113400m³ | 30000m³ |
| What % is dumped in open | 100% | 100% | 100% |
| Where is it dumped | Open drains, vacant plots | Open drains, sewerage line, vacant plot, isolated open spaces | Vacant plots, flowing river, water bodies |
| What % is sold to users? And price received per m3 | 0 | 0 | 0 |

**Mechanical emptying business information**

| | Delhi | Jaipur | Madurai |
|---|---|---|---|
| # of private mechanical businesses in the city | 35 | 29 | 10 |
| # of trucks run by private businesses | 35 | 38 | 10 |
| # of trucks owned by utilities | 24 | 4 | 2 |
| Are Utility trucks used for HH emptying? | No | Yes | No |
| What is typical HH emptying fee (manual)? USD | $18 | 0 | 0 |
| What is typical HH emptying fee (mechanical)? USD | $45 | $11.8 | $20 |
| What is the fee per m3 for mechanical emptying? | $18 | $3.9 | |
| # of private businesses that are small (1 truck) | 100% | 69.00% | 100% |
| # of private businesses that are medium size (2-5 trucks) | 0 | 31% | 0 |
| # of private businesses that are large (>5 trucks) | 0 | 0 | 0 |
| What is the range of capacities of private trucks (m3) | 2.5-5 | 2.5-3.5 | 3.0-6.0 |
| What is most common capacity of private truck m3? | 3 | 3 | 5 |
| Most common truck capacity for utility (m3) | 3 | 3 | 5 |
| Price for new truck (mention for what m3 capacity ) | $16,500 | $12,500 | $15,555 |
| Price for 2nd-hand truck (3000 to 5000 ltr capacity) | $7,500 | $6,818 | $ 8,000 |
| Are most trucks 2nd hand or new at time of purchase | New | New | New |
| Typical age of trucks in city? | 5 to 8 years | 5 to 10 years | 3 to 5 years |
| What is typical number of trips per day for the trucks? | Two trips per day for 250 days in a year | Three trips per day for 300 days in a year | Two trips per day for 300 days in a year |
| Avg distance per trip | 24 km | 14 | 15 Km |
| Avg time per trip | 2-3 hrs | 1.3 Hrs | 2 hrs |
| Cost of fuel for truck? (USD/liter) | $1/liter | $1/liter | $1.1/liter |

**Financial Access**

| Financial access for private owners | India |
|---|---|
| Who is the Owner? (self employed, Civil servant? Venture?) | Self Employed |
| What % of the private truck owners take loans? | 10% |
| What are bank interest rate and years for repayment? | 12% to 14% |
| Are the rest self-financing? | Yes |
| Do they run any other business from which they get this self finance money? | Yes, agriculture |
| What % of the FS emptying owners do this as their main business? | 80% |
| What are the other sources of funding for these operators besides bank and personal money? | Potential exists to tap loans from public funding through national schemes |

**Dumping site and treatment of waste**

| | Delhi | Jaipur | Madurai |
|---|---|---|---|
| What is the official dumping site for city? (WWTP, FSTP, wetlands, landfill, official site, or open?? | Landfill, open | Open | Open |
| Who operates the treatment plant? | No FSM treatment plant exists | No FSM treatment plant exists | No FSM treatment plant exists |
| What is the m3 capacity of this treatment facility? | 0 | 0 | 0 |
| Where is it located? (center of city, edge of city, outside city..?) | 0 | 0 | 0 |
| Where should the treatment site be located? How many sites are best? | In the periphery of East, West and North Delhi. One site per area. Locations cannot be specified at this stage | Only specific location studies can pin point sites | Only specific location studies can pin point sites |
| What is the dumping fee truckers have to pay? | 0 | 0 | 0 |
| Is this payment per trip or per month or m3 | 0 | 0 | 0 |
| What % of emptying trucks in city actually do to official dumping site? | 0 | 0 | 0 |

**Annex 2**

## Calculation of Fecal Sludge Production

## Calculation of FS production: Delhi

| **Calculations** | | |
|---|---|---|
| Number of households in the city = | **HH** | 1700714 |
| % of the city HH with On-site sanitation = | OSS% | 25% |
| Number of the city HH with On-site sanitation = | OSS% x HH= OSS | 424857 |
| % of the HH with on-site sanitation having pits in the city = | PIT% | 18.7% |
| % of the HH with on-site sanitation having septic tanks in the city = | ST% | 81.3% |
| % of the HH with on-site sanitation having OTHER (i.e. cesspools, holding tanks) in the city = | CES% | |
| Number of the HH with on-site sanitation having pits in the city = | PITS% x OSS = **PITS** | 79448 |
| Number of the HH with on-site sanitation having septic tanks in the city = | ST% x OSS = **ST** | 345409 |
| Typical volume of the septic tank = | **SV** $m^3$ | $7m^3$ (30%); $3.88m^3$ (30%); $1.15m^3$ (40%) |
| Typical volume of the pits = | **PV** $m^3$ | $1.72m^3$ (60%); $2.6m^3$ (40%) |
| Typical volume of the Cesspool/Holding tanks = | **CV** $m^3$ | |

**Number of Pits and septic tanks to be emptied in a year**

| Survey Data | Emptying Frequency Pits | # pits to be Emptied/yr | Emptying Frequency Septic Tanks | # Septic tanks to be Emptied/yr | Emptying Frequency cesspools | # Frequency cesspools to be Emptied/yr |
|---|---|---|---|---|---|---|
| 2 times/yr | 0.0% | 0.00 | 0% | 0.00 | 0% | ST x 0% x 2 |
| Once/yr | 0.0% | 0.00 | 0% | 0.00 | 0% | ST x 0% x 1 |
| Once/2 yrs | 0.0% | 0.00 | 0% | 0.00 | 0% | ST x 0% x 0.5 |
| Once/3yrs | 10.0% | 2621.78 | 0% | 0.00 | 0% | ST x 0% x 0.33 |
| Once/4 yrs | 8.0% | 1588.96 | 0% | 0.00 | 0% | ST x 0% x 0.25 |
| 5-10 yrs | 20.0% | 2065.65 | 28% | 12572.89 | 0% | ST x 0% x 0.13 |
| Over 10 yrs | 0.0% | 0.00 | 0% | 0.00 | 0% | ST x 0% x 0.1 |
| Not done Yet | 62.0% | - | 72% | - | 0% | - |
| | TOTAL Pits TO BE emptied per year = | 6276 | TOTAL Septic tanks To BE emptied/ year = | 12573 | TOTAL cesspools To BE emptied/ year = | Sum of all these cells = C |

| | | | | |
|---|---|---|---|---|
| P1 | Market Size = | Total VOLUME of sludge TO BE emptied / year | $m^3$ | |
| P2 | Theoretical Market Size = | Total VOLUME of sludge TO BE emptied / year | 564310$m^3$ | |
| **C** | **Current FS COLLECTED =** | | **77700$m^3$** | |

**Note:**

- Septic tanks are available in three different sizes (8ft x 8ft x 4ft; 6ft x 6ftx 4ft; 4ft x 4ft x 3ft) and there percentage distribution is taken into account for FS volume calculation similarly simple pits are two different sizes ( 6ft x 4ft x 4ft; 6ft x 4ft x 3ft) their percentage distribution is also considered in calculating FS volume.
- Household size is 6; Amount of fecal sludge for septic tank is 0.7 lt/person/day and simple pit 0.3 lt/person/day
- Number of trucks is 32, with capacity of 2500 liters and each truck making 500 trips per year. About 1085 manual scavengers clean 15000 septic tanks and simple pits in a year.

**Calculation of FS production: Jaipur**

| **Calculations** | |
|---|---|
| Number of households in the city = | 508571 |
| % of the city HH with On-site sanitation= | 20.00% |
| Number of the city HH with On-site sanitation = | 101714 |
| % of the HH with on-site sanitation having pits in the city (from your HH survey) = | 80.00% |
| % of the HH with on-site sanitation having septic tanks in the city (from your HH survey) = | 20.00% |
| % of the HH with on-site sanitation having OTHER (i.e. cesspools, holding tanks) in the city (from your HH survey) = | 0 |
| Number of the HH with on-site sanitation having pits in the city (from your HH survey) = | 81371 |
| Number of the HH with on-site sanitation having septic tanks in the city (from your HH survey) = | 20343 |
| Typical volume of the septic tank = | 4.4 |
| Typical volume of the pits = | 1.25 |
| Typical volume of the Cesspool/Holding tanks = | 0 |

| Survey Data | Emptying Frequency Pits | # pits to be Emptied/yr | Emptying Frequency Septic Tanks | # Septic tanks to be Emptied/yr | Emptying Frequency cesspools | # Frequency cesspools to be Emptied/yr |
|---|---|---|---|---|---|---|
| 2 times/yr | 30% | 48823 | 0% | 0 | 0 | 0 |
| Once/yr | 44% | 35803 | 0% | 0 | 0 | 0 |
| Once/2 yrs | 16% | 6510 | 8% | 814 | 0 | 0 |
| Once/3yrs | 0% | 0 | 18% | 1208 | 0 | 0 |
| Once/4 yrs | 0% | 0 | 8% | 407 | 0 | 0 |
| 5-10 yrs | 0% | 0 | 12% | 317 | 0 | 0 |
| Over 10 yrs | 0% | 0 | 0% | 0 | 0 | 0 |
| Not done Yet | 10% | - | 54% | - | 0 | 0 |
| | TOTAL Pits TO BE emptied per year = | 91136 | TOTAL Septic tanks To BE emptied/ | 2746 | TOTAL cesspools To BE emptied/ | 0.00 |

| | | | | |
|---|---|---|---|---|
| **P1** | Market Size = | Total VOLUME of sludge TO BE emptied / year | 126004$m^3$ | |
| **P2** | Theoretical Market Size = | Total VOLUME of sludge TO BE emptied / year | 129940$m^3$ | |
| **C** | Current FS COLLECTED = | | 113400$m^3$ | |

**Calculation of FS production: Madurai**

| **Calculations** | |
|---|---|
| Number of households in the city = | 224209 |
| % of the city HH with On-site sanitation= | 16% |
| Number of the city HH with On-site sanitation = | 35873 |
| % of the HH with on-site sanitation having pits in the city (from your HH survey) = | 0 |
| % of the HH with on-site sanitation having septic tanks in the city (from your HH survey) = | 100% |
| % of the HH with on-site sanitation having OTHER (i.e. cesspools, holding tanks) in the city (from your HH survey) = | CES% |
| Number of the HH with on-site sanitation having pits in the city (from your HH survey) = | 0 |
| Number of the HH with on-site sanitation having septic tanks in the city (from your HH survey) = | 35873 |
| Typical volume of the septic tank = | 2.7 $m^3$ |
| Typical volume of the pits (PV) = | 0 $m^3$ |
| Typical volume of the Cesspool/Holding tanks (CV) = | 0 $m^3$ |

| Survey Data | Emptying Frequency Pits | # pits to be Emptied/yr | Emptying Frequency Septic Tanks | # Septic tanks to be Emptied/yr | Emptying Frequency cesspools | Frequency cesspools to be Emptied/yr |
|---|---|---|---|---|---|---|
| 2 times/yr | | PITS x 2% x2 | 18% | 12914.4384 | 4% | ST x 4% x 2 |
| Once/yr | | PITS x 4% x1 | 20% | 7174.688 | 25% | ST x 25% x 1 |
| Once/2 yrs | | PITS x 25% x 0.5 | 19% | 3407.9768 | 2% | ST x 2% x 0.5 |
| Once/3yrs | | PITS x 10% x 0.33 | 0% | 0 | 12% | ST x 12% x 0.33 |
| Once/4 yrs | | PITS x 12% x .25 | 0% | 0 | 14% | ST x 14% x 0.25 |
| 5-10 yrs | | PITS x 14% x 0.13 | 22% | 1025.98 | 10% | ST x 10% x 0.13 |
| Over 10 yrs | | PITS x 18% x 0.1 | 0% | | 18% | ST x 18% x 0.1 |
| Not done Yet | | - | 21% | 0 | 15% | - |
| | TOTAL Pits TO BE emptied per year = | Sum of all these cells = A | 100% | 24523.08 | TOTAL cesspools To BE emptied/ year = | Sum of all these cells = C |

| | | | | |
|---|---|---|---|---|
| **P1** | Market Size = | Total VOLUME of sludge TO BE emptied / year | $m^3$ | |
| **P2** | Theoretical Market Size = | Total VOLUME of sludge TO BE emptied / | 68742$m^3$ | |

| | | | | |
|---|---|---|---|---|
| | | year | | |
| **C** | Current FS Collected = | | 30000m³ | |

**Annex 3**

## Financial Analysis of Emptiers

### Delhi:

Baba Tankers

| Year | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Total Investment including accumulated profits (in Rs) | 796,120 | 986,218 | 1,196,624 | 1,428,757 | 1,684,140 |
| Dollars | 17,692 | 21,916 | 26,592 | 31,750 | 37,425 |
| Bank Loan | 0 | 0 | 0 | 0 | 0 |
| Own Investment (in Rs) | 796,120 | 986,218 | 1,196,624 | 1,428,757 | 1,684,140 |
| Dollars | 17,692 | 21,916 | 26,592 | 31,750 | 37,425 |
| Gross Revenue (in Rs) | 800,000 | 856,000 | 915,920 | 980,034 | 1,048,637 |
| Dollars | 17,778 | 19,022 | 20,354 | 21,779 | 23,303 |
| Net Present Value (5 years) (in Rs) | 484600 | USD 10769 | | | |
| Avg 5 yr monthly cash to operator | 17652 | USD 392 | | | |
| Return on Equity (5 years) | 22% | | | | |
| IRR Pretax | 52% | | | | |
| IRR Post Tax | 43% | | | | |

Baba Tankers has only one employee. He has invested a sum of Rs. 625,000 ($13,880) from own sources. His commitment towards interest and repayment of principal per annum are NIL. Net present value of his investment for 5 years at 15% discount works out to be Rs. 4,84,600 ($ 10,769). His average net cash inflow is Rs. 17,652 ($392), post tax. Although he does not currently pay any tax, it is assumed to be 20% of earnings. Average Return on Equity is 22% assuming that he is reinvesting profits in business. In case, he withdraws part of profits for self use, his return on equity will increase. Internal rate of Return of 43% (Post Tax) is quite promising. However, if he has taken a loan and invested less equity he would have earned more return on equity in percentage terms.

Kamal Tankers

| Year | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Total Investment including accumulated profits (in Rs) | 580,689 | 675,139 | 784,170 | 908,644 | 1,049,454 |
| Dollars | 12,904 | 15,003 | 17,426 | 20,192 | 23,321 |
| Bank Loan (in Rs) | 340,596 | 272,321 | 193,850 | 103,660 | 0 |
| Dollars | 7,569 | 6,052 | 4,308 | 2,304 | 0 |
| Own Investment (in Rs) | 240,093 | 402,817 | 590,320 | 804,984 | 1,049,454 |
| Dollars | 5,335 | 8,951 | 13,118 | 17,889 | 23,321 |

| | | | | | |
|---|---|---|---|---|---|
| Gross Revenue (in Rs) | 849,000 | 908,430 | 972,020 | 1,040,062 | 1,112,866 |
| Dollars | 18,867 | 20,187 | 21,600 | 23,112 | 24,730 |
| Net Present Value (5 years) (in Rs) | 422055 | USD 9379 | | | |
| Average Monthly Cash to Operator (5 years) | 11658 | USD 259 | | | |
| Return on Equity (5 years) | 64% | | | | |
| IRR Pre-tax | 175% | | | | |
| IRR Post Tax | 138% | | | | |

Kamal Tankers has one employee. He has invested a sum of Rs. 5, 00,000 ($11,110) in business out of which Rs. 400,000 ($8,888) is taken as loan @ 14% per annum and balance 100,000 ($2,222) from own sources. His commitment towards interest and repayment of principal is 1, 12,000 ($2,488). Net present value of his investment for 5 years at 15% discount is Rs. 422,055 ($9,379). His average net cash inflow is Rs.11,658 ($259), post tax. Although he does not currently pay any tax, it is assumed to be 20% of earnings. Average Return on Equity is 64% assuming he is not withdrawing anything from business and reinvests profits into business. However, in case, he withdraws part of profits for self use, his return on equity will increase. Post tax IRR of 138% indicates excellent returns.

Nagar Tankers

| **Year** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
|---|---|---|---|---|---|
| Total Investment including accumulated profits (in Rs) | 663,262 | 714,341 | 778,960 | 857,864 | 951,821 |
| In US Dollars | 14,739 | 15,874 | 17,310 | 19,064 | 21,152 |
| Bank Loan(in Rs) | 425,746 | 340,402 | 242,313 | 129,575 | 0 |
| Dollars | 9,461 | 7,564 | 5,385 | 2,879 | 0 |
| Own Investment (in Rs) | 237,516 | 373,939 | 536,648 | 728,290 | 951,821 |
| Dollars | 5,278 | 8,310 | 11,926 | 16,184 | 21,152 |
| Gross Revenue (in Rs) | 680,000 | 727,600 | 778,532 | 833,029 | 891,341 |
| Dollars | 15,111 | 16,169 | 17,301 | 18,512 | 19,808 |
| Net Present Value (5 years) (in Rs) | 290719 | USD 6460 | | | |
| Average Monthly Cash to Operator (5 years) | 8572 | USD 190 | | | |
| Return on Equity (5 years) | 51% | | | | |
| IRR Pretax | 113% | | | | |
| IRR Post Tax | 86% | | | | |

Nagar Tankers has one employee as a helper. He has invested a sum of Rs. 6, 25,000 ($13,888). Ha has taken a loan of Rs. 500,000 ($11,111) @ 14% per annuam and balance Rs. 125,000 ($2,778) has been invested from own sources. His commitment towards interest and repayment of principal is Rs. 140,000 ($3,111). Net present value of his investment for 5 years at 15% discount is Rs. 2,90,719 ($6,460). His average net cash inflows are Rs.8572 ($190), post tax. Although he does not currently pay any tax, it is assumed to be 20% of earnings Average Return on Equity is 51% assuming he is not withdrawing any cash and reinvests in business In case, he withdraws part of profits for self use, his return on equity will increase. Post Tax Internal Rate of Return of 86% reflects a healthy business.

Prakash Tankers

| **Year** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
|---|---|---|---|---|---|
| Total Investment including accumulated profits (in Rs) | 649,022 | 684,864 | 733,180 | 794,639 | 869,930 |
| Dollars | 14,423 | 15,219 | 16,293 | 17,659 | 19,332 |
| Bank Loan (in Rs) | 425,746 | 340,402 | 242,313 | 129,575 | 0 |
| Dollars | 9,461 | 7,564 | 5,385 | 2,879 | 0 |
| Own Investment (in Rs) | 223,276 | 344,463 | 490,867 | 665,065 | 869,930 |
| Dollars | 4,962 | 7,655 | 10,908 | 14,779 | 19,332 |
| Gross Revenue (in Rs) | 680,000 | 727,600 | 778,532 | 833,029 | 891,341 |
| Dollars | 15,111 | 16,169 | 17,301 | 18,512 | 19,808 |
| | | | | | |
| Net Present Value (5 years) (in Rs) | 236841 | USD 5263 | | | |
| Average Monthly Cash to Operator (5 years) (in Rs) | 7207 | USD 160 | | | |
| Return on Equity (5 years) | 48% | | | | |
| IRR Pre-tax | 98% | | | | |
| IRR Post Tax | 74% | | | | |

Prakash Tankers has one employee. He has invested a sum of Rs. 625,000 ($ 13,888) in business. He has taken a loan of 5, 50,000 (12,222) and has invested 125,000 ($ 2,777) from his own sources. His commitment towards interest and repayment of principal is Rs. 139610 ($ 3,102) per annum. Net present value of his investment for 5 years at 15% discount is Rs 236,841 ($ 5,263). His average net cash inflows are Rs.7207 ($160), post tax. Tax is assumed to be 20% of earnings. Average Return on Equity is 48% assuming he is not withdrawing anything from business and profits are reinvested. However, in case, he withdraws part of profits for self use, his return on equity will increase. Post tax internal rate of return of 74% shows a healthy business.

Prateek Tankers

| Year | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Total Investment including accumulated profits (in Rs) | 866,720 | 1,102,250 | 1,357,908 | 1,635,101 | 1,935,339 |
| | 19,260 | 24,494 | 30,176 | 36,336 | 43,008 |
| Bank Loan | 0 | 0 | 0 | 0 | 0 |
| Own Investment (in Rs) | 866,720 | 1,102,250 | 1,357,908 | 1,635,101 | 1,935,339 |
| | 19,260 | 24,494 | 30,176 | 36,336 | 43,008 |
| Gross Revenue (in Rs) | 800,000 | 856,000 | 915,920 | 980,034 | 1,048,637 |
| | 17,778 | 19,022 | 20,354 | 21,779 | 23,303 |
| Net Present Value (5 years) (in Rs) | 410293 | USD 9118 | | | |
| Average Monthly Cash to Operator (5 years) (in Rs) | 16006 | USD 356 | | | |
| Return on Equity (5 years) | 24% | | | | |
| IRR Pre-tax | 49% | | | | |
| IRR Post Tax | 38% | | | | |

Prateek Tankers has one employee. He has invested a sum of Rs. 6, 50,000 ($ 14,444) in business from own sources. His commitment towards interest and repayment of principal is nil. Net present value of his investment for 5 years at 15% discount is Rs. 410,293 ($9,118). His average net cash inflow is Rs.16006 ($356) post tax. Tax is assumed to be 20% of earnings. Since he has not taken any loan, there is no EMI commitment. Average Return on Equity is 24% assuming he is not withdrawing anything from business and profit is reinvested. In case, he withdraws part of profits for self use, his return on equity will increase. Post Tax Internal Rate of return of 38% is good keeping in view of the fact that he has invested more money from own sources.

Shambhu Tankers

| Year | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Total Investment including accumulated profits (in Rs) | 684,062 | 757,397 | 845,830 | 950,215 | 1,071,436 |
| Dollars | 15,201 | 16,831 | 18,796 | 21,116 | 23,810 |
| Bank Loan (in Rs) | 425,746 | 340,402 | 242,313 | 129,575 | 0 |
| Dollars | 9,461 | 7,564 | 5,385 | 2,879 | 0 |
| Own Investment (in Rs) | 258,316 | 416,995 | 603,518 | 820,641 | 1,071,436 |
| Dollars | 5,740 | 9,267 | 13,412 | 18,236 | 23,810 |
| Gross Revenue (in Rs) | 600,000 | 642,000 | 686,940 | 735,026 | 786,478 |

| | | | | | |
|---|---|---|---|---|---|
| Dollars | 13,333 | 14,267 | 15,265 | 16,334 | 17,477 |
| Net Present Value (5 years) (in Rs) | 369417 | USD 8209 | | | |
| Average Monthly Cash to Operator (5 years) (in Rs) | 10566 | USD 235 | | | |
| Return on Equity (5 years) | 56% | | | | |
| IRR Pre-tax | 134% | | | | |
| IRR Post Tax | 104% | | | | |

Shambhu Tankers has one permanent employee. He has invested a sum of Rs. 625,000 ($ 13,888) in business. He has taken a loan of Rs. 500,000 ($ 11,111) @ 14% interest and balance Rs. 125,000 ( $2,777) from own sources. His commitment towards interest and repayment of principal is Rs.139610 ($ 3,102) per annum. Net present value of his investment for 5 years at 15% discount is Rs. 369,417 ($ 8,209). His average net cash inflows are Rs.10,566 ($ 235) post tax. Tax is assumed to be 20% of earnings. Average Return on Equity is 56% assuming he is not withdrawing money from business and profit is reinvested in the business. In case, he withdraws part of profits for self use, his return on equity will increase. Post Tax Internal Rate of return of 56%, which again is healthy.

Yaseen Tankers

| **Year** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
|---|---|---|---|---|---|
| Total Investment including accumulated profits (in Rs) | 687,262 | 764,021 | 856,118 | 964,423 | 1,089,838 |
| Dollars | 15,272 | 16,978 | 19,025 | 21,432 | 24,219 |
| Bank Loan (in Rs) | 425,746 | 340,402 | 242,313 | 129,575 | 0 |
| Dollars | 9,461 | 7,564 | 5,385 | 2,879 | 0 |
| Own Investment (in Rs) | 261,516 | 423,619 | 613,805 | 834,848 | 1,089,838 |
| Dollars | 5,811 | 9,414 | 13,640 | 18,552 | 24,219 |
| Gross Revenue (in Rs) | 600,000 | 642,000 | 686,940 | 735,026 | 786,478 |
| Dollars | 13,333 | 14,267 | 15,265 | 16,334 | 17,477 |
| Net Present Value (5 years) | 381524 | USD 8478 | | | |
| Average Monthly Cash to Operator (5 years) (in Rs) | 10872 | USD 242 | | | |
| Return on Equity (5 years) | 57% | | | | |
| IRR Pre-tax | 137% | | | | |
| IRR Post Tax | 107% | | | | |

Yaseen Tankers employs one person. He has invested a sum of Rs. 625,000 (($ 13,888) in business. He has taken a loan of Rs. 500,000 ($11,111) @ 14% interest and balance Rs. 125,000 ($ 2,778) from own sources. His commitment towards interest and repayment of

principal is Rs.139610 ($ 3102) per annum. Net present value of his investment for 5 years at 15% discount is Rs. 381524 ($8,478). His average net cash inflows are Rs.10,872 ($242), post tax. Tax is assumed to be 20% of earnings. Average Return on Equity is 57% assuming he is not withdrawing profits from business and it is reinvested. In case, he withdraws part of profits for self use, his return on equity will increase. Post Tax Internal Rate of return of 107% is very healthy as he is earning good profits.

**Jaipur:**
**Sri Ultra Sewer Tank Service**

| Year | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Total Investment including accumulated profits | 795,290($17,673) | 887,868($19,730 | 998,909($21,997) | 1,129,668($25,103) | 1,281,481($28,477) |
| Bank Loan | 515,146 ($11,448) | 448,252 ($9,961) | 374,720 ($8,327) | 293,889 ($6,531) | 205,036 ($4,556) |
| Own Investment | 280,144 ($6,225) | 439,615 ($9,769) | 624,190 ($13,870) | 835,779 (18,572) | 1,076,445 ($23,921) |
| Gross Revenue | 588,000 ($13,067) | 629,160 ($13,981) | 673,201 ($14,960) | 720,325 ($16,007) | 770,748 ($17,128) |
| Net Present Value (5 years) | 576,756 ($12,817) | | | | |
| Average Monthly Cash to Operator (5 years) | 15,958 ($355) | | | | |
| Return on Equity (5 years) | 51% | | | | |
| IRR Pre-tax | 159% | | | | |
| IRR Post Tax | 134% | | | | |
| Break Even Point (No of Trips) | 661 | | | | |

Sri Ultra Sewer Tank Service is working without office space and has only one employee. He has invested a sum of Rs. 720,000 ($16,000), out of which a sum of Rs. 576,000 ($12,800) has been taken on loan @ 10% per annum and balance Rs. 144,000 ($3,200) has been invested from own source. His commitment towards interest and repayment of principal are 1, 13,000($2,511) per annum. Net present value of his investment for 5 years at 15% discount is Rs. 5,76,756 ($12,817). His average net cash inflows are Rs.15, 958 ($355), post tax. Although he does not currently pay any tax, it is assumed to be 20% of earnings. Average Return on Equity is 51% assuming that he reinvests profits in the business. In case, he withdraws part of profits for self use, his return on equity will increase. Breakeven point works out to be 661 trips.

## Sri Ram Sewer Tank Service

| Year | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Total Investment including accumulated profits | 390,332 ($8,674) | 537,279 ($11,940) | 696,655 ($15,481) | 869,329 ($19,318) | 1,056,232 ($23,472) |
| Bank Loan | 0 | 0 | 0 | 0 | 0 |
| Own Investment | 390,332 ($8,674) | 537,279 ($11,940) | 696,655 ($15,481) | 869,329 ($19,318) | 1,056,232 ($23,472) |
| Gross Revenue | 384,000 ($8,533) | 410,880 ($9,131) | 439,642 ($9,770) | 470,417 ($10,453) | 503,346 ($11,185) |
| Net Present Value (5 years) | 398,456 ($8855) | | | | |
| Average Monthly Cash to Operator (5 years) | 12,291 ($273) | | | | |
| Return on Equity (5 years) | 53% | | | | |
| IRR Pre-tax | 83% | | | | |
| IRR Post Tax | 68% | | | | |
| Break Even Point (No of Trips) | 207 | | | | |

Sri Ram Sewer Tank Service functions without any office space and have no permanent employee. He is an owner-operator. He has invested a sum of Rs. 255,000($5,667) from own source. His commitment towards interest and repayment of principal are non-existent as compared to other operators. Net present value of his investment for 5 years at 15% discount is Rs. 398,456 ($8,855). His average net cash inflows are Rs.12, 291($273) post tax. Although he does not currently pay any tax, it is assumed to be 20% of earnings. Average Return on Equity is 53% assuming that he reinvests profits in the business. In case, he withdraws part of profits for self use, his return on equity will increase. Breakeven point works out to be 207 trips.

## New Star Sewer Tank Service

| Year | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Total Investment including accumulated profits | 355,804 ($7,907) | 465,806 ($10,351) | 585,651 ($13,014) | 716,026 (15,9111) | 857,670 (19,059) |
| Bank Loan | 0 | 0 | 0 | 0 | 0 |
| Own Investment | 355,804 ($7,907) | 465,806 ($10,351) | 585,651 ($13,014) | 716,026 (15,9111) | 857,670 (19,059) |
| Gross Revenue | 594,000 ($13,200) | 635,580 ($14,124) | 680,071 ($15,113) | 727,676 ($16,170) | 778,613 ($17,303) |
| Net Present Value (5 years) | 267,817 ($5,951) | | | | |
| Average Monthly Cash to Operator (5 years) | 8,982 ($200 | | | | |
| Return on Equity (5 years) | 28% | | | | |

| | | | | | |
|---|---|---|---|---|---|
| IRR Pre-tax | 64% | | | | |
| IRR Post Tax | 52% | | | | |
| Break Even Point (No of Trips) | | | | | |

New Star Sewer Tank Service employs one helper. The owner himself doubles as operator. He has invested a sum of Rs. 255,000 ($5,667) from own sources. His commitment towards interest and repayment of principal are non-existent as compared to other operators. Net present value of his investment for 5 years at 15% discount is Rs. 2,67,817 ($5,951). His average net cash inflows are Rs.8, 982 ($200), post tax. Although he does not currently pay any tax, it is assumed to be 20% of earnings. Average Return on Equity is 28% assuming that he reinvests profits in the business. In case, he withdraws part of profits for self use, his return on equity will increase.

## Pink City Sewer Tankers

| Year | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Total Investment including accumulated profits | 697,841 ($15508) | 895,601 ($19,902) | 1,114,525 ($24,767) | 1,355,911 ($30,131) | 1,621,094 ($36,024) |
| Bank Loan | 206,203 ($4,582) | 188,706 ($4,193) | 166,515 ($3,700 ) | 138,371 ($3,075) | 102,678 ($2,282) |
| Own Investment | 491,638 ($10,925) | 706,895 ($15,709) | 948,011($2 1,067) | 1,217,540 ($27,056) | 1,518,416 ($33,743) |
| Gross Revenue | 804,000 ($17,867) | 860,280 ($19,117) | 920,500 ($20,456) | 984,935 ($21,087) | 1,053,880 ($23,420) |
| Net Present Value (5 years) | 174,149 ($3,870) | | | | |
| Average Monthly Cash to Operator (5 years) | 8,117 ($180) | | | | |
| Return on Equity (5 years) | 19% | | | | |
| IRR Pre-tax | 38% | | | | |
| IRR Post Tax | 30% | | | | |
| Break Even Point (No of Trips) | | | | | |

Pink City Sewer Tankers is also a small business employing one helper. He has invested a sum of Rs. 520,000 ($11,555) in business. He has taken a loan of 2, 20,000($4,889) and has invested 300,000 ($6,667) from own sources. His commitment towards interest and repayment of principal are Rs. 65,144 ($1,448) per annum. Net present value of his investment for 5 years at 15% discount is Rs 174149 ($3,870). His average net cash inflows are Rs.8117 ($180) post tax. Although he does not currently pay any tax, it is assumed to be 20% of earnings. Average Return on Equity is 19% assuming he is reinvesting profits in business. In case, he withdraws part of profits for self use, his return on equity will increase.

## Jai Shree Ganesh Sewer Tank Service

| Year | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Total Investment including accumulated profits | 526,649 ($11,703) | 633,675 ($14,082) | 751,805 ($16,707) | 881,816 ($19596) | 1,024,540 ($22,768) |
| Bank Loan | 0 | 0 | 0 | 0 | 0 |
| Own Investment | 526,649 ($11,703) | 633,675 ($14,082) | 751,805 ($16,707) | 881,816 ($19596) | 1,024,540 ($22,768) |
| Gross Revenue | 552,000 ($12,267) | 590,640 ($13,125) | 631,985 ($14,044) | 676,224 ($15,027) | 723,559 ($16,079) |
| Net Present Value (5 years) | 679,450 ($15,099) | | | | |
| Average Monthly Cash to Operator (5 years) | 19,852 ($441) | | | | |
| Return on Equity (5 years) | 39% | | | | |
| IRR Pre-tax | 106% | | | | |
| IRR Post Tax | 88% | | | | |
| Break Even Point (No of Trips) | | | | | |

Jai Shree Ganesh Sewer Tank Service employs one helper. He has invested a sum of Rs. 430,000 in business from own sources. His commitment towards interest and repayment of principal is zero. Net present value of his investment for 5 years at 15% discount is Rs. 679,450 ($15,099). His average net cash inflows are Rs.19, 852 ($441) post tax. Although he does not currently pay any tax, it is assumed to be 20% of earnings Average Return on Equity is 39% assuming he is reinvesting profits into business In case, he withdraws part of profits for self use, his return on equity will increase.

## Madurai:

Bharath Tankers

| Year | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Total Investment including accumulated profits (in Rs) | 449,550 | 406,442 | 371,100 | 343,968 | 325,505 |
| Dollars | 9,990 | 9,032 | 8,247 | 7,644 | 7,233 |
| Bank Loan (in Rs) | 337,884 | 267,890 | 189,019 | 100,145 | 0 |
| Dollars | 7,509 | 5,953 | 4,200 | 2,225 | 0 |
| Own Investment (in Rs) | 111,666 | 138,552 | 182,081 | 243,822 | 325,505 |

| | | | | | |
|---|---|---|---|---|---|
| Dollars | 2,481 | 3,079 | 4,046 | 5,418 | 7,233 |
| Gross Revenue (in Rs) | | | | 624,772 | 668,506 |
| Net Present Value (5 years) | | | | | |
| Average Monthly Cash to Operator (5 years) | | | | | |
| Return on Equity (5 years) | 27% | | | | |
| IRR Pre-tax | | | | | |
| IRR Post Tax | 52% | | | | |
| Break Even Point (No of Trips) | | | | | |

Bharath Tankers has only one employee. He has invested a sum of Rs. 500,000 ($11,111) in the business. He has taken a loan of Rs. 400,000 ($ 8,888) @ 14% per annum and invested Rs. 100,000 ($ 2,222) from own source. His commitment towards interest and repayment of principal is Rs. 106,773 ($2,373) per annum. Net present value of his investment for 5 years at 15% discount is Rs. 1,10,820 ($2,463). His average net cash inflow is Rs. 3,758 ($84) post tax. Although he is not paying any tax, it is assumed to be 20% of earnings. Average Return on Equity is 27% assuming he is not withdrawing profits from business and it is reinvested in the business. In case, he withdraws part of profits for self use, his return on equity will increase. Internal rate of Return of 52% (Post Tax) is good. However, if he had taken a loan and invested less equity he would have earned more return on equity in percentage terms. His average rate of return on equity is 27%.

J J Cleaning Services

| **Year** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
|---|---|---|---|---|---|
| Total Investment including accumulated profits (in Rs) | 428,446 | 362,757 | 303,253 | 250,267 | 204,141 |
| Dollars | 9,521 | 8,061 | 6,739 | 5,561 | 4,536 |
| Bank Loan (in Rs) | 337,884 | 267,890 | 189,019 | 100,145 | 0 |
| Dollars | 7,509 | 5,953 | 4,200 | 2,225 | 0 |
| Own Investment (in Rs) | 90,562 | 94,867 | 114,234 | 150,122 | 204,141 |
| In US Dollars | 2,012 | 2,108 | 2,539 | 3,336 | 4,536 |
| Gross Revenue (in Rs) | 510,000 | 545,700 | 583,899 | 624,772 | 668,506 |
| Dollars | 11,333 | 12,127 | 12,976 | 13,884 | 14,856 |

| | | | | | |
|---|---|---|---|---|---|
| Net Present Value (5 years) (in Rs) | 30972 | USD 688 | | | |
| Average Monthly Cash to Operator (5 years) (in Rs) | 1446 | USD 32 | | | |
| Return on Equity (5 years) | 17% | | | | |
| IRR Pretax | 30% | | | | |
| IRR Post Tax | 26% | | | | |

J J Cleaning Services employees one helper. He has invested a sum of Rs. 500,000 ($ 11,111) in business out of which Rs. 400,000 ($8,888) has been taken as loan @ 14% per annum and balance 100,000 ($ 2,222) from own sources. His commitment towards interest and repayment of principal is 1, 12,000 ($ 2,489). Net present value of his investment for 5 years at 15% discount is Rs. 30,972 ($688). His average net cash inflow is Rs.1, 446 ($32), post tax. Tax is assumed to be 20% of earnings. Average Return on Equity is 17% assuming he is not withdrawing profits from business and it is reinvested. In case, he withdraws part of profits for self use, his return on equity will increase. Post tax IRR of 26% shows that his returns are lower than his peers.

Minaxi Tankers

| **Year** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
|---|---|---|---|---|---|
| Total Investment including accumulated profits (in Rs) | 478,750 | 362,060 | 250,142 | 143,210 | 41,476 |
| Dollars | 10,639 | 8,046 | 5,559 | 3,182 | 922 |
| Bank Loan (in Rs) | 405,461 | 321,468 | 226,823 | 120,174 | 0 |
| Dollars | 9,010 | 7,144 | 5,041 | 2,671 | 0 |
| Own Investment (in Rs) | 73,289 | 40,592 | 23,320 | 23,036 | 41,476 |
| In US Dollars | 1,629 | 902 | 518 | 512 | 922 |
| Gross Revenue (in Rs) | 450,000 | 481,500 | 515,205 | 551,269 | 589,858 |
| Dollars | 10,000 | 10,700 | 11,449 | 12,250 | 13,108 |
| Net Present Value (5 years) (in Rs) | -96717 | USD (2149) | | | |
| Average Monthly Cash to Operator (5 years) (in Rs) | 8572 | USD (24) | | | |
| Return on Equity (5 years) | -9% | | | | |
| IRR Pretax | | | | | |
| IRR Post Tax | -22% | | | | |

Minaxi Tankers has one permanent employee. He has invested a sum of Rs. 600,000 ($13,333). He has taken a loan of Rs. 4, 80,000 ($10,666) @ 14% per annum and balance Rs. 1, 20,000 (2,667) coming from own source. His commitment towards interest and repayment of principal are Rs. 128,000 ($ 2,844). Net present value of his investment for 5 years at 15% discount is Rs. 96,717 ($2,149). His average net cash inflows is Rs.1, 091 ($24), post tax. Tax is assumed to be 20% of earnings. Average Return on Equity is -9%. Post Tax Internal Rate of Return of (-) 22% shows that expenses outweigh his revenue. This is the only case where IRR is in the negative.

Sri Kannan Tankers

| **Year** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
|---|---|---|---|---|---|
| Total Investment including accumulated profits (in Rs) | 423,438 | 352,390 | 287,153 | 228,032 | 175,341 |
| Dollars | 9,410 | 7,831 | 6,381 | 5,067 | 3,896 |
| Bank Loan (in Rs) | 337,884 | 267,890 | 189,019 | 100,145 | 0 |
| Dollars | 7,509 | 5,953 | 4,200 | 2,225 | 0 |
| Own Investment (in Rs) | 85,554 | 84,500 | 98,134 | 127,887 | 175,341 |
| Dollars | 1,901 | 1,878 | 2,181 | 2,842 | 3,896 |
| Gross Revenue (in Rs) | 450,000 | 481,500 | 515,205 | 551,269 | 589,858 |
| Dollars | 10,000 | 10,700 | 11,449 | 12,250 | 13,108 |
| Net Present Value (5 years) (in Rs) | 12024 | USD 267 | | | |
| Average Monthly Cash to Operator (5 years) (in Rs) | 1256 | USD 28 | | | |
| Return on Equity (5 years) | 14% | | | | |
| IRR Pre-tax | 22% | | | | |
| IRR Post Tax | 19% | | | | |

Srikannan Tankers employs one person. He has invested a sum of Rs. 500,000 ($11,111). He has taken a loan of Rs. 400,000 ($8,888)@ 14% per annum and balance Rs. 100,000 ($2,222) has been invested from own sources. His commitment towards interest and repayment of principal is Rs. 1,06,773 ($ 2,373). Net present value of his investment for 5 years at 15% discount is Rs. 12,024 ($267). His average net cash inflows are Rs.1, 256 ($28), post tax. Tax assumed to be 20% of earnings. Average Return on Equity is 14% assuming he is not withdrawing profits from business and it is reinvested. In case, he withdraws part of profits for self use, his return on equity will increase. Post Tax Internal Rate of Return is below par at 19%. This indicates that he is over burdened with expenses as compared to the revenue he is generating.

**Annex 4**

# Financial Worksheets

| | Baba Tankers, Delhi | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Unit % / cost** | **Units** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 500 | Trips p.a. | | 7,50,000 | 8,02,500 | 8,58,675 | 9,18,782 | 9,83,097 |
| | | 1500 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | 50000 | | | 50,000 | 53,500 | 57,245 | 61,252 | 65,540 |
| | **TOTAL ANNUAL REVENUE** | | | - | **8,00,000** | **8,56,000** | **9,15,920** | **9,80,034** | **10,48,637** |
| | | | | | 17,778 | 19,022 | 20,354 | 21,779 | 23,303 |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | 1,20,000 | | | - 1,20,000 | - 1,28,400 | - 1,37,388 | - 1,47,005 | - 1,57,296 |
| 6 | Medical Expenses | 5,000 | | | - 5,000 | - 5,350 | - 5,725 | - 6,125 | - 6,554 |
| 7 | Office building rent | 12,000 | | | - 12,000 | - 12,840 | - 13,739 | - 14,701 | - 15,730 |
| 8 | Telephone | 3,600 | | | - 3,600 | - 3,852 | - 4,122 | - 4,410 | - 4,719 |
| 9 | Electricity & Water | 3,000 | | | - 3,000 | - 3,210 | - 3,435 | - 3,675 | - 3,932 |
| 10 | Annual maintenance provision | 31500 | | | - 31,500 | - 33,705 | - 36,064 | - 38,589 | - 41,290 |
| 11 | Insurance (% of value at beginning of year) | 20000 | | | - 20,000 | - 21,400 | - 22,898 | - 24,501 | - 26,216 |
| 12 | Misc other costs | 15,000 | | | - 15,000 | - 16,050 | - 17,174 | - 18,376 | - 19,662 |
| | TOTAL FIXED OPEX | | | - | - 2,10,100 | - 2,24,807 | - 2,40,543 | - 2,57,382 | - 2,75,398 |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 502 | Cost/Trip | - | - 2,51,000 | - 2,68,570 | - 2,87,370 | - 3,07,486 | - 3,29,010 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 2,51,000 | - 2,68,570 | - 2,87,370 | - 3,07,486 | - 3,29,010 |
| | **TOTAL ANNUAL OPEX** | | | - | **- 4,61,100** | **- 4,93,377** | **- 5,27,913** | **- 5,64,867** | **- 6,04,408** |
| | **Net operating cash flow** | | | - | **3,38,900** | **3,62,623** | **3,88,007** | **4,15,167** | **4,44,229** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 100% | | - 6,25,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | |
| 13 | Interest payment | 14% | | | | | | | |
| 14 | Principal repayment | | | | | | | | |
| 15 | Total debt service | | | - | - | - | - | - | - |
| | **Net Investment and finance cash flow** | | | **- 6,25,000** | - | - | - | - | - |
| | **Net cash before taxation** | | | **- 6,25,000** | **3,38,900** | **3,62,623** | **3,88,007** | **4,15,167** | **4,44,229** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 20% | | | 1,25,000 | 1,25,000 | 1,25,000 | 1,25,000 | 1,25,000 |
| 17 | Book value of vehicle at year end | | | | 5,00,000 | 3,75,000 | 2,50,000 | 1,25,000 | - |
| 18 | Net profit | | | | 2,13,900 | 2,37,623 | 2,63,007 | 2,90,167 | 3,19,229 |
| 19 | Taxation | 20% | | | - 42,780 | - 47,525 | - 52,601 | - 58,033 | - 63,846 |
| | **EAITDA** | | | - | **1,71,120** | **1,90,098** | **2,10,405** | **2,32,134** | **2,55,383** |
| | **Net cash after taxes (FCF)** | | | **- 6,25,000** | **2,96,120** | **3,15,098** | **3,35,405** | **3,57,134** | **3,80,383** |
| | *Net monthly cash* | | | *- 52,083* | *24,677* | *26,258* | *27,950* | *29,761* | *31,699* |
| | ***DSCR*** | | | | | | | | |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | **4,84,600** | 10,769 | | | | | | |
| | **After Tax Equity IRR - 5 years** | **43%** | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | **52%** | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | - | - | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | 2,96,120 | 6,11,218 | 9,46,624 | 13,03,757 |
| | Bank loan | | | - | | | | | |
| | Equity | | | 6,25,000 | | | | | |
| | Cash increase (decrease) for the year | | | (6,25,000.00) | 2,96,120 | 3,15,098 | 3,35,405 | 3,57,134 | 3,80,383 |
| | Closing balance | | | - | 2,96,120 | 6,11,218 | 9,46,624 | 13,03,757 | 16,84,140 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 8,00,000 | 8,56,000 | 9,15,920 | 9,80,034 | 10,48,637 |
| | Less operating expenses | | | | - 4,61,100 | - 4,93,377 | - 5,27,913 | - 5,64,867 | - 6,04,408 |
| | EBITDA | | | | 3,38,900 | 3,62,623 | 3,88,007 | 4,15,167 | 4,44,229 |
| | Less depreciation | | | | - 1,25,000 | - 1,25,000 | - 1,25,000 | - 1,25,000 | - 1,25,000 |
| | EBIT | | | | 2,13,900 | 2,37,623 | 2,63,007 | 2,90,167 | 3,19,229 |
| | Interest | | | | - | - | - | - | - |
| | Gross taxable annual Income | | | | 2,13,900 | 2,37,623 | 2,63,007 | 2,90,167 | 3,19,229 |
| | Total tax payable | | | | - 42,780 | - 47,525 | - 52,601 | - 58,033 | - 63,846 |
| | EAITDA | | | - | 1,71,120 | 1,90,098 | 2,10,405 | 2,32,134 | 2,55,383 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 6,25,000 | 5,00,000 | 3,75,000 | 2,50,000 | 1,25,000 | - |
| | Closing cash | | | | 2,96,120 | 6,11,218 | 9,46,624 | 13,03,757 | 16,84,140 |
| | | | | 6,25,000 | 7,96,120 | 9,86,218 | 11,96,624 | 14,28,757 | 16,84,140 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | - | - | - | - | - | - |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 6,25,000 | *6,25,000* | *7,96,120* | *9,86,218* | *11,96,624* | *14,28,757* |
| | Add annual net EAITDA | | | 0 | *1,71,120* | *1,90,098* | *2,10,405* | *2,32,134* | *2,55,383* |
| | Net owner's equity | | | 6,25,000 | 7,96,120 | 9,86,218 | 11,96,624 | 14,28,757 | 16,84,140 |
| | | | | 6,25,000 | 7,96,120 | 9,86,218 | 11,96,624 | 14,28,757 | 16,84,140 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **27%** | **24%** | **21%** | **19%** | **18%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *22%* | | | | |
| | *Average annual 5 year ROE* | | | | *22%* | | | | |
| | | | | - | - | - | - | - | - |
| | | | | | 17,692 | 21,916 | 26,592 | 31,750 | 37,425 |

| | Kamal Tankers, Delhi | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Unit % / cost | Units | Year 0 | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 600 | Trips p.a. | | 8,49,000 | 9,08,430 | 9,72,020 | 10,40,062 | 11,12,866 |
| | | 1415 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | 0 | | | - | - | - | - | - |
| | **TOTAL ANNUAL REVENUE** | | | - | **8,49,000** | **9,08,430** | **9,72,020** | **10,40,062** | **11,12,866** |
| | | | | | 18,867 | 20,187 | 21,600 | 23,112 | 24,730 |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | 1,32,000 | | | - 1,32,000 | - 1,41,240 | - 1,51,127 | - 1,61,706 | - 1,73,025 |
| 6 | Medical Expenses | 5,000 | | | - 5,000 | - 5,350 | - 5,725 | - 6,125 | - 6,554 |
| 7 | Office building rent | 36,000 | | | - 36,000 | - 38,520 | - 41,216 | - 44,102 | - 47,189 |
| 8 | Telephone | 4,000 | | | - 4,000 | - 4,280 | - 4,580 | - 4,900 | - 5,243 |
| 9 | Electricity & Water | 15,000 | | | - 15,000 | - 16,050 | - 17,174 | - 18,376 | - 19,662 |
| 10 | Annual maintenance provision | 50000 | | | - 50,000 | - 53,500 | - 57,245 | - 61,252 | - 65,540 |
| 11 | Insurance (% of value at beginning of year) | 25000 | | | - 25,000 | - 26,750 | - 28,623 | - 30,626 | - 32,770 |
| 12 | Misc other costs | 25,000 | | | - 25,000 | - 26,750 | - 28,623 | - 30,626 | - 32,770 |
| | TOTAL FIXED OPEX | | | - | - 2,92,000 | - 3,12,440 | - 3,34,311 | - 3,57,713 | - 3,82,752 |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 466 | Cost/Trip | - | - 2,79,600 | - 2,99,172 | - 3,20,114 | - 3,42,522 | - 3,66,499 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 2,79,600 | - 2,99,172 | - 3,20,114 | - 3,42,522 | - 3,66,499 |
| | **TOTAL ANNUAL OPEX** | | | - | **- 5,71,600** | **- 6,11,612** | **- 6,54,425** | **- 7,00,235** | **- 7,49,251** |
| | **Net operating cash flow** | | | - | **2,77,400** | **2,96,818** | **3,17,595** | **3,39,827** | **3,63,615** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 20% | | - 1,00,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | |
| 13 | Interest payment | 14% | | | - 52,284 | - 43,413 | - 33,216 | - 21,497 | - 8,028 |
| 14 | Principal repayment | | | | - 59,404 | - 68,275 | - 78,471 | - 90,190 | - 1,03,660 |
| 15 | Total debt service | | | - | - 1,11,688 | - 1,11,688 | - 1,11,688 | - 1,11,688 | - 1,11,688 |
| | **Net Investment and finance cash flow** | | | **- 1,00,000** | **- 1,11,688** | **- 1,11,688** | **- 1,11,688** | **- 1,11,688** | **- 1,11,688** |
| | | | | | | | | | |
| | **Net cash before taxation** | | | **- 1,00,000** | **1,65,712** | **1,85,130** | **2,05,908** | **2,28,139** | **2,51,927** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 10% | | | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 |
| 17 | Book value of vehicle at year end | | | | 4,50,000 | 4,00,000 | 3,50,000 | 3,00,000 | 2,50,000 |
| 18 | Net profit | | | | 1,75,116 | 2,03,405 | 2,34,379 | 2,68,330 | 3,05,587 |
| 19 | Taxation | 20% | | | - 35,023 | - 40,681 | - 46,876 | - 53,666 | - 61,117 |
| | **EAITDA** | | | **-** | **1,40,093** | **1,62,724** | **1,87,503** | **2,14,664** | **2,44,469** |
| | **Net cash after taxes (FCF)** | | | **- 1,00,000** | **1,30,689** | **1,44,449** | **1,59,032** | **1,74,473** | **1,90,810** |
| | *Net monthly cash* | | | *- 8,333* | *10,891* | *12,037* | *13,253* | *14,539* | *15,901* |
| | ***DSCR*** | | | | ***2.17*** | ***2.29*** | ***2.42*** | ***2.56*** | ***2.71*** |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | 4,22,055 | 9,379 | | | | | | |
| | **After Tax Equity IRR - 5 years** | 138% | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | 175% | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | 11,658 | 259 | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | Year 0 | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | 1,30,689 | 2,75,139 | 4,34,170 | 6,08,644 |
| | Bank loan | | | 4,00,000 | | | | | |
| | Equity | | | 1,00,000 | | | | | |
| | Cash increase (decrease) for the year | | | (5,00,000.00) | 1,30,689 | 1,44,449 | 1,59,032 | 1,74,473 | 1,90,810 |
| | Closing balance | | | - | 1,30,689 | 2,75,139 | 4,34,170 | 6,08,644 | 7,99,454 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 8,49,000 | 9,08,430 | 9,72,020 | 10,40,062 | 11,12,866 |
| | Less operating expenses | | | | - 5,71,600 | - 6,11,612 | - 6,54,425 | - 7,00,235 | - 7,49,251 |
| | EBITDA | | | | 2,77,400 | 2,96,818 | 3,17,595 | 3,39,827 | 3,63,615 |
| | Less depreciation | | | | - 50,000 | - 50,000 | - 50,000 | - 50,000 | - 50,000 |
| | EBIT | | | | 2,27,400 | 2,46,818 | 2,67,595 | 2,89,827 | 3,13,615 |
| | Interest | | | | - 52,284 | - 43,413 | - 33,216 | - 21,497 | - 8,028 |
| | Gross taxable annual Income | | | | 1,75,116 | 2,03,405 | 2,34,379 | 2,68,330 | 3,05,587 |
| | Total tax payable | | | | - 35,023 | - 40,681 | - 46,876 | - 53,666 | - 61,117 |
| | EAITDA | | | - | 1,40,093 | 1,62,724 | 1,87,503 | 2,14,664 | 2,44,469 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 5,00,000 | 4,50,000 | 4,00,000 | 3,50,000 | 3,00,000 | 2,50,000 |
| | Closing cash | | | | 1,30,689 | 2,75,139 | 4,34,170 | 6,08,644 | 7,99,454 |
| | | | | 5,00,000 | 5,80,689 | 6,75,139 | 7,84,170 | 9,08,644 | 10,49,454 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | 4,00,000 | 3,40,596 | 2,72,321 | 1,93,850 | 1,03,660 | 0 |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 1,00,000 | *1,00,000* | *2,40,093* | *4,02,817* | *5,90,320* | *8,04,984* |
| | Add annual net EAITDA | | | 0 | *1,40,093* | *1,62,724* | *1,87,503* | *2,14,664* | *2,44,469* |
| | Net owner's equity | | | 1,00,000 | 2,40,093 | 4,02,817 | 5,90,320 | 8,04,984 | 10,49,454 |
| | | | | 5,00,000 | 5,80,689 | 6,75,139 | 7,84,170 | 9,08,644 | 10,49,454 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **140%** | **68%** | **47%** | **36%** | **30%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *64%* | | | | |
| | *Average annual 5 year ROE* | | | | *64%* | | | | |
| | | | | - | - | - | - | - | - |
| | | | | | 5,335 | 8,951 | 13,118 | 17,889 | 23,321 |
| | | | | | 7,569 | 6,052 | 4,308 | 2,304 | 0 |
| | | | | | 12,904 | 15,003 | 17,426 | 20,192 | 23,321 |

| | Nagar Tankers, Delhi | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Unit % / cost** | **Units** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 400 | Trips p.a. | | 6,00,000 | 6,42,000 | 6,86,940 | 7,35,026 | 7,86,478 |
| | | 1500 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | 80000 | | | 80,000 | 85,600 | 91,592 | 98,003 | 1,04,864 |
| | **TOTAL ANNUAL REVENUE** | | | - | **6,80,000** | **7,27,600** | **7,78,532** | **8,33,029** | **8,91,341** |
| | | | | | 15,111 | 16,169 | 17,301 | 18,512 | 19,808 |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | 1,12,000 | | | - 1,12,000 | - 1,19,840 | - 1,28,229 | - 1,37,205 | - 1,46,809 |
| 6 | Medical Expenses | 6,000 | | | - 6,000 | - 6,420 | - 6,869 | - 7,350 | - 7,865 |
| 7 | Office building rent | 18,000 | | | - 18,000 | - 19,260 | - 20,608 | - 22,051 | - 23,594 |
| 8 | Telephone | 2,500 | | | - 2,500 | - 2,675 | - 2,862 | - 3,063 | - 3,277 |
| 9 | Electricity & Water | 3,600 | | | - 3,600 | - 3,852 | - 4,122 | - 4,410 | - 4,719 |
| 10 | Annual maintenance provision | 43000 | | | - 43,000 | - 46,010 | - 49,231 | - 52,677 | - 56,364 |
| 11 | Insurance (% of value at beginning of year) | 25000 | | | - 25,000 | - 26,750 | - 28,623 | - 30,626 | - 32,770 |
| 12 | Misc other costs | 15,000 | | | - 15,000 | - 16,050 | - 17,174 | - 18,376 | - 19,662 |
| | TOTAL FIXED OPEX | | | - | - 2,25,100 | - 2,40,857 | - 2,57,717 | - 2,75,757 | - 2,95,060 |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 466 | Cost/Trip | - | - 1,86,400 | - 1,99,448 | - 2,13,409 | - 2,28,348 | - 2,44,332 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 1,86,400 | - 1,99,448 | - 2,13,409 | - 2,28,348 | - 2,44,332 |
| | **TOTAL ANNUAL OPEX** | | | - | **- 4,11,500** | **- 4,40,305** | **- 4,71,126** | **- 5,04,105** | **- 5,39,393** |
| | **Net operating cash flow** | | | - | **2,68,500** | **2,87,295** | **3,07,406** | **3,28,924** | **3,51,949** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 20% | | - 1,25,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | |
| 13 | Interest payment | 14% | | | - 65,355 | - 54,266 | - 41,520 | - 26,871 | - 10,035 |
| 14 | Principal repayment | | | | - 74,254 | - 85,344 | - 98,089 | - 1,12,738 | - 1,29,575 |
| 15 | Total debt service | | | - | - 1,39,610 | - 1,39,610 | - 1,39,610 | - 1,39,610 | - 1,39,610 |
| | **Net Investment and finance cash flow** | | | **- 1,25,000** | **- 1,39,610** | **- 1,39,610** | **- 1,39,610** | **- 1,39,610** | **- 1,39,610** |
| | **Net cash before taxation** | | | **- 1,25,000** | **1,28,890** | **1,47,685** | **1,67,796** | **1,89,315** | **2,12,339** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 10% | | | 62,500 | 62,500 | 62,500 | 62,500 | 62,500 |
| 17 | Book value of vehicle at year end | | | | 5,62,500 | 5,00,000 | 4,37,500 | 3,75,000 | 3,12,500 |
| 18 | Net profit | | | | 1,40,645 | 1,70,529 | 2,03,385 | 2,39,553 | 2,79,414 |
| 19 | Taxation | 20% | | | - 28,129 | - 34,106 | - 40,677 | - 47,911 | - 55,883 |
| | **EAITDA** | | | - | **1,12,516** | **1,36,423** | **1,62,708** | **1,91,642** | **2,23,531** |
| | **Net cash after taxes (FCF)** | | | **- 1,25,000** | **1,00,762** | **1,13,580** | **1,27,119** | **1,41,404** | **1,56,456** |
| | *Net monthly cash* | | | *- 10,417* | *8,397* | *9,465* | *10,593* | *11,784* | *13,038* |
| | ***DSCR*** | | | | ***1.72*** | ***1.81*** | ***1.91*** | ***2.01*** | ***2.12*** |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | **2,90,719** | 6,460 | | | | | | |
| | **After Tax Equity IRR - 5 years** | **86%** | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | **113%** | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | 8,572 | 190 | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | 1,00,762 | 2,14,341 | 3,41,460 | 4,82,864 |
| | Bank loan | | | 5,00,000 | | | | | |
| | Equity | | | 1,25,000 | | | | | |
| | Cash increase (decrease) for the year | | | (6,25,000.00) | 1,00,762 | 1,13,580 | 1,27,119 | 1,41,404 | 1,56,456 |
| | Closing balance | | | - | 1,00,762 | 2,14,341 | 3,41,460 | 4,82,864 | 6,39,321 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 6,80,000 | 7,27,600 | 7,78,532 | 8,33,029 | 8,91,341 |
| | Less operating expenses | | | | - 4,11,500 | - 4,40,305 | - 4,71,126 | - 5,04,105 | - 5,39,393 |
| | EBITDA | | | | 2,68,500 | 2,87,295 | 3,07,406 | 3,28,924 | 3,51,949 |
| | Less depreciation | | | | - 62,500 | - 62,500 | - 62,500 | - 62,500 | - 62,500 |
| | EBIT | | | | 2,06,000 | 2,24,795 | 2,44,906 | 2,66,424 | 2,89,449 |
| | Interest | | | | - 65,355 | - 54,266 | - 41,520 | - 26,871 | - 10,035 |
| | Gross taxable annual Income | | | | 1,40,645 | 1,70,529 | 2,03,385 | 2,39,553 | 2,79,414 |
| | Total tax payable | | | | - 28,129 | - 34,106 | - 40,677 | - 47,911 | - 55,883 |
| | EAITDA | | | - | 1,12,516 | 1,36,423 | 1,62,708 | 1,91,642 | 2,23,531 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 6,25,000 | 5,62,500 | 5,00,000 | 4,37,500 | 3,75,000 | 3,12,500 |
| | Closing cash | | | | 1,00,762 | 2,14,341 | 3,41,460 | 4,82,864 | 6,39,321 |
| | | | | 6,25,000 | 6,63,262 | 7,14,341 | 7,78,960 | 8,57,864 | 9,51,821 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | 5,00,000 | 4,25,746 | 3,40,402 | 2,42,313 | 1,29,575 | 0 |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 1,25,000 | *1,25,000* | *2,37,516* | *3,73,939* | *5,36,648* | *7,28,290* |
| | Add annual net EAITDA | | | 0 | *1,12,516* | *1,36,423* | *1,62,708* | *1,91,642* | *2,23,531* |
| | Net owner's equity | | | 1,25,000 | 2,37,516 | 3,73,939 | 5,36,648 | 7,28,290 | 9,51,821 |
| | | | | 6,25,000 | 6,63,262 | 7,14,341 | 7,78,960 | 8,57,864 | 9,51,821 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **90%** | **57%** | **44%** | **36%** | **31%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *51%* | | | | |
| | *Average annual 5 year ROE* | | | | *51%* | | | | |
| | | | | - | - | - | - | - | - |
| | | | | | 14,739 | 15,874 | 17,310 | 19,064 | 21,152 |
| | | | | | 9,461 | 7,564 | 5,385 | 2,879 | 0 |
| | | | | | 5,278 | 8,310 | 11,926 | 16,184 | 21,152 |

| | Prakash Tankers, Delhi | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Unit % / cost** | **Units** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 400 | Trips p.a. | | 6,00,000 | 6,42,000 | 6,86,940 | 7,35,026 | 7,86,478 |
| | | 1500 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | 80000 | | | 80,000 | 85,600 | 91,592 | 98,003 | 1,04,864 |
| | **TOTAL ANNUAL REVENUE** | | | - | **6,80,000** | **7,27,600** | **7,78,532** | **8,33,029** | **8,91,341** |
| | | | | | 15,111 | 16,169 | 17,301 | 18,512 | 19,808 |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | 1,12,000 | | | - 1,12,000 | - 1,19,840 | - 1,28,229 | - 1,37,205 | - 1,46,809 |
| 6 | Medical Expenses | 5,000 | | | - 5,000 | - 5,350 | - 5,725 | - 6,125 | - 6,554 |
| 7 | Office building rent | 18,000 | | | - 18,000 | - 19,260 | - 20,608 | - 22,051 | - 23,594 |
| 8 | Telephone | 2,500 | | | - 2,500 | - 2,675 | - 2,862 | - 3,063 | - 3,277 |
| 9 | Electricity & Water | 3,600 | | | - 3,600 | - 3,852 | - 4,122 | - 4,410 | - 4,719 |
| 10 | Annual maintenance provision | 43000 | | | - 43,000 | - 46,010 | - 49,231 | - 52,677 | - 56,364 |
| 11 | Insurance (% of value at beginning of year) | 25000 | | | - 25,000 | - 26,750 | - 28,623 | - 30,626 | - 32,770 |
| 12 | Misc other costs | 17,000 | | | - 17,000 | - 18,190 | - 19,463 | - 20,826 | - 22,284 |
| | TOTAL FIXED OPEX | | | - | - 2,26,100 | - 2,41,927 | - 2,58,862 | - 2,76,982 | - 2,96,371 |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 508 | Cost/Trip | - | - 2,03,200 | - 2,17,424 | - 2,32,644 | - 2,48,929 | - 2,66,354 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 2,03,200 | - 2,17,424 | - 2,32,644 | - 2,48,929 | - 2,66,354 |
| | **TOTAL ANNUAL OPEX** | | | - | **- 4,29,300** | **- 4,59,351** | **- 4,91,506** | **- 5,25,911** | **- 5,62,725** |
| | **Net operating cash flow** | | | - | **2,50,700** | **2,68,249** | **2,87,026** | **3,07,118** | **3,28,617** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 20% | | - 1,25,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | |
| 13 | Interest payment | 14% | | | - 65,355 | - 54,266 | - 41,520 | - 26,871 | - 10,035 |
| 14 | Principal repayment | | | | - 74,254 | - 85,344 | - 98,089 | - 1,12,738 | - 1,29,575 |
| 15 | Total debt service | | | - | - 1,39,610 | - 1,39,610 | - 1,39,610 | - 1,39,610 | - 1,39,610 |
| | **Net Investment and finance cash flow** | | | **- 1,25,000** | **- 1,39,610** | **- 1,39,610** | **- 1,39,610** | **- 1,39,610** | **- 1,39,610** |
| | **Net cash before taxation** | | | **- 1,25,000** | **1,11,090** | **1,28,639** | **1,47,417** | **1,67,509** | **1,89,007** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 10% | | | 62,500 | 62,500 | 62,500 | 62,500 | 62,500 |
| 17 | Book value of vehicle at year end | | | | 5,62,500 | 5,00,000 | 4,37,500 | 3,75,000 | 3,12,500 |
| 18 | Net profit | | | | 1,22,845 | 1,51,483 | 1,83,006 | 2,17,747 | 2,56,082 |
| 19 | Taxation | 20% | | | - 24,569 | - 30,297 | - 36,601 | - 43,549 | - 51,216 |
| | **EAITDA** | | | - | **98,276** | **1,21,187** | **1,46,405** | **1,74,197** | **2,04,865** |
| | **Net cash after taxes (FCF)** | | | **- 1,25,000** | **86,522** | **98,343** | **1,10,816** | **1,23,959** | **1,37,791** |
| | *Net monthly cash* | | | *- 10,417* | *7,210* | *8,195* | *9,235* | *10,330* | *11,483* |
| | ***DSCR*** | | | | ***1.62*** | ***1.70*** | ***1.79*** | ***1.89*** | ***1.99*** |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | **2,36,841** | 5,263 | | | | | | |
| | **After Tax Equity IRR - 5 years** | **74%** | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | **98%** | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | 7,207 | 160 | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | 86,522 | 1,84,864 | 2,95,680 | 4,19,639 |
| | Bank loan | | | 5,00,000 | | | | | |
| | Equity | | | 1,25,000 | | | | | |
| | Cash increase (decrease) for the year | | | (6,25,000.00) | 86,522 | 98,343 | 1,10,816 | 1,23,959 | 1,37,791 |
| | Closing balance | | | - | 86,522 | 1,84,864 | 2,95,680 | 4,19,639 | 5,57,430 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 6,80,000 | 7,27,600 | 7,78,532 | 8,33,029 | 8,91,341 |
| | Less operating expenses | | | | - 4,29,300 | - 4,59,351 | - 4,91,506 | - 5,25,911 | - 5,62,725 |
| | EBITDA | | | | 2,50,700 | 2,68,249 | 2,87,026 | 3,07,118 | 3,28,617 |
| | Less depreciation | | | | - 62,500 | - 62,500 | - 62,500 | - 62,500 | - 62,500 |
| | EBIT | | | | 1,88,200 | 2,05,749 | 2,24,526 | 2,44,618 | 2,66,117 |
| | Interest | | | | - 65,355 | - 54,266 | - 41,520 | - 26,871 | - 10,035 |
| | Gross taxable annual Income | | | | 1,22,845 | 1,51,483 | 1,83,006 | 2,17,747 | 2,56,082 |
| | Total tax payable | | | | - 24,569 | - 30,297 | - 36,601 | - 43,549 | - 51,216 |
| | EAITDA | | | - | 98,276 | 1,21,187 | 1,46,405 | 1,74,197 | 2,04,865 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 6,25,000 | 5,62,500 | 5,00,000 | 4,37,500 | 3,75,000 | 3,12,500 |
| | Closing cash | | | | 86,522 | 1,84,864 | 2,95,680 | 4,19,639 | 5,57,430 |
| | | | | 6,25,000 | 6,49,022 | 6,84,864 | 7,33,180 | 7,94,639 | 8,69,930 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | 5,00,000 | 4,25,746 | 3,40,402 | 2,42,313 | 1,29,575 | 0 |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 1,25,000 | *1,25,000* | *2,23,276* | *3,44,463* | *4,90,867* | *6,65,065* |
| | Add annual net EAITDA | | | 0 | *98,276* | *1,21,187* | *1,46,405* | *1,74,197* | *2,04,865* |
| | Net owner's equity | | | 1,25,000 | 2,23,276 | 3,44,463 | 4,90,867 | 6,65,065 | 8,69,930 |
| | | | | 6,25,000 | 6,49,022 | 6,84,864 | 7,33,180 | 7,94,639 | 8,69,930 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **79%** | **54%** | **43%** | **35%** | **31%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *48%* | | | | |
| | *Average annual 5 year ROE* | | | | *48%* | | | | |
| | | | | - | - | - | - | - | - |
| | | | | | 14,423 | 15,219 | 16,293 | 17,659 | 19,332 |
| | | | | | 9,461 | 7,564 | 5,385 | 2,879 | 0 |
| | | | | | 4,962 | 7,655 | 10,908 | 14,779 | 19,332 |

| | Prateek Tankers, Delhi | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Unit % / cost** | **Units** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 500 | Trips p.a. | | 7,50,000 | 8,02,500 | 8,58,675 | 9,18,782 | 9,83,097 |
| | | 1500 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | 50000 | | | 50,000 | 53,500 | 57,245 | 61,252 | 65,540 |
| | **TOTAL ANNUAL REVENUE** | | | - | **8,00,000** | **8,56,000** | **9,15,920** | **9,80,034** | **10,48,637** |
| | | | | | 17,778 | 19,022 | 20,354 | 21,779 | 23,303 |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | 1,20,000 | | | - 1,20,000 | - 1,28,400 | - 1,37,388 | - 1,47,005 | - 1,57,296 |
| 6 | Medical Expenses | 5,000 | | | - 5,000 | - 5,350 | - 5,725 | - 6,125 | - 6,554 |
| 7 | Office building rent | 12,000 | | | - 12,000 | - 12,840 | - 13,739 | - 14,701 | - 15,730 |
| 8 | Telephone | 3,600 | | | - 3,600 | - 3,852 | - 4,122 | - 4,410 | - 4,719 |
| 9 | Electricity & Water | 3,000 | | | - 3,000 | - 3,210 | - 3,435 | - 3,675 | - 3,932 |
| 10 | Annual maintenance provision | 31500 | | | - 31,500 | - 33,705 | - 36,064 | - 38,589 | - 41,290 |
| 11 | Insurance (% of value at beginning of year) | 20000 | | | - 20,000 | - 21,400 | - 22,898 | - 24,501 | - 26,216 |
| 12 | Misc other costs | 15,000 | | | - 15,000 | - 16,050 | - 17,174 | - 18,376 | - 19,662 |
| | TOTAL FIXED OPEX | | | - | - 2,10,100 | - 2,24,807 | - 2,40,543 | - 2,57,382 | - 2,75,398 |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 508 | Cost/Trip | - | - 2,54,000 | - 2,71,780 | - 2,90,805 | - 3,11,161 | - 3,32,942 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 2,54,000 | - 2,71,780 | - 2,90,805 | - 3,11,161 | - 3,32,942 |
| | **TOTAL ANNUAL OPEX** | | | - | **- 4,64,100** | **- 4,96,587** | **- 5,31,348** | **- 5,68,542** | **- 6,08,340** |
| | **Net operating cash flow** | | | - | **3,35,900** | **3,59,413** | **3,84,572** | **4,11,492** | **4,40,296** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 100% | | - 6,50,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | |
| 13 | Interest payment | 14% | | | | | | | |
| 14 | Principal repayment | | | | | | | | |
| 15 | Total debt service | | | - | - | - | - | - | - |
| | **Net Investment and finance cash flow** | | | **- 6,50,000** | - | - | - | - | - |
| | **Net cash before taxation** | | | **- 6,50,000** | **3,35,900** | **3,59,413** | **3,84,572** | **4,11,492** | **4,40,296** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 10% | | | 65,000 | 65,000 | 65,000 | 65,000 | 65,000 |
| 17 | Book value of vehicle at year end | | | | 5,85,000 | 5,20,000 | 4,55,000 | 3,90,000 | 3,25,000 |
| 18 | Net profit | | | | 2,70,900 | 2,94,413 | 3,19,572 | 3,46,492 | 3,75,296 |
| 19 | Taxation | 20% | | | - 54,180 | - 58,883 | - 63,914 | - 69,298 | - 75,059 |
| | **EAITDA** | | | **-** | **2,16,720** | **2,35,530** | **2,55,658** | **2,77,194** | **3,00,237** |
| | **Net cash after taxes (FCF)** | | | **- 6,50,000** | **2,81,720** | **3,00,530** | **3,20,658** | **3,42,194** | **3,65,237** |
| | *Net monthly cash* | | | *- 54,167* | *23,477* | *25,044* | *26,721* | *28,516* | *30,436* |
| | ***DSCR*** | | | | | | | | |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | **4,10,293** | 9,118 | | | | | | |
| | **After Tax Equity IRR - 5 years** | **38%** | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | **49%** | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | **16,006** | 356 | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | 2,81,720 | 5,82,250 | 9,02,908 | 12,45,101 |
| | Bank loan | | | - | | | | | |
| | Equity | | | 6,50,000 | | | | | |
| | Cash increase (decrease) for the year | | | (6,50,000.00) | 2,81,720 | 3,00,530 | 3,20,658 | 3,42,194 | 3,65,237 |
| | Closing balance | | | - | 2,81,720 | 5,82,250 | 9,02,908 | 12,45,101 | 16,10,339 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 8,00,000 | 8,56,000 | 9,15,920 | 9,80,034 | 10,48,637 |
| | Less operating expenses | | | | - 4,64,100 | - 4,96,587 | - 5,31,348 | - 5,68,542 | - 6,08,340 |
| | EBITDA | | | | 3,35,900 | 3,59,413 | 3,84,572 | 4,11,492 | 4,40,296 |
| | Less depreciation | | | | - 65,000 | - 65,000 | - 65,000 | - 65,000 | - 65,000 |
| | EBIT | | | | 2,70,900 | 2,94,413 | 3,19,572 | 3,46,492 | 3,75,296 |
| | Interest | | | | - | - | - | - | - |
| | Gross taxable annual Income | | | | 2,70,900 | 2,94,413 | 3,19,572 | 3,46,492 | 3,75,296 |
| | Total tax payable | | | | - 54,180 | - 58,883 | - 63,914 | - 69,298 | - 75,059 |
| | EAITDA | | | - | 2,16,720 | 2,35,530 | 2,55,658 | 2,77,194 | 3,00,237 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 6,50,000 | 5,85,000 | 5,20,000 | 4,55,000 | 3,90,000 | 3,25,000 |
| | Closing cash | | | | 2,81,720 | 5,82,250 | 9,02,908 | 12,45,101 | 16,10,339 |
| | | | | 6,50,000 | 8,66,720 | 11,02,250 | 13,57,908 | 16,35,101 | 19,35,339 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | - | - | - | - | - | - |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 6,50,000 | *6,50,000* | *8,66,720* | *11,02,250* | *13,57,908* | *16,35,101* |
| | Add annual net EAITDA | | | 0 | *2,16,720* | *2,35,530* | *2,55,658* | *2,77,194* | *3,00,237* |
| | Net owner's equity | | | 6,50,000 | 8,66,720 | 11,02,250 | 13,57,908 | 16,35,101 | 19,35,339 |
| | | | | 6,50,000 | 8,66,720 | 11,02,250 | 13,57,908 | 16,35,101 | 19,35,339 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **33%** | **27%** | **23%** | **20%** | **18%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *24%* | | | | |
| | *Average annual 5 year ROE* | | | | *24%* | | | | |
| | | | | - | - | - | - | - | - |
| | | | | | 19,260 | 24,494 | 30,176 | 36,336 | 43,008 |

| | Shambu Tankers, Delhi | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Unit % / cost** | **Units** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 500 | Trips p.a. | | 6,00,000 | 6,42,000 | 6,86,940 | 7,35,026 | 7,86,478 |
| | | 1200 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | 0 | | | - | - | - | - | - |
| | **TOTAL ANNUAL REVENUE** | | | - | **6,00,000** | **6,42,000** | **6,86,940** | **7,35,026** | **7,86,478** |
| | | | | | 13,333 | 14,267 | 15,265 | 16,334 | 17,477 |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | 60,000 | | | - 60,000 | - 64,200 | - 68,694 | - 73,503 | - 78,648 |
| 6 | Medical Expenses | 5,000 | | | - 5,000 | - 5,350 | - 5,725 | - 6,125 | - 6,554 |
| 7 | Office building rent | - | | | - | - | - | - | - |
| 8 | Telephone | 2,500 | | | - 2,500 | - 2,675 | - 2,862 | - 3,063 | - 3,277 |
| 9 | Electricity & Water | - | | | - | - | - | - | - |
| 10 | Annual maintenance provision | 44000 | | | - 44,000 | - 47,080 | - 50,376 | - 53,902 | - 57,675 |
| 11 | Insurance (% of value at beginning of year) | 25000 | | | - 25,000 | - 26,750 | - 28,623 | - 30,626 | - 32,770 |
| 12 | Misc other costs | 20,000 | | | - 20,000 | - 21,400 | - 22,898 | - 24,501 | - 26,216 |
| | TOTAL FIXED OPEX | | | - | - 1,56,500 | - 1,67,455 | - 1,79,177 | - 1,91,719 | - 2,05,140 |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 298 | Cost/Trip | - | - 1,49,000 | - 1,59,430 | - 1,70,590 | - 1,82,531 | - 1,95,309 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 1,49,000 | - 1,59,430 | - 1,70,590 | - 1,82,531 | - 1,95,309 |
| | **TOTAL ANNUAL OPEX** | | | - | **- 3,05,500** | **- 3,26,885** | **- 3,49,767** | **- 3,74,251** | **- 4,00,448** |
| | **Net operating cash flow** | | | - | **2,94,500** | **3,15,115** | **3,37,173** | **3,60,775** | **3,86,029** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 20% | | - 1,25,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | |
| 13 | Interest payment | 14% | | | - 65,355 | - 54,266 | - 41,520 | - 26,871 | - 10,035 |
| 14 | Principal repayment | | | | - 74,254 | - 85,344 | - 98,089 | - 1,12,738 | - 1,29,575 |
| 15 | Total debt service | | | - | - 1,39,610 | - 1,39,610 | - 1,39,610 | - 1,39,610 | - 1,39,610 |
| | **Net Investment and finance cash flow** | | | **- 1,25,000** | **- 1,39,610** | **- 1,39,610** | **- 1,39,610** | **- 1,39,610** | **- 1,39,610** |
| | **Net cash before taxation** | | | **- 1,25,000** | **1,54,890** | **1,75,505** | **1,97,564** | **2,21,166** | **2,46,420** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 10% | | | 62,500 | 62,500 | 62,500 | 62,500 | 62,500 |
| 17 | Book value of vehicle at year end | | | | 5,62,500 | 5,00,000 | 4,37,500 | 3,75,000 | 3,12,500 |
| 18 | Net profit | | | | 1,66,645 | 1,98,349 | 2,33,153 | 2,71,404 | 3,13,494 |
| 19 | Taxation | 20% | | | - 33,329 | - 39,670 | - 46,631 | - 54,281 | - 62,699 |
| | **EAITDA** | | | **-** | **1,33,316** | **1,58,679** | **1,86,522** | **2,17,123** | **2,50,796** |
| | **Net cash after taxes (FCF)** | | | **- 1,25,000** | **1,21,562** | **1,35,836** | **1,50,933** | **1,66,885** | **1,83,721** |
| | *Net monthly cash* | | | *- 10,417* | *10,130* | *11,320* | *12,578* | *13,907* | *15,310* |
| | ***DSCR*** | | | | ***1.87*** | ***1.97*** | ***2.08*** | ***2.20*** | ***2.32*** |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | **3,69,417** | 8,209 | | | | | | |
| | **After Tax Equity IRR - 5 years** | **104%** | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | **134%** | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | **10,566** | 235 | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | 1,21,562 | 2,57,397 | 4,08,330 | 5,75,215 |
| | Bank loan | | | 5,00,000 | | | | | |
| | Equity | | | 1,25,000 | | | | | |
| | Cash increase (decrease) for the year | | | (6,25,000.00) | 1,21,562 | 1,35,836 | 1,50,933 | 1,66,885 | 1,83,721 |
| | Closing balance | | | - | 1,21,562 | 2,57,397 | 4,08,330 | 5,75,215 | 7,58,936 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 6,00,000 | 6,42,000 | 6,86,940 | 7,35,026 | 7,86,478 |
| | Less operating expenses | | | | - 3,05,500 | - 3,26,885 | - 3,49,767 | - 3,74,251 | - 4,00,448 |
| | EBITDA | | | | 2,94,500 | 3,15,115 | 3,37,173 | 3,60,775 | 3,86,029 |
| | Less depreciation | | | | - 62,500 | - 62,500 | - 62,500 | - 62,500 | - 62,500 |
| | EBIT | | | | 2,32,000 | 2,52,615 | 2,74,673 | 2,98,275 | 3,23,529 |
| | Interest | | | | - 65,355 | - 54,266 | - 41,520 | - 26,871 | - 10,035 |
| | Gross taxable annual Income | | | | 1,66,645 | 1,98,349 | 2,33,153 | 2,71,404 | 3,13,494 |
| | Total tax payable | | | | - 33,329 | - 39,670 | - 46,631 | - 54,281 | - 62,699 |
| | EAITDA | | | - | 1,33,316 | 1,58,679 | 1,86,522 | 2,17,123 | 2,50,796 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 6,25,000 | 5,62,500 | 5,00,000 | 4,37,500 | 3,75,000 | 3,12,500 |
| | Closing cash | | | | 1,21,562 | 2,57,397 | 4,08,330 | 5,75,215 | 7,58,936 |
| | | | | 6,25,000 | 6,84,062 | 7,57,397 | 8,45,830 | 9,50,215 | 10,71,436 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | 5,00,000 | 4,25,746 | 3,40,402 | 2,42,313 | 1,29,575 | 0 |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 1,25,000 | *1,25,000* | *2,58,316* | *4,16,995* | *6,03,518* | *8,20,641* |
| | Add annual net EAITDA | | | 0 | *1,33,316* | *1,58,679* | *1,86,522* | *2,17,123* | *2,50,796* |
| | Net owner's equity | | | 1,25,000 | 2,58,316 | 4,16,995 | 6,03,518 | 8,20,641 | 10,71,436 |
| | | | | 6,25,000 | 6,84,062 | 7,57,397 | 8,45,830 | 9,50,215 | 10,71,436 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **107%** | **61%** | **45%** | **36%** | **31%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *56%* | | | | |
| | *Average annual 5 year ROE* | | | | *56%* | | | | |
| | | | | - | - | - | - | - | - |
| | | | | | 15,201 | 16,831 | 18,796 | 21,116 | 23,810 |
| | | | | | 9,461 | 7,564 | 5,385 | 2,879 | 0 |
| | | | | | 5,740 | 9,267 | 13,412 | 18,236 | 23,810 |

| | Yaseen, Delhi | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Unit % / cost** | **Units** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 400 | Trips p.a. | | 6,00,000 | 6,42,000 | 6,86,940 | 7,35,026 | 7,86,478 |
| | | 1500 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | | | | | | | | |
| | **TOTAL ANNUAL REVENUE** | | | - | **6,00,000** | **6,42,000** | **6,86,940** | **7,35,026** | **7,86,478** |
| | | | | | 13,333 | 14,267 | 15,265 | 16,334 | 17,477 |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | 60,000 | | | - 60,000 | - 64,200 | - 68,694 | - 73,503 | - 78,648 |
| 6 | Medical Expenses | - | | | - | - | - | - | - |
| 7 | Office building rent | - | | | - | - | - | - | - |
| 8 | Telephone | 2,500 | | | - 2,500 | - 2,675 | - 2,862 | - 3,063 | - 3,277 |
| 9 | Electricity & Water | - | | | - | - | - | - | - |
| 10 | Annual maintenance provision | 44000 | | | - 44,000 | - 47,080 | - 50,376 | - 53,902 | - 57,675 |
| 11 | Insurance (% of value at beginning of year) | 25000 | | | - 25,000 | - 26,750 | - 28,623 | - 30,626 | - 32,770 |
| 12 | Misc other costs | 20,000 | | | - 20,000 | - 21,400 | - 22,898 | - 24,501 | - 26,216 |
| | TOTAL FIXED OPEX | | | - | - 1,51,500 | - 1,62,105 | - 1,73,452 | - 1,85,594 | - 1,98,586 |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 375 | Cost/Trip | - | - 1,50,000 | - 1,60,500 | - 1,71,735 | - 1,83,756 | - 1,96,619 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 1,50,000 | - 1,60,500 | - 1,71,735 | - 1,83,756 | - 1,96,619 |
| | | | | | | | | | |
| | **TOTAL ANNUAL OPEX** | | | - | **- 3,01,500** | **- 3,22,605** | **- 3,45,187** | **- 3,69,350** | **- 3,95,205** |
| | **Net operating cash flow** | | | - | **2,98,500** | **3,19,395** | **3,41,753** | **3,65,675** | **3,91,273** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 20% | | - 1,25,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | |
| 13 | Interest payment | 14% | | | - 65,355 | - 54,266 | - 41,520 | - 26,871 | - 10,035 |
| 14 | Principal repayment | | | | - 74,254 | - 85,344 | - 98,089 | - 1,12,738 | - 1,29,575 |
| 15 | Total debt service | | | - | - 1,39,610 | - 1,39,610 | - 1,39,610 | - 1,39,610 | - 1,39,610 |
| | **Net Investment and finance cash flow** | | | **- 1,25,000** | **- 1,39,610** | **- 1,39,610** | **- 1,39,610** | **- 1,39,610** | **- 1,39,610** |
| | **Net cash before taxation** | | | **- 1,25,000** | **1,58,890** | **1,79,785** | **2,02,143** | **2,26,066** | **2,51,663** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 10% | | | 62,500 | 62,500 | 62,500 | 62,500 | 62,500 |
| 17 | Book value of vehicle at year end | | | | 5,62,500 | 5,00,000 | 4,37,500 | 3,75,000 | 3,12,500 |
| 18 | Net profit | | | | 1,70,645 | 2,02,629 | 2,37,732 | 2,76,304 | 3,18,738 |
| 19 | Taxation | 20% | | | - 34,129 | - 40,526 | - 47,546 | - 55,261 | - 63,748 |
| | **EAITDA** | | | - | **1,36,516** | **1,62,103** | **1,90,186** | **2,21,043** | **2,54,990** |
| | **Net cash after taxes (FCF)** | | | **- 1,25,000** | **1,24,762** | **1,39,260** | **1,54,597** | **1,70,805** | **1,87,916** |
| | *Net monthly cash* | | | *- 10,417* | *10,397* | *11,605* | *12,883* | *14,234* | *15,660* |
| | ***DSCR*** | | | | ***1.89*** | ***2.00*** | ***2.11*** | ***2.22*** | ***2.35*** |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | **3,81,524** | 8,478 | | | | | | |
| | **After Tax Equity IRR - 5 years** | **107%** | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | **137%** | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | **10,872** | 242 | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | 1,24,762 | 2,64,021 | 4,18,618 | 5,89,423 |
| | Bank loan | | | 5,00,000 | | | | | |
| | Equity | | | 1,25,000 | | | | | |
| | Cash increase (decrease) for the year | | | (6,25,000.00) | 1,24,762 | 1,39,260 | 1,54,597 | 1,70,805 | 1,87,916 |
| | Closing balance | | | - | 1,24,762 | 2,64,021 | 4,18,618 | 5,89,423 | 7,77,338 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 6,00,000 | 6,42,000 | 6,86,940 | 7,35,026 | 7,86,478 |
| | Less operating expenses | | | | - 3,01,500 | - 3,22,605 | - 3,45,187 | - 3,69,350 | - 3,95,205 |
| | EBITDA | | | | 2,98,500 | 3,19,395 | 3,41,753 | 3,65,675 | 3,91,273 |
| | Less depreciation | | | | - 62,500 | - 62,500 | - 62,500 | - 62,500 | - 62,500 |
| | EBIT | | | | 2,36,000 | 2,56,895 | 2,79,253 | 3,03,175 | 3,28,773 |
| | Interest | | | | - 65,355 | - 54,266 | - 41,520 | - 26,871 | - 10,035 |
| | Gross taxable annual Income | | | | 1,70,645 | 2,02,629 | 2,37,732 | 2,76,304 | 3,18,738 |
| | Total tax payable | | | | - 34,129 | - 40,526 | - 47,546 | - 55,261 | - 63,748 |
| | EAITDA | | | - | 1,36,516 | 1,62,103 | 1,90,186 | 2,21,043 | 2,54,990 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 6,25,000 | 5,62,500 | 5,00,000 | 4,37,500 | 3,75,000 | 3,12,500 |
| | Closing cash | | | | 1,24,762 | 2,64,021 | 4,18,618 | 5,89,423 | 7,77,338 |
| | | | | 6,25,000 | 6,87,262 | 7,64,021 | 8,56,118 | 9,64,423 | 10,89,838 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | 5,00,000 | 4,25,746 | 3,40,402 | 2,42,313 | 1,29,575 | 0 |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 1,25,000 | *1,25,000* | *2,61,516* | *4,23,619* | *6,13,805* | *8,34,848* |
| | Add annual net EAITDA | | | 0 | *1,36,516* | *1,62,103* | *1,90,186* | *2,21,043* | *2,54,990* |
| | Net owner's equity | | | 1,25,000 | 2,61,516 | 4,23,619 | 6,13,805 | 8,34,848 | 10,89,838 |
| | | | | 6,25,000 | 6,87,262 | 7,64,021 | 8,56,118 | 9,64,423 | 10,89,838 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **109%** | **62%** | **45%** | **36%** | **31%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *57%* | | | | |
| | *Average annual 5 year ROE* | | | | *57%* | | | | |
| | | | | | 9,461 | 7,564 | 5,385 | 2,879 | 0 |
| | | | | | 5,811 | 9,414 | 13,640 | 18,552 | 24,219 |
| | | | | | 15,272 | 16,978 | 19,025 | 21,432 | 24,219 |

| | Sri Ultra Sewer Tank Service, Jaipur | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Unit % / cost** | **Units** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 500 | Trips p.a. | | 4,80,000 | 5,13,600 | 5,49,552 | 5,88,021 | 6,29,182 |
| | | 960 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | 240 | Trips p.a. | | 1,08,000 | 1,15,560 | 1,23,649 | 1,32,305 | 1,41,566 |
| | | 450 | Tarriff / trip | | | | | | |
| | **TOTAL ANNUAL REVENUE** | | | - | **5,88,000** | **6,29,160** | **6,73,201** | **7,20,325** | **7,70,748** |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | 72,000 | | | - 72,000 | - 77,040 | - 82,433 | - 88,203 | - 94,377 |
| 6 | Medical Expenses | 1,200 | | | - 1,200 | - 1,284 | - 1,374 | - 1,470 | - 1,573 |
| 7 | Office building rent | - | | | - | - | - | - | - |
| 8 | Telephone | 7,200 | | | - 7,200 | - 7,704 | - 8,243 | - 8,820 | - 9,438 |
| 9 | Electricity & Water | - | | | - | - | - | - | - |
| 10 | Annual maintenance provision | 34705 | | | - 34,705 | - 37,134 | - 39,734 | - 42,515 | - 45,491 |
| 11 | Insurance (% of value at beginning of year) | 0 | | | - | - | - | - | - |
| 12 | Misc other costs | - | | | - | - | - | - | - |
| | TOTAL FIXED OPEX | | | - | - 1,15,105 | - 1,23,162 | - 1,31,784 | - 1,41,009 | - 1,50,879 |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 105 | Cost/Trip | - | - 77,700 | - 83,139 | - 88,959 | - 95,186 | - 1,01,849 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 77,700 | - 83,139 | - 88,959 | - 95,186 | - 1,01,849 |
| | **TOTAL ANNUAL OPEX** | | | - | **- 1,92,805** | **- 2,06,301** | **- 2,20,742** | **- 2,36,194** | **- 2,52,728** |
| | **Net operating cash flow** | | | - | **3,95,195** | **4,22,859** | **4,52,459** | **4,84,131** | **5,18,020** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 20% | | - 1,44,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | |
| 13 | Interest payment | 10% | | | - 52,116 | - 46,076 | - 39,437 | - 32,139 | - 24,117 |
| 14 | Principal repayment | | | | - 60,854 | - 66,894 | - 73,533 | - 80,831 | - 88,853 |
| 15 | Total debt service | | | - | - 1,12,970 | - 1,12,970 | - 1,12,970 | - 1,12,970 | - 1,12,970 |
| | **Net Investment and finance cash flow** | | | **- 1,44,000** | **- 1,12,970** | **- 1,12,970** | **- 1,12,970** | **- 1,12,970** | **- 1,12,970** |
| | **Net cash before taxation** | | | **- 1,44,000** | **2,82,225** | **3,09,889** | **3,39,489** | **3,71,161** | **4,05,050** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 15% | | | 1,08,000 | 1,08,000 | 1,08,000 | 1,08,000 | 1,08,000 |
| 17 | Book value of vehicle at year end | | | | 6,12,000 | 5,04,000 | 3,96,000 | 2,88,000 | 1,80,000 |
| 18 | Net profit | | | | 2,35,079 | 2,68,783 | 3,05,022 | 3,43,992 | 3,85,903 |
| 19 | Taxation | 20% | | | - 47,016 | - 53,757 | - 61,004 | - 68,798 | - 77,181 |
| | **EAITDA** | | | **-** | **1,88,064** | **2,15,026** | **2,44,017** | **2,75,194** | **3,08,723** |
| | **Net cash after taxes (FCF)** | | | **- 1,44,000** | **2,35,210** | **2,56,133** | **2,78,485** | **3,02,363** | **3,27,870** |
| | *Net monthly cash* | | | *- 12,000* | *19,601* | *21,344* | *23,207* | *25,197* | *27,322* |
| | ***DSCR*** | | | | ***3.08*** | ***3.27*** | ***3.47*** | ***3.68*** | ***3.90*** |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | **7,73,197** | | | | | | | |
| | **After Tax Equity IRR - 5 years** | **170%** | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | **204%** | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | **20,934** | | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | 2,35,210 | 4,91,342 | 7,69,827 | 10,72,190 |
| | Bank loan | | | 5,76,000 | | | | | |
| | Equity | | | 1,44,000 | | | | | |
| | Cash increase (decrease) for the year | | | (7,20,000.00) | 2,35,210 | 2,56,133 | 2,78,485 | 3,02,363 | 3,27,870 |
| | Closing balance | | | - | 2,35,210 | 4,91,342 | 7,69,827 | 10,72,190 | 14,00,059 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 5,88,000 | 6,29,160 | 6,73,201 | 7,20,325 | 7,70,748 |
| | Less operating expenses | | | | - 1,92,805 | - 2,06,301 | - 2,20,742 | - 2,36,194 | - 2,52,728 |
| | EBITDA | | | | 3,95,195 | 4,22,859 | 4,52,459 | 4,84,131 | 5,18,020 |
| | Less depreciation | | | | - 1,08,000 | - 1,08,000 | - 1,08,000 | - 1,08,000 | - 1,08,000 |
| | EBIT | | | | 2,87,195 | 3,14,859 | 3,44,459 | 3,76,131 | 4,10,020 |
| | Interest | | | | - 52,116 | - 46,076 | - 39,437 | - 32,139 | - 24,117 |
| | Gross taxable annual Income | | | | 2,35,079 | 2,68,783 | 3,05,022 | 3,43,992 | 3,85,903 |
| | Total tax payable | | | | - 47,016 | - 53,757 | - 61,004 | - 68,798 | - 77,181 |
| | EAITDA | | | - | 1,88,064 | 2,15,026 | 2,44,017 | 2,75,194 | 3,08,723 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 7,20,000 | 6,12,000 | 5,04,000 | 3,96,000 | 2,88,000 | 1,80,000 |
| | Closing cash | | | | 2,35,210 | 4,91,342 | 7,69,827 | 10,72,190 | 14,00,059 |
| | | | | 7,20,000 | 8,47,210 | 9,95,342 | 11,65,827 | 13,60,190 | 15,80,059 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | 5,76,000 | 5,15,146 | 4,48,252 | 3,74,720 | 2,93,889 | 2,05,036 |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 1,44,000 | *1,44,000* | *3,32,064* | *5,47,090* | *7,91,107* | *10,66,301* |
| | Add annual net EAITDA | | | 0 | *1,88,064* | *2,15,026* | *2,44,017* | *2,75,194* | *3,08,723* |
| | Net owner's equity | | | 1,44,000 | 3,32,064 | 5,47,090 | 7,91,107 | 10,66,301 | 13,75,023 |
| | | | | 7,20,000 | 8,47,210 | 9,95,342 | 11,65,827 | 13,60,190 | 15,80,059 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **131%** | **65%** | **45%** | **35%** | **29%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *61%* | | | | |
| | *Average annual 5 year ROE* | | | | *61%* | | | | |

| | Sri Ram Sewer Tank Service, Jaipur | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Unit % / cost** | **Units** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 720 | Trips p.a. | | 3,60,000 | 3,85,200 | 4,12,164 | 4,41,015 | 4,71,887 |
| | | 500 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | 40 | Trips p.a. | | 24,000 | 25,680 | 27,478 | 29,401 | 31,459 |
| | | 600 | Tarriff / trip | | | | | | |
| | **TOTAL ANNUAL REVENUE** | | | - | **3,84,000** | **4,10,880** | **4,39,642** | **4,70,417** | **5,03,346** |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | - | | | - | - | - | - | - |
| 6 | Medical Expenses | - | | | - | - | - | - | - |
| 7 | Office building rent | - | | | - | - | - | - | - |
| 8 | Telephone | 3,600 | | | - 3,600 | - 3,852 | - 4,122 | - 4,410 | - 4,719 |
| 9 | Electricity & Water | - | | | - | - | - | - | - |
| 10 | Annual maintenance provision | 52905 | | | - 52,905 | - 56,608 | - 60,571 | - 64,811 | - 69,348 |
| 11 | Insurance (% of value at beginning of year) | 0 | | | - | - | - | - | - |
| 12 | Misc other costs | - | | | - | - | - | - | - |
| | TOTAL FIXED OPEX | | | - | - 56,505 | - 60,460 | - 64,693 | - 69,221 | - 74,067 |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 158 | Cost/Trip | - | - 1,20,080 | - 1,28,486 | - 1,37,480 | - 1,47,103 | - 1,57,400 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 1,20,080 | - 1,28,486 | - 1,37,480 | - 1,47,103 | - 1,57,400 |
| | **TOTAL ANNUAL OPEX** | | | - | **- 1,76,585** | **- 1,88,946** | **- 2,02,172** | **- 2,16,324** | **- 2,31,467** |
| | **Net operating cash flow** | | | - | **2,07,415** | **2,21,934** | **2,37,469** | **2,54,092** | **2,71,879** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 100% | | - 2,55,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | |
| 13 | Interest payment | 10% | | | | | | | |
| 14 | Principal repayment | | | | | | | | |
| 15 | Total debt service | | | - | - | - | - | - | - |
| | **Net Investment and finance cash flow** | | | **- 2,55,000** | - | - | - | - | - |
| | | | | | | | | | |
| | **Net cash before taxation** | | | **- 2,55,000** | **2,07,415** | **2,21,934** | **2,37,469** | **2,54,092** | **2,71,879** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 15% | | | 38,250 | 38,250 | 38,250 | 38,250 | 38,250 |
| 17 | Book value of vehicle at year end | | | | 2,16,750 | 1,78,500 | 1,40,250 | 1,02,000 | 63,750 |
| 18 | Net profit | | | | 1,69,165 | 1,83,684 | 1,99,219 | 2,15,842 | 2,33,629 |
| 19 | Taxation | 20% | | | - 33,833 | - 36,737 | - 39,844 | - 43,168 | - 46,726 |
| | **EAITDA** | | | **-** | **1,35,332** | **1,46,947** | **1,59,376** | **1,72,674** | **1,86,903** |
| | **Net cash after taxes (FCF)** | | | **- 2,55,000** | **1,73,582** | **1,85,197** | **1,97,626** | **2,10,924** | **2,25,153** |
| | *Net monthly cash* | | | *- 21,250* | *14,465* | *15,433* | *16,469* | *17,577* | *18,763* |
| | ***DSCR*** | | | | | | | | |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | **3,98,456** | | | | | | | |
| | **After Tax Equity IRR - 5 years** | **68%** | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | **83%** | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | 12,291 | | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | 1,73,582 | 3,58,779 | 5,56,405 | 7,67,329 |
| | Bank loan | | | - | | | | | |
| | Equity | | | 2,55,000 | | | | | |
| | Cash increase (decrease) for the year | | | (2,55,000.00) | 1,73,582 | 1,85,197 | 1,97,626 | 2,10,924 | 2,25,153 |
| | Closing balance | | | - | 1,73,582 | 3,58,779 | 5,56,405 | 7,67,329 | 9,92,482 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 3,84,000 | 4,10,880 | 4,39,642 | 4,70,417 | 5,03,346 |
| | Less operating expenses | | | | - 1,76,585 | - 1,88,946 | - 2,02,172 | - 2,16,324 | - 2,31,467 |
| | EBITDA | | | | 2,07,415 | 2,21,934 | 2,37,469 | 2,54,092 | 2,71,879 |
| | Less depreciation | | | | - 38,250 | - 38,250 | - 38,250 | - 38,250 | - 38,250 |
| | EBIT | | | | 1,69,165 | 1,83,684 | 1,99,219 | 2,15,842 | 2,33,629 |
| | Interest | | | | - | - | - | - | - |
| | Gross taxable annual Income | | | | 1,69,165 | 1,83,684 | 1,99,219 | 2,15,842 | 2,33,629 |
| | Total tax payable | | | | - 33,833 | - 36,737 | - 39,844 | - 43,168 | - 46,726 |
| | EAITDA | | | - | 1,35,332 | 1,46,947 | 1,59,376 | 1,72,674 | 1,86,903 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 2,55,000 | 2,16,750 | 1,78,500 | 1,40,250 | 1,02,000 | 63,750 |
| | Closing cash | | | | 1,73,582 | 3,58,779 | 5,56,405 | 7,67,329 | 9,92,482 |
| | | | | 2,55,000 | 3,90,332 | 5,37,279 | 6,96,655 | 8,69,329 | 10,56,232 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | - | - | - | - | - | - |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 2,55,000 | *2,55,000* | *3,90,332* | *5,37,279* | *6,96,655* | *8,69,329* |
| | Add annual net EAITDA | | | 0 | *1,35,332* | *1,46,947* | *1,59,376* | *1,72,674* | *1,86,903* |
| | Net owner's equity | | | 2,55,000 | 3,90,332 | 5,37,279 | 6,96,655 | 8,69,329 | 10,56,232 |
| | | | | 2,55,000 | 3,90,332 | 5,37,279 | 6,96,655 | 8,69,329 | 10,56,232 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **53%** | **38%** | **30%** | **25%** | **21%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *33%* | | | | |
| | *Average annual 5 year ROE* | | | | *33%* | | | | |

| | New Star Sewer Tank Service, Jaipur | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Unit % / cost** | **Units** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 900 | Trips p.a. | | 4,50,000 | 4,81,500 | 5,15,205 | 5,51,269 | 5,89,858 |
| | | 500 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | 480 | Trips p.a. | | 1,44,000 | 1,54,080 | 1,64,866 | 1,76,406 | 1,88,755 |
| | | 300 | Tarriff / trip | | | | | | |
| | **TOTAL ANNUAL REVENUE** | | | - | **5,94,000** | **6,35,580** | **6,80,071** | **7,27,676** | **7,78,613** |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | 96,000 | | | - 96,000 | - 1,02,720 | - 1,09,910 | - 1,17,604 | - 1,25,836 |
| 6 | Medical Expenses | - | | | - | - | - | - | - |
| 7 | Office building rent | - | | | - | - | - | - | - |
| 8 | Telephone | 12,000 | | | - 12,000 | - 12,840 | - 13,739 | - 14,701 | - 15,730 |
| 9 | Electricity & Water | 9,600 | | | - 9,600 | - 10,272 | - 10,991 | - 11,760 | - 12,584 |
| 10 | Annual maintenance provision | 54105 | | | - 54,105 | - 57,892 | - 61,945 | - 66,281 | - 70,921 |
| 11 | Insurance (% of value at beginning of year) | 0 | | | - | - | - | - | - |
| 12 | Misc other costs | 10,000 | | | - 10,000 | - 10,700 | - 11,449 | - 12,250 | - 13,108 |
| | TOTAL FIXED OPEX | | | - | - 1,81,705 | - 1,94,424 | - 2,08,034 | - 2,22,596 | - 2,38,178 |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 158 | Cost/Trip | - | - 2,18,040 | - 2,33,303 | - 2,49,634 | - 2,67,108 | - 2,85,806 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 2,18,040 | - 2,33,303 | - 2,49,634 | - 2,67,108 | - 2,85,806 |
| | | | | | | | | | |
| | **TOTAL ANNUAL OPEX** | | | - | **- 3,99,745** | **- 4,27,727** | **- 4,57,668** | **- 4,89,705** | **- 5,23,984** |
| | **Net operating cash flow** | | | - | **1,94,255** | **2,07,853** | **2,22,403** | **2,37,971** | **2,54,629** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 100% | | - 2,55,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | |
| 13 | Interest payment | 10% | | | | | | | |
| 14 | Principal repayment | | | | | | | | |
| 15 | Total debt service | | | - | - | - | - | - | - |
| | **Net Investment and finance cash flow** | | | **- 2,55,000** | - | - | - | - | - |
| | **Net cash before taxation** | | | **- 2,55,000** | **1,94,255** | **2,07,853** | **2,22,403** | **2,37,971** | **2,54,629** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 15% | | | 38,250 | 38,250 | 38,250 | 38,250 | 38,250 |
| 17 | Book value of vehicle at year end | | | | 2,16,750 | 1,78,500 | 1,40,250 | 1,02,000 | 63,750 |
| 18 | Net profit | | | | 1,56,005 | 1,69,603 | 1,84,153 | 1,99,721 | 2,16,379 |
| 19 | Taxation | 20% | | | - 31,201 | - 33,921 | - 36,831 | - 39,944 | - 43,276 |
| | **EAITDA** | | | **-** | **1,24,804** | **1,35,682** | **1,47,322** | **1,59,777** | **1,73,103** |
| | | | | | | | | | |
| | **Net cash after taxes (FCF)** | | | **- 2,55,000** | **1,63,054** | **1,73,932** | **1,85,572** | **1,98,027** | **2,11,353** |
| | *Net monthly cash* | | | *- 21,250* | *13,588* | *14,494* | *15,464* | *16,502* | *17,613* |
| | ***DSCR*** | | | | | | | | |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | **3,58,623** | | | | | | | |
| | **After Tax Equity IRR - 5 years** | **63%** | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | **77%** | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | **11,282** | | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | 1,63,054 | 3,36,986 | 5,22,558 | 7,20,585 |
| | Bank loan | | | - | | | | | |
| | Equity | | | 2,55,000 | | | | | |
| | Cash increase (decrease) for the year | | | (2,55,000.00) | 1,63,054 | 1,73,932 | 1,85,572 | 1,98,027 | 2,11,353 |
| | Closing balance | | | - | 1,63,054 | 3,36,986 | 5,22,558 | 7,20,585 | 9,31,938 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 5,94,000 | 6,35,580 | 6,80,071 | 7,27,676 | 7,78,613 |
| | Less operating expenses | | | | - 3,99,745 | - 4,27,727 | - 4,57,668 | - 4,89,705 | - 5,23,984 |
| | EBITDA | | | | 1,94,255 | 2,07,853 | 2,22,403 | 2,37,971 | 2,54,629 |
| | Less depreciation | | | | - 38,250 | - 38,250 | - 38,250 | - 38,250 | - 38,250 |
| | EBIT | | | | 1,56,005 | 1,69,603 | 1,84,153 | 1,99,721 | 2,16,379 |
| | Interest | | | | - | - | - | - | - |
| | Gross taxable annual Income | | | | 1,56,005 | 1,69,603 | 1,84,153 | 1,99,721 | 2,16,379 |
| | Total tax payable | | | | - 31,201 | - 33,921 | - 36,831 | - 39,944 | - 43,276 |
| | EAITDA | | | - | 1,24,804 | 1,35,682 | 1,47,322 | 1,59,777 | 1,73,103 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 2,55,000 | 2,16,750 | 1,78,500 | 1,40,250 | 1,02,000 | 63,750 |
| | Closing cash | | | | 1,63,054 | 3,36,986 | 5,22,558 | 7,20,585 | 9,31,938 |
| | | | | 2,55,000 | 3,79,804 | 5,15,486 | 6,62,808 | 8,22,585 | 9,95,688 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | - | - | - | - | - | - |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 2,55,000 | *2,55,000* | *3,79,804* | *5,15,486* | *6,62,808* | *8,22,585* |
| | Add annual net EAITDA | | | 0 | *1,24,804* | *1,35,682* | *1,47,322* | *1,59,777* | *1,73,103* |
| | Net owner's equity | | | 2,55,000 | 3,79,804 | 5,15,486 | 6,62,808 | 8,22,585 | 9,95,688 |
| | | | | 2,55,000 | 3,79,804 | 5,15,486 | 6,62,808 | 8,22,585 | 9,95,688 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **49%** | **36%** | **29%** | **24%** | **21%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *32%* | | | | |
| | *Average annual 5 year ROE* | | | | *32%* | | | | |

| | Pink City Sewer Tankers, Jaipur | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Unit % / cost** | **Units** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 500 | Trips p.a. | | 4,80,000 | 5,13,600 | 5,49,552 | 5,88,021 | 6,29,182 |
| | | 960 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | 720 | Trips p.a. | | 3,24,000 | 3,46,680 | 3,70,948 | 3,96,914 | 4,24,698 |
| | | 450 | Tarriff / trip | | | | | | |
| | **TOTAL ANNUAL REVENUE** | | | - | **8,04,000** | **8,60,280** | **9,20,500** | **9,84,935** | **10,53,880** |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | 1,20,000 | | | - 1,20,000 | - 1,28,400 | - 1,37,388 | - 1,47,005 | - 1,57,296 |
| 6 | Medical Expenses | - | | | - | - | - | - | - |
| 7 | Office building rent | 30,000 | | | - 30,000 | - 32,100 | - 34,347 | - 36,751 | - 39,324 |
| 8 | Telephone | 9,000 | | | - 9,000 | - 9,630 | - 10,304 | - 11,025 | - 11,797 |
| 9 | Electricity & Water | 9,600 | | | - 9,600 | - 10,272 | - 10,991 | - 11,760 | - 12,584 |
| 10 | Annual maintenance provision | 115305 | | | - 1,15,305 | - 1,23,376 | - 1,32,013 | - 1,41,254 | - 1,51,141 |
| 11 | Insurance (% of value at beginning of year) | 0 | | | - | - | - | - | - |
| 12 | Misc other costs | - | | | - | - | - | - | - |
| | TOTAL FIXED OPEX | | | - | - 2,83,905 | - 3,03,778 | - 3,25,043 | - 3,47,796 | - 3,72,142 |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 90 | Cost/Trip | - | - 1,09,800 | - 1,17,486 | - 1,25,710 | - 1,34,510 | - 1,43,925 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 1,09,800 | - 1,17,486 | - 1,25,710 | - 1,34,510 | - 1,43,925 |
| | **TOTAL ANNUAL OPEX** | | | - | **- 3,93,705** | **- 4,21,264** | **- 4,50,753** | **- 4,82,306** | **- 5,16,067** |
| | **Net operating cash flow** | | | - | **4,10,295** | **4,39,016** | **4,69,747** | **5,02,629** | **5,37,813** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 20% | | - 3,00,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | |
| 13 | Interest payment | 24% | | | - 51,347 | - 47,647 | - 42,953 | - 37,000 | - 29,451 |
| 14 | Principal repayment | | | | - 13,797 | - 17,498 | - 22,191 | - 28,144 | - 35,693 |
| 15 | Total debt service | | | - | - 65,144 | - 65,144 | - 65,144 | - 65,144 | - 65,144 |
| | **Net Investment and finance cash flow** | | | **- 3,00,000** | **- 65,144** | **- 65,144** | **- 65,144** | **- 65,144** | **- 65,144** |
| | **Net cash before taxation** | | | **- 3,00,000** | **3,45,151** | **3,73,872** | **4,04,603** | **4,37,485** | **4,72,669** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 15% | | | 78,000 | 78,000 | 78,000 | 78,000 | 78,000 |
| 17 | Book value of vehicle at year end | | | | 4,42,000 | 3,64,000 | 2,86,000 | 2,08,000 | 1,30,000 |
| 18 | Net profit | | | | 2,80,948 | 3,13,369 | 3,48,794 | 3,87,629 | 4,30,362 |
| 19 | Taxation | 20% | | | - 56,190 | - 62,674 | - 69,759 | - 77,526 | - 86,072 |
| | **EAITDA** | | | **-** | **2,24,758** | **2,50,695** | **2,79,035** | **3,10,103** | **3,44,290** |
| | **Net cash after taxes (FCF)** | | | **- 3,00,000** | **2,88,961** | **3,11,198** | **3,34,844** | **3,59,959** | **3,86,597** |
| | *Net monthly cash* | | | *- 25,000* | *24,080* | *25,933* | *27,904* | *29,997* | *32,216* |
| | ***DSCR*** | | | | ***5.44*** | ***5.78*** | ***6.14*** | ***6.53*** | ***6.93*** |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | **8,04,761** | | | | | | | |
| | **After Tax Equity IRR - 5 years** | **100%** | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | **120%** | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | - | | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | 2,88,961 | 6,00,159 | 9,35,003 | 12,94,962 |
| | Bank loan | | | 2,20,000 | | | | | |
| | Equity | | | 3,00,000 | | | | | |
| | Cash increase (decrease) for the year | | | (5,20,000.00) | 2,88,961 | 3,11,198 | 3,34,844 | 3,59,959 | 3,86,597 |
| | Closing balance | | | - | 2,88,961 | 6,00,159 | 9,35,003 | 12,94,962 | 16,81,559 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 8,04,000 | 8,60,280 | 9,20,500 | 9,84,935 | 10,53,880 |
| | Less operating expenses | | | | - 3,93,705 | - 4,21,264 | - 4,50,753 | - 4,82,306 | - 5,16,067 |
| | EBITDA | | | | 4,10,295 | 4,39,016 | 4,69,747 | 5,02,629 | 5,37,813 |
| | Less depreciation | | | | - 78,000 | - 78,000 | - 78,000 | - 78,000 | - 78,000 |
| | EBIT | | | | 3,32,295 | 3,61,016 | 3,91,747 | 4,24,629 | 4,59,813 |
| | Interest | | | | - 51,347 | - 47,647 | - 42,953 | - 37,000 | - 29,451 |
| | Gross taxable annual Income | | | | 2,80,948 | 3,13,369 | 3,48,794 | 3,87,629 | 4,30,362 |
| | Total tax payable | | | | - 56,190 | - 62,674 | - 69,759 | - 77,526 | - 86,072 |
| | EAITDA | | | - | 2,24,758 | 2,50,695 | 2,79,035 | 3,10,103 | 3,44,290 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 5,20,000 | 4,42,000 | 3,64,000 | 2,86,000 | 2,08,000 | 1,30,000 |
| | Closing cash | | | | 2,88,961 | 6,00,159 | 9,35,003 | 12,94,962 | 16,81,559 |
| | | | | 5,20,000 | 7,30,961 | 9,64,159 | 12,21,003 | 15,02,962 | 18,11,559 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | 2,20,000 | 2,06,203 | 1,88,706 | 1,66,515 | 1,38,371 | 1,02,678 |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 3,00,000 | *3,00,000* | *5,24,758* | *7,75,453* | *10,54,488* | *13,64,591* |
| | Add annual net EAITDA | | | 0 | *2,24,758* | *2,50,695* | *2,79,035* | *3,10,103* | *3,44,290* |
| | Net owner's equity | | | 3,00,000 | 5,24,758 | 7,75,453 | 10,54,488 | 13,64,591 | 17,08,881 |
| | | | | 5,20,000 | 7,30,961 | 9,64,159 | 12,21,003 | 15,02,962 | 18,11,559 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **75%** | **48%** | **36%** | **29%** | **25%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *43%* | | | | |
| | *Average annual 5 year ROE* | | | | *43%* | | | | |

| | Jai Ganesh Sewer Tanker Service, Jaipur | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Unit % / cost** | **Units** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 720 | Trips p.a. | | 3,60,000 | 3,85,200 | 4,12,164 | 4,41,015 | 4,71,887 |
| | | 500 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | 480 | Trips p.a. | | 1,92,000 | 2,05,440 | 2,19,821 | 2,35,208 | 2,51,673 |
| | | 400 | Tarriff / trip | | | | | | |
| | **TOTAL ANNUAL REVENUE** | | | - | **5,52,000** | **5,90,640** | **6,31,985** | **6,76,224** | **7,23,559** |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | 1,00,000 | | | - 1,00,000 | - 1,07,000 | - 1,14,490 | - 1,22,504 | - 1,31,080 |
| 6 | Medical Expenses | - | | | - | - | - | - | - |
| 7 | Office building rent | - | | | - | - | - | - | - |
| 8 | Telephone | 6,000 | | | - 6,000 | - 6,420 | - 6,869 | - 7,350 | - 7,865 |
| 9 | Electricity & Water | - | | | - | - | - | - | - |
| 10 | Annual maintenance provision | 71089 | | | - 71,089 | - 76,065 | - 81,390 | - 87,087 | - 93,183 |
| 11 | Insurance (% of value at beginning of year) | 0 | | | - | - | - | - | - |
| 12 | Misc other costs | - | | | - | - | - | - | - |
| | TOTAL FIXED OPEX | | | - | - 1,77,089 | - 1,89,485 | - 2,02,749 | - 2,16,942 | - 2,32,128 |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 158 | Cost/Trip | - | - 1,89,600 | - 2,02,872 | - 2,17,073 | - 2,32,268 | - 2,48,527 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 1,89,600 | - 2,02,872 | - 2,17,073 | - 2,32,268 | - 2,48,527 |
| | **TOTAL ANNUAL OPEX** | | | - | **- 3,66,689** | **- 3,92,357** | **- 4,19,822** | **- 4,49,210** | **- 4,80,654** |
| | **Net operating cash flow** | | | - | **1,85,311** | **1,98,283** | **2,12,163** | **2,27,014** | **2,42,905** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 100% | | - 4,30,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | |
| 13 | Interest payment | 10% | | | | | | | |
| 14 | Principal repayment | | | | | | | | |
| 15 | Total debt service | | | - | - | - | - | - | - |
| | **Net Investment and finance cash flow** | | | **- 4,30,000** | - | - | - | - | - |
| | **Net cash before taxation** | | | **- 4,30,000** | **1,85,311** | **1,98,283** | **2,12,163** | **2,27,014** | **2,42,905** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 15% | | | 64,500 | 64,500 | 64,500 | 64,500 | 64,500 |
| 17 | Book value of vehicle at year end | | | | 3,65,500 | 3,01,000 | 2,36,500 | 1,72,000 | 1,07,500 |
| 18 | Net profit | | | | 1,20,811 | 1,33,783 | 1,47,663 | 1,62,514 | 1,78,405 |
| 19 | Taxation | 20% | | | - 24,162 | - 26,757 | - 29,533 | - 32,503 | - 35,681 |
| | **EAITDA** | | | - | **96,649** | **1,07,026** | **1,18,130** | **1,30,011** | **1,42,724** |
| | **Net cash after taxes (FCF)** | | | **- 4,30,000** | **1,61,149** | **1,71,526** | **1,82,630** | **1,94,511** | **2,07,224** |
| | *Net monthly cash* | | | *- 35,833* | *13,429* | *14,294* | *15,219* | *16,209* | *17,269* |
| | ***DSCR*** | | | | | | | | |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | **1,74,149** | | | | | | | |
| | **After Tax Equity IRR - 5 years** | **30%** | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | **38%** | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | **8,117** | | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | 1,61,149 | 3,32,675 | 5,15,305 | 7,09,816 |
| | Bank loan | | | - | | | | | |
| | Equity | | | 4,30,000 | | | | | |
| | Cash increase (decrease) for the year | | | (4,30,000.00) | 1,61,149 | 1,71,526 | 1,82,630 | 1,94,511 | 2,07,224 |
| | Closing balance | | | - | 1,61,149 | 3,32,675 | 5,15,305 | 7,09,816 | 9,17,040 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 5,52,000 | 5,90,640 | 6,31,985 | 6,76,224 | 7,23,559 |
| | Less operating expenses | | | | - 3,66,689 | - 3,92,357 | - 4,19,822 | - 4,49,210 | - 4,80,654 |
| | EBITDA | | | | 1,85,311 | 1,98,283 | 2,12,163 | 2,27,014 | 2,42,905 |
| | Less depreciation | | | | - 64,500 | - 64,500 | - 64,500 | - 64,500 | - 64,500 |
| | EBIT | | | | 1,20,811 | 1,33,783 | 1,47,663 | 1,62,514 | 1,78,405 |
| | Interest | | | | - | - | - | - | - |
| | Gross taxable annual Income | | | | 1,20,811 | 1,33,783 | 1,47,663 | 1,62,514 | 1,78,405 |
| | Total tax payable | | | | - 24,162 | - 26,757 | - 29,533 | - 32,503 | - 35,681 |
| | EAITDA | | | - | 96,649 | 1,07,026 | 1,18,130 | 1,30,011 | 1,42,724 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 4,30,000 | 3,65,500 | 3,01,000 | 2,36,500 | 1,72,000 | 1,07,500 |
| | Closing cash | | | | 1,61,149 | 3,32,675 | 5,15,305 | 7,09,816 | 9,17,040 |
| | | | | 4,30,000 | 5,26,649 | 6,33,675 | 7,51,805 | 8,81,816 | 10,24,540 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | - | - | - | - | - | - |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 4,30,000 | *4,30,000* | *5,26,649* | *6,33,675* | *7,51,805* | *8,81,816* |
| | Add annual net EAITDA | | | 0 | *96,649* | *1,07,026* | *1,18,130* | *1,30,011* | *1,42,724* |
| | Net owner's equity | | | 4,30,000 | 5,26,649 | 6,33,675 | 7,51,805 | 8,81,816 | 10,24,540 |
| | | | | 4,30,000 | 5,26,649 | 6,33,675 | 7,51,805 | 8,81,816 | 10,24,540 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **22%** | **20%** | **19%** | **17%** | **16%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *19%* | | | | |
| | *Average annual 5 year ROE* | | | | *19%* | | | | |

| | Bharath tanker Service, Madurai | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Unit % / cost** | **Units** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 340 | Trips p.a. | | 5,10,000 | 5,45,700 | 5,83,899 | 6,24,772 | 6,68,506 |
| | | 1500 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | | | | | | | | |
| | **TOTAL ANNUAL REVENUE** | | | - | **5,10,000** | **5,45,700** | **5,83,899** | **6,24,772** | **6,68,506** |
| | | | | | 11,333 | 12,127 | 12,976 | 13,884 | 14,856 |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | 1,32,000 | | | - 1,32,000 | - 1,41,240 | - 1,51,127 | - 1,61,706 | - 1,73,025 |
| 6 | Medical Expenses | 5,000 | | | - 5,000 | - 5,350 | - 5,725 | - 6,125 | - 6,554 |
| 7 | Office building rent | 11,400 | | | - 11,400 | - 12,198 | - 13,052 | - 13,965 | - 14,943 |
| 8 | Telephone | 6,000 | | | - 6,000 | - 6,420 | - 6,869 | - 7,350 | - 7,865 |
| 9 | Electricity & Water | 2,700 | | | - 2,700 | - 2,889 | - 3,091 | - 3,308 | - 3,539 |
| 10 | Annual maintenance provision | 28000 | | | - 28,000 | - 29,960 | - 32,057 | - 34,301 | - 36,702 |
| 11 | Insurance (% of value at beginning of year) | 15000 | | | - 15,000 | - 16,050 | - 17,174 | - 18,376 | - 19,662 |
| 12 | Misc other costs | 15,000 | | | - 15,000 | - 16,050 | - 17,174 | - 18,376 | - 19,662 |
| | TOTAL FIXED OPEX | | | - | - 2,15,100 | - 2,30,157 | - 2,46,268 | - 2,63,507 | - 2,81,952 |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 399 | Cost/Trip | - | - 1,35,660 | - 1,45,156 | - 1,55,317 | - 1,66,189 | - 1,77,823 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 1,35,660 | - 1,45,156 | - 1,55,317 | - 1,66,189 | - 1,77,823 |
| | **TOTAL ANNUAL OPEX** | | | - | **- 3,50,760** | **- 3,75,313** | **- 4,01,585** | **- 4,29,696** | **- 4,59,775** |
| | **Net operating cash flow** | | | - | **1,59,240** | **1,70,387** | **1,82,314** | **1,95,076** | **2,08,731** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 20% | | - 1,00,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | - |
| 13 | Interest payment | 12% | | | - 44,657 | - 36,779 | - 27,902 | - 17,900 | - 6,628 |
| 14 | Principal repayment | | | | - 62,116 | - 69,994 | - 78,871 | - 88,874 | - 1,00,145 |
| 15 | Total debt service | | | - | - 1,06,773 | - 1,06,773 | - 1,06,773 | - 1,06,773 | - 1,06,773 |
| | **Net Investment and finance cash flow** | | | **- 1,00,000** | **- 1,06,773** | **- 1,06,773** | **- 1,06,773** | **- 1,06,773** | **- 1,06,773** |
| | **Net cash before taxation** | | | **- 1,00,000** | **52,467** | **63,613** | **75,541** | **88,302** | **1,01,958** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 20% | | | 1,00,000 | 1,00,000 | 1,00,000 | 1,00,000 | 1,00,000 |
| 17 | Book value of vehicle at year end | | | | 4,00,000 | 3,00,000 | 2,00,000 | 1,00,000 | - |
| 18 | Net profit | | | | 14,583 | 33,607 | 54,411 | 77,176 | 1,02,103 |
| 19 | Taxation | 20% | | | - 2,917 | - 6,721 | - 10,882 | - 15,435 | - 20,421 |
| | **EAITDA** | | | **-** | **11,666** | **26,886** | **43,529** | **61,741** | **81,682** |
| | **Net cash after taxes (FCF)** | | | **- 1,00,000** | **49,550** | **56,892** | **64,658** | **72,867** | **81,537** |
| | *Net monthly cash* | | | *- 8,333* | *4,129* | *4,741* | *5,388* | *6,072* | *6,795* |
| | ***DSCR*** | | | | ***1.46*** | ***1.53*** | ***1.61*** | ***1.68*** | ***1.76*** |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | **1,10,820** | 2,463 | | | | | | |
| | **After Tax Equity IRR - 5 years** | **52%** | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | **60%** | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | **3,758** | 84 | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | 49,550 | 1,06,442 | 1,71,100 | 2,43,968 |
| | Bank loan | | | 4,00,000 | | | | | |
| | Equity | | | 1,00,000 | | | | | |
| | Cash increase (decrease) for the year | | | (5,00,000.00) | 49,550 | 56,892 | 64,658 | 72,867 | 81,537 |
| | Closing balance | | | - | 49,550 | 1,06,442 | 1,71,100 | 2,43,968 | 3,25,505 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 5,10,000 | 5,45,700 | 5,83,899 | 6,24,772 | 6,68,506 |
| | Less operating expenses | | | | - 3,50,760 | - 3,75,313 | - 4,01,585 | - 4,29,696 | - 4,59,775 |
| | EBITDA | | | | 1,59,240 | 1,70,387 | 1,82,314 | 1,95,076 | 2,08,731 |
| | Less depreciation | | | | - 1,00,000 | - 1,00,000 | - 1,00,000 | - 1,00,000 | - 1,00,000 |
| | EBIT | | | | 59,240 | 70,387 | 82,314 | 95,076 | 1,08,731 |
| | Interest | | | | - 44,657 | - 36,779 | - 27,902 | - 17,900 | - 6,628 |
| | Gross taxable annual Income | | | | 14,583 | 33,607 | 54,411 | 77,176 | 1,02,103 |
| | Total tax payable | | | | - 2,917 | - 6,721 | - 10,882 | - 15,435 | - 20,421 |
| | EAITDA | | | - | 11,666 | 26,886 | 43,529 | 61,741 | 81,682 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 5,00,000 | 4,00,000 | 3,00,000 | 2,00,000 | 1,00,000 | - |
| | Closing cash | | | | 49,550 | 1,06,442 | 1,71,100 | 2,43,968 | 3,25,505 |
| | | | | 5,00,000 | 4,49,550 | 4,06,442 | 3,71,100 | 3,43,968 | 3,25,505 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | 4,00,000 | 3,37,884 | 2,67,890 | 1,89,019 | 1,00,145 | 0 |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 1,00,000 | *1,00,000* | *1,11,666* | *1,38,552* | *1,82,081* | *2,43,822* |
| | Add annual net EAITDA | | | 0 | *11,666* | *26,886* | *43,529* | *61,741* | *81,682* |
| | Net owner's equity | | | 1,00,000 | 1,11,666 | 1,38,552 | 1,82,081 | 2,43,822 | 3,25,505 |
| | | | | 5,00,000 | 4,49,550 | 4,06,442 | 3,71,100 | 3,43,968 | 3,25,505 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **12%** | **24%** | **31%** | **34%** | **34%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *27%* | | | | |
| | *Average annual 5 year ROE* | | | | *27%* | | | | |

| | JJ Cleaning Service, Madurai | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Unit % / cost** | **Units** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 340 | Trips p.a. | | 5,10,000 | 5,45,700 | 5,83,899 | 6,24,772 | 6,68,506 |
| | | 1500 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | | | | | | | | |
| | **TOTAL ANNUAL REVENUE** | | | - | **5,10,000** | **5,45,700** | **5,83,899** | **6,24,772** | **6,68,506** |
| | | | | | 11,333 | 12,127 | 12,976 | 13,884 | 14,856 |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | 1,35,600 | | | - 1,35,600 | - 1,45,092 | - 1,55,248 | - 1,66,116 | - 1,77,744 |
| 6 | Medical Expenses | 5,000 | | | - 5,000 | - 5,350 | - 5,725 | - 6,125 | - 6,554 |
| 7 | Office building rent | 11,400 | | | - 11,400 | - 12,198 | - 13,052 | - 13,965 | - 14,943 |
| 8 | Telephone | 6,000 | | | - 6,000 | - 6,420 | - 6,869 | - 7,350 | - 7,865 |
| 9 | Electricity & Water | 2,700 | | | - 2,700 | - 2,889 | - 3,091 | - 3,308 | - 3,539 |
| 10 | Annual maintenance provision | 28000 | | | - 28,000 | - 29,960 | - 32,057 | - 34,301 | - 36,702 |
| 11 | Insurance (% of value at beginning of year) | 15000 | | | - 15,000 | - 16,050 | - 17,174 | - 18,376 | - 19,662 |
| 12 | Misc other costs | 15,000 | | | - 15,000 | - 16,050 | - 17,174 | - 18,376 | - 19,662 |
| | TOTAL FIXED OPEX | | | - | - 2,18,700 | - 2,34,009 | - 2,50,390 | - 2,67,917 | - 2,86,671 |
| | | | | | | | | | |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 466 | Cost/Trip | - | - 1,58,440 | - 1,69,531 | - 1,81,398 | - 1,94,096 | - 2,07,683 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 1,58,440 | - 1,69,531 | - 1,81,398 | - 1,94,096 | - 2,07,683 |
| | **TOTAL ANNUAL OPEX** | | | - | **- 3,77,140** | **- 4,03,540** | **- 4,31,788** | **- 4,62,013** | **- 4,94,354** |
| | **Net operating cash flow** | | | - | **1,32,860** | **1,42,160** | **1,52,111** | **1,62,759** | **1,74,152** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 20% | | - 1,00,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | - |
| 13 | Interest payment | 12% | | | - 44,657 | - 36,779 | - 27,902 | - 17,900 | - 6,628 |
| 14 | Principal repayment | | | | - 62,116 | - 69,994 | - 78,871 | - 88,874 | - 1,00,145 |
| 15 | Total debt service | | | - | - 1,06,773 | - 1,06,773 | - 1,06,773 | - 1,06,773 | - 1,06,773 |
| | **Net Investment and finance cash flow** | | | **- 1,00,000** | **- 1,06,773** | **- 1,06,773** | **- 1,06,773** | **- 1,06,773** | **- 1,06,773** |
| | **Net cash before taxation** | | | **- 1,00,000** | **26,087** | **35,387** | **45,338** | **55,986** | **67,379** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 20% | | | 1,00,000 | 1,00,000 | 1,00,000 | 1,00,000 | 1,00,000 |
| 17 | Book value of vehicle at year end | | | | 4,00,000 | 3,00,000 | 2,00,000 | 1,00,000 | - |
| 18 | Net profit | | | | - 11,797 | 5,381 | 24,209 | 44,860 | 67,524 |
| 19 | Taxation | 20% | | | 2,359 | - 1,076 | - 4,842 | - 8,972 | - 13,505 |
| | **EAITDA** | | | **-** | **- 9,438** | **4,305** | **19,367** | **35,888** | **54,019** |
| | **Net cash after taxes (FCF)** | | | **- 1,00,000** | **28,446** | **34,311** | **40,496** | **47,014** | **53,874** |
| | *Net monthly cash* | | | *- 8,333* | *2,371* | *2,859* | *3,375* | *3,918* | *4,490* |
| | ***DSCR*** | | | | ***1.27*** | ***1.32*** | ***1.38*** | ***1.44*** | ***1.50*** |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | **30,972** | 688 | | | | | | |
| | **After Tax Equity IRR - 5 years** | **26%** | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | **30%** | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | 1,446 | 32 | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | 28,446 | 62,757 | 1,03,253 | 1,50,267 |
| | Bank loan | | | 4,00,000 | | | | | |
| | Equity | | | 1,00,000 | | | | | |
| | Cash increase (decrease) for the year | | | (5,00,000.00) | 28,446 | 34,311 | 40,496 | 47,014 | 53,874 |
| | Closing balance | | | - | 28,446 | 62,757 | 1,03,253 | 1,50,267 | 2,04,141 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 5,10,000 | 5,45,700 | 5,83,899 | 6,24,772 | 6,68,506 |
| | Less operating expenses | | | | - 3,77,140 | - 4,03,540 | - 4,31,788 | - 4,62,013 | - 4,94,354 |
| | EBITDA | | | | 1,32,860 | 1,42,160 | 1,52,111 | 1,62,759 | 1,74,152 |
| | Less depreciation | | | | - 1,00,000 | - 1,00,000 | - 1,00,000 | - 1,00,000 | - 1,00,000 |
| | EBIT | | | | 32,860 | 42,160 | 52,111 | 62,759 | 74,152 |
| | Interest | | | | - 44,657 | - 36,779 | - 27,902 | - 17,900 | - 6,628 |
| | Gross taxable annual Income | | | | - 11,797 | 5,381 | 24,209 | 44,860 | 67,524 |
| | Total tax payable | | | | 2,359 | - 1,076 | - 4,842 | - 8,972 | - 13,505 |
| | EAITDA | | | - | - 9,438 | 4,305 | 19,367 | 35,888 | 54,019 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 5,00,000 | 4,00,000 | 3,00,000 | 2,00,000 | 1,00,000 | - |
| | Closing cash | | | | 28,446 | 62,757 | 1,03,253 | 1,50,267 | 2,04,141 |
| | | | | 5,00,000 | 4,28,446 | 3,62,757 | 3,03,253 | 2,50,267 | 2,04,141 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | 4,00,000 | 3,37,884 | 2,67,890 | 1,89,019 | 1,00,145 | 0 |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 1,00,000 | *1,00,000* | *90,562* | *94,867* | *1,14,234* | *1,50,122* |
| | Add annual net EAITDA | | | 0 | - *9,438* | *4,305* | *19,367* | *35,888* | *54,019* |
| | Net owner's equity | | | 1,00,000 | 90,562 | 94,867 | 1,14,234 | 1,50,122 | 2,04,141 |
| | | | | 5,00,000 | 4,28,446 | 3,62,757 | 3,03,253 | 2,50,267 | 2,04,141 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **-9%** | **5%** | **20%** | **31%** | **36%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *17%* | | | | |
| | *Average annual 5 year ROE* | | | | *17%* | | | | |

| | Minaxi Taanker Service, Madurai | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Unit % / cost** | **Units** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 300 | Trips p.a. | | 4,50,000 | 4,81,500 | 5,15,205 | 5,51,269 | 5,89,858 |
| | | 1500 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | | | | | | | | |
| | **TOTAL ANNUAL REVENUE** | | | - | **4,50,000** | **4,81,500** | **5,15,205** | **5,51,269** | **5,89,858** |
| | | | | | 10,000 | 10,700 | 11,449 | 12,250 | 13,108 |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | 1,32,000 | | | - 1,32,000 | - 1,41,240 | - 1,51,127 | - 1,61,706 | - 1,73,025 |
| 6 | Medical Expenses | 5,000 | | | - 5,000 | - 5,350 | - 5,725 | - 6,125 | - 6,554 |
| 7 | Office building rent | 11,400 | | | - 11,400 | - 12,198 | - 13,052 | - 13,965 | - 14,943 |
| 8 | Telephone | 6,000 | | | - 6,000 | - 6,420 | - 6,869 | - 7,350 | - 7,865 |
| 9 | Electricity & Water | 2,700 | | | - 2,700 | - 2,889 | - 3,091 | - 3,308 | - 3,539 |
| 10 | Annual maintenance provision | 28000 | | | - 28,000 | - 29,960 | - 32,057 | - 34,301 | - 36,702 |
| 11 | Insurance (% of value at beginning of year) | 15000 | | | - 15,000 | - 16,050 | - 17,174 | - 18,376 | - 19,662 |
| 12 | Misc other costs | 15,000 | | | - 15,000 | - 16,050 | - 17,174 | - 18,376 | - 19,662 |
| | TOTAL FIXED OPEX | | | - | - 2,15,100 | - 2,30,157 | - 2,46,268 | - 2,63,507 | - 2,81,952 |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 399 | Cost/Trip | - | - 1,19,700 | - 1,28,079 | - 1,37,045 | - 1,46,638 | - 1,56,902 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 1,19,700 | - 1,28,079 | - 1,37,045 | - 1,46,638 | - 1,56,902 |
| | **TOTAL ANNUAL OPEX** | | | - | **- 3,34,800** | **- 3,58,236** | **- 3,83,313** | **- 4,10,144** | **- 4,38,855** |
| | **Net operating cash flow** | | | - | **1,15,200** | **1,23,264** | **1,31,892** | **1,41,125** | **1,51,004** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 20% | | - 1,20,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | - |
| 13 | Interest payment | 12% | | | - 53,589 | - 44,135 | - 33,483 | - 21,479 | - 7,954 |
| 14 | Principal repayment | | | | - 74,539 | - 83,993 | - 94,645 | - 1,06,649 | - 1,20,174 |
| 15 | Total debt service | | | - | - 1,28,128 | - 1,28,128 | - 1,28,128 | - 1,28,128 | - 1,28,128 |
| | **Net Investment and finance cash flow** | | | **- 1,20,000** | **- 1,28,128** | **- 1,28,128** | **- 1,28,128** | **- 1,28,128** | **- 1,28,128** |
| | **Net cash before taxation** | | | **- 1,20,000** | **- 12,928** | **- 4,864** | **3,764** | **12,997** | **22,876** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 20% | | | 1,20,000 | 1,20,000 | 1,20,000 | 1,20,000 | 1,20,000 |
| 17 | Book value of vehicle at year end | | | | 4,80,000 | 3,60,000 | 2,40,000 | 1,20,000 | - |
| 18 | Net profit | | | | - 58,389 | - 40,871 | - 21,590 | - 355 | 23,050 |
| 19 | Taxation | 20% | | | 11,678 | 8,174 | 4,318 | 71 | - 4,610 |
| | **EAITDA** | | | - | **- 46,711** | **- 32,697** | **- 17,272** | **- 284** | **18,440** |
| | **Net cash after taxes (FCF)** | | | **- 1,20,000** | **- 1,250** | **3,310** | **8,083** | **13,068** | **18,266** |
| | *Net monthly cash* | | | *- 10,000* | *- 104* | *276* | *674* | *1,089* | *1,522* |
| | ***DSCR*** | | | | ***0.99*** | ***1.03*** | ***1.06*** | ***1.10*** | ***1.14*** |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | **-96,717** | (2,149) | | | | | | |
| | **After Tax Equity IRR - 5 years** | **-22%** | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | **#NUM!** | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | **- 1,091** | (24) | | | | | | |
| | | | | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | - 1,250 | 2,060 | 10,142 | 23,210 |
| | Bank loan | | | 4,80,000 | | | | | |
| | Equity | | | 1,20,000 | | | | | |
| | Cash increase (decrease) for the year | | | (6,00,000.00) | - 1,250 | 3,310 | 8,083 | 13,068 | 18,266 |
| | Closing balance | | | - | - 1,250 | 2,060 | 10,142 | 23,210 | 41,476 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 4,50,000 | 4,81,500 | 5,15,205 | 5,51,269 | 5,89,858 |
| | Less operating expenses | | | | - 3,34,800 | - 3,58,236 | - 3,83,313 | - 4,10,144 | - 4,38,855 |
| | EBITDA | | | | 1,15,200 | 1,23,264 | 1,31,892 | 1,41,125 | 1,51,004 |
| | Less depreciation | | | | - 1,20,000 | - 1,20,000 | - 1,20,000 | - 1,20,000 | - 1,20,000 |
| | EBIT | | | | - 4,800 | 3,264 | 11,892 | 21,125 | 31,004 |
| | Interest | | | | - 53,589 | - 44,135 | - 33,483 | - 21,479 | - 7,954 |
| | Gross taxable annual Income | | | | - 58,389 | - 40,871 | - 21,590 | - 355 | 23,050 |
| | Total tax payable | | | | 11,678 | 8,174 | 4,318 | 71 | - 4,610 |
| | EAITDA | | | - | - 46,711 | - 32,697 | - 17,272 | - 284 | 18,440 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 6,00,000 | 4,80,000 | 3,60,000 | 2,40,000 | 1,20,000 | - |
| | Closing cash | | | | - 1,250 | 2,060 | 10,142 | 23,210 | 41,476 |
| | | | | 6,00,000 | 4,78,750 | 3,62,060 | 2,50,142 | 1,43,210 | 41,476 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | 4,80,000 | 4,05,461 | 3,21,468 | 2,26,823 | 1,20,174 | 0 |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 1,20,000 | *1,20,000* | *73,289* | *40,592* | *23,320* | *23,036* |
| | Add annual net EAITDA | | | 0 | *- 46,711* | *- 32,697* | *- 17,272* | *- 284* | *18,440* |
| | Net owner's equity | | | 1,20,000 | 73,289 | 40,592 | 23,320 | 23,036 | 41,476 |
| | | | | 6,00,000 | 4,78,750 | 3,62,060 | 2,50,142 | 1,43,210 | 41,476 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **-39%** | **-45%** | **-43%** | **-1%** | **80%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *-9%* | | | | |
| | *Average annual 5 year ROE* | | | | *-9%* | | | | |

| | Srikannan, Madurai | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Unit % / cost** | **Units** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 300 | Trips p.a. | | 4,50,000 | 4,81,500 | 5,15,205 | 5,51,269 | 5,89,858 |
| | | 1500 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | | | | | | | | |
| | **TOTAL ANNUAL REVENUE** | | | - | **4,50,000** | **4,81,500** | **5,15,205** | **5,51,269** | **5,89,858** |
| | | | | | 10,000 | 10,700 | 11,449 | 12,250 | 13,108 |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | 1,29,600 | | | - 1,29,600 | - 1,38,672 | - 1,48,379 | - 1,58,766 | - 1,69,879 |
| 6 | Medical Expenses | 5,000 | | | - 5,000 | - 5,350 | - 5,725 | - 6,125 | - 6,554 |
| 7 | Office building rent | 11,400 | | | - 11,400 | - 12,198 | - 13,052 | - 13,965 | - 14,943 |
| 8 | Telephone | 6,000 | | | - 6,000 | - 6,420 | - 6,869 | - 7,350 | - 7,865 |
| 9 | Electricity & Water | 2,700 | | | - 2,700 | - 2,889 | - 3,091 | - 3,308 | - 3,539 |
| 10 | Annual maintenance provision | 28000 | | | - 28,000 | - 29,960 | - 32,057 | - 34,301 | - 36,702 |
| 11 | Insurance (% of value at beginning of year) | 15000 | | | - 15,000 | - 16,050 | - 17,174 | - 18,376 | - 19,662 |
| 12 | Misc other costs | 15,000 | | | - 15,000 | - 16,050 | - 17,174 | - 18,376 | - 19,662 |
| | TOTAL FIXED OPEX | | | - | - 2,12,700 | - 2,27,589 | - 2,43,520 | - 2,60,567 | - 2,78,806 |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 369 | Cost/Trip | - | - 1,10,700 | - 1,18,449 | - 1,26,740 | - 1,35,612 | - 1,45,105 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 1,10,700 | - 1,18,449 | - 1,26,740 | - 1,35,612 | - 1,45,105 |
| | **TOTAL ANNUAL OPEX** | | | **-** | **- 3,23,400** | **- 3,46,038** | **- 3,70,261** | **- 3,96,179** | **- 4,23,911** |
| | **Net operating cash flow** | | | - | **1,26,600** | **1,35,462** | **1,44,944** | **1,55,090** | **1,65,947** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 20% | | - 1,00,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | - |
| 13 | Interest payment | 12% | | | - 44,657 | - 36,779 | - 27,902 | - 17,900 | - 6,628 |
| 14 | Principal repayment | | | | - 62,116 | - 69,994 | - 78,871 | - 88,874 | - 1,00,145 |
| 15 | Total debt service | | | - | - 1,06,773 | - 1,06,773 | - 1,06,773 | - 1,06,773 | - 1,06,773 |
| | | | | | | | | | |
| | **Net Investment and finance cash flow** | | | **- 1,00,000** | **- 1,06,773** | **- 1,06,773** | **- 1,06,773** | **- 1,06,773** | **- 1,06,773** |
| | **Net cash before taxation** | | | **- 1,00,000** | **19,827** | **28,689** | **38,171** | **48,317** | **59,173** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 20% | | | 1,00,000 | 1,00,000 | 1,00,000 | 1,00,000 | 1,00,000 |
| 17 | Book value of vehicle at year end | | | | 4,00,000 | 3,00,000 | 2,00,000 | 1,00,000 | - |
| 18 | Net profit | | | | - 18,057 | - 1,317 | 17,042 | 37,191 | 59,319 |
| 19 | Taxation | 20% | | | 3,611 | 263 | - 3,408 | - 7,438 | - 11,864 |
| | **EAITDA** | | | **-** | **- 14,446** | **- 1,054** | **13,634** | **29,753** | **47,455** |
| | | | | | | | | | |
| | **Net cash after taxes (FCF)** | | | **- 1,00,000** | **23,438** | **28,952** | **34,763** | **40,879** | **47,310** |
| | *Net monthly cash* | | | *- 8,333* | *1,953* | *2,413* | *2,897* | *3,407* | *3,942* |
| | ***DSCR*** | | | | ***1.22*** | ***1.27*** | ***1.33*** | ***1.38*** | ***1.44*** |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | **12,024** | 267 | | | | | | |
| | **After Tax Equity IRR - 5 years** | **19%** | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | **22%** | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | **1,256** | 28 | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | 23,438 | 52,390 | 87,153 | 1,28,032 |
| | Bank loan | | | 4,00,000 | | | | | |
| | Equity | | | 1,00,000 | | | | | |
| | Cash increase (decrease) for the year | | | (5,00,000.00) | 23,438 | 28,952 | 34,763 | 40,879 | 47,310 |
| | Closing balance | | | - | 23,438 | 52,390 | 87,153 | 1,28,032 | 1,75,341 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 4,50,000 | 4,81,500 | 5,15,205 | 5,51,269 | 5,89,858 |
| | Less operating expenses | | | | - 3,23,400 | - 3,46,038 | - 3,70,261 | - 3,96,179 | - 4,23,911 |
| | EBITDA | | | | 1,26,600 | 1,35,462 | 1,44,944 | 1,55,090 | 1,65,947 |
| | Less depreciation | | | | - 1,00,000 | - 1,00,000 | - 1,00,000 | - 1,00,000 | - 1,00,000 |
| | EBIT | | | | 26,600 | 35,462 | 44,944 | 55,090 | 65,947 |
| | Interest | | | | - 44,657 | - 36,779 | - 27,902 | - 17,900 | - 6,628 |
| | Gross taxable annual Income | | | | - 18,057 | - 1,317 | 17,042 | 37,191 | 59,319 |
| | Total tax payable | | | | 3,611 | 263 | - 3,408 | - 7,438 | - 11,864 |
| | EAITDA | | | - | - 14,446 | - 1,054 | 13,634 | 29,753 | 47,455 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 5,00,000 | 4,00,000 | 3,00,000 | 2,00,000 | 1,00,000 | - |
| | Closing cash | | | | 23,438 | 52,390 | 87,153 | 1,28,032 | 1,75,341 |
| | | | | 5,00,000 | 4,23,438 | 3,52,390 | 2,87,153 | 2,28,032 | 1,75,341 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | 4,00,000 | 3,37,884 | 2,67,890 | 1,89,019 | 1,00,145 | 0 |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 1,00,000 | *1,00,000* | *85,554* | *84,500* | *98,134* | *1,27,887* |
| | Add annual net EAITDA | | | 0 | - *14,446* | - *1,054* | *13,634* | *29,753* | *47,455* |
| | Net owner's equity | | | 1,00,000 | 85,554 | 84,500 | 98,134 | 1,27,887 | 1,75,341 |
| | | | | 5,00,000 | 4,23,438 | 3,52,390 | 2,87,153 | 2,28,032 | 1,75,341 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **-14%** | **-1%** | **16%** | **30%** | **37%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *14%* | | | | |
| | *Average annual 5 year ROE* | | | | *14%* | | | | |

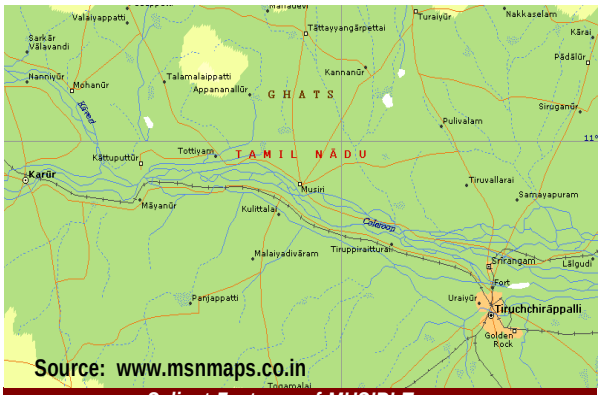
| | | Unit % / cost | Units | Year 0 | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Inflation index | 7.0% | | | 1 | 1.07 | 1.14 | 1.23 | 1.31 |
| 3 | Number of trucks | 1 | | | | | | | |
| | **Revenue** | | | | | | | | |
| 3 | Emptying services | 300 | Trips p.a. | | 4,50,000 | 4,81,500 | 5,15,205 | 5,51,269 | 5,89,858 |
| | | 1500 | Tarriff / trip | | | | | | |
| 4 | Other revenue sources | | | | | | | | |
| | **TOTAL ANNUAL REVENUE** | | | - | **4,50,000** | **4,81,500** | **5,15,205** | **5,51,269** | **5,89,858** |
| | | | | | 10,000 | 10,700 | 11,449 | 12,250 | 13,108 |
| | **Operating costs - Fixed** | | | | | | | | |
| 5 | Fixed annual salary costs | 1,29,600 | | | - 1,29,600 | - 1,38,672 | - 1,48,379 | - 1,58,766 | - 1,69,879 |
| 6 | Medical Expenses | 5,000 | | | - 5,000 | - 5,350 | - 5,725 | - 6,125 | - 6,554 |
| 7 | Office building rent | 11,400 | | | - 11,400 | - 12,198 | - 13,052 | - 13,965 | - 14,943 |
| 8 | Telephone | 6,000 | | | - 6,000 | - 6,420 | - 6,869 | - 7,350 | - 7,865 |
| 9 | Electricity & Water | 2,700 | | | - 2,700 | - 2,889 | - 3,091 | - 3,308 | - 3,539 |
| 10 | Annual maintenance provision | 28000 | | | - 28,000 | - 29,960 | - 32,057 | - 34,301 | - 36,702 |
| 11 | Insurance (% of value at beginning of year) | 15000 | | | - 15,000 | - 16,050 | - 17,174 | - 18,376 | - 19,662 |
| 12 | Misc other costs | 15,000 | | | - 15,000 | - 16,050 | - 17,174 | - 18,376 | - 19,662 |
| | TOTAL FIXED OPEX | | | - | - 2,12,700 | - 2,27,589 | - 2,43,520 | - 2,60,567 | - 2,78,806 |
| | **Operating costs - Variable** | | | | | | | | |
| 9 | Fuel | 369 | Cost/Trip | - | - 1,10,700 | - 1,18,449 | - 1,26,740 | - 1,35,612 | - 1,45,105 |
| 10 | Variable wages | - | Per trip | | - | - | - | - | - |
| | TOTAL VARIABLE OPEX | | | - | - 1,10,700 | - 1,18,449 | - 1,26,740 | - 1,35,612 | - 1,45,105 |
| | **TOTAL ANNUAL OPEX** | | | - | **- 3,23,400** | **- 3,46,038** | **- 3,70,261** | **- 3,96,179** | **- 4,23,911** |
| | **Net operating cash flow** | | | - | **1,26,600** | **1,35,462** | **1,44,944** | **1,55,090** | **1,65,947** |
| | **Investment and Finance cash flow** | | | | | | | | |
| 11 | Equity downpayment on vehicle | 20% | | - 1,00,000 | | | | | |
| 12 | Sale of salvage | | | | | | | | - |
| 13 | Interest payment | 12% | | | - 44,657 | - 36,779 | - 27,902 | - 17,900 | - 6,628 |
| 14 | Principal repayment | | | | - 62,116 | - 69,994 | - 78,871 | - 88,874 | - 1,00,145 |
| 15 | Total debt service | | | - | - 1,06,773 | - 1,06,773 | - 1,06,773 | - 1,06,773 | - 1,06,773 |
| | **Net Investment and finance cash flow** | | | **- 1,00,000** | **- 1,06,773** | **- 1,06,773** | **- 1,06,773** | **- 1,06,773** | **- 1,06,773** |
| | **Net cash before taxation** | | | **- 1,00,000** | **19,827** | **28,689** | **38,171** | **48,317** | **59,173** |
| | **Line items to calculate taxation** | | | | | | | | |
| 16 | Depreciation | 20% | | | 1,00,000 | 1,00,000 | 1,00,000 | 1,00,000 | 1,00,000 |
| 17 | Book value of vehicle at year end | | | | 4,00,000 | 3,00,000 | 2,00,000 | 1,00,000 | - |
| 18 | Net profit | | | | - 18,057 | - 1,317 | 17,042 | 37,191 | 59,319 |
| 19 | Taxation | 20% | | | 3,611 | 263 | - 3,408 | - 7,438 | - 11,864 |
| | **EAITDA** | | | - | **- 14,446** | **- 1,054** | **13,634** | **29,753** | **47,455** |
| | **Net cash after taxes (FCF)** | | | **- 1,00,000** | **23,438** | **28,952** | **34,763** | **40,879** | **47,310** |
| | *Net monthly cash* | | | *- 8,333* | *1,953* | *2,413* | *2,897* | *3,407* | *3,942* |
| | ***DSCR*** | | | | ***1.22*** | ***1.27*** | ***1.33*** | ***1.38*** | ***1.44*** |
| | **5 year analysis** | | | | | | | | |
| | **NPV @15% discount rate** | 12,024 | 267.1963953 | | | | | | |
| | **After Tax Equity IRR - 5 years** | 19% | | | | | | | |
| | **Pre-tax Equity IRR - 5 years** | 22% | | | | | | | |
| | **Avg 5 yr monthly cash to operator** | 1,256 | 27.90424125 | | | | | | |
| 1 | Inflation rate is based on average CPI for the last 5 years | | | | | | | | |
| 3 | Tariff is based on prevailing market rates. Number of trips is based on average for xyz business for the last 2 years | | | | | | | | |
| 5 | Fixed monthly salary for: 1 driver, 1 turnboy etc | | | | | | | | |
| 9 | Based on prevailing price of diesel in xx and subject to annual CPI | | | | | | | | |
| 13 | Based on prevailing market interest rates for five year lease on vehicle purchase from zz bank | | | | | | | | |
| 14 | Debt service based on 5 year loan with constant monthly repayments and interst compounded monthly | | | | | | | | |
| | | | | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| | **CASH A/C** | | | | | | | | |
| | Op balance | | | | - | 23,438 | 52,390 | 87,153 | 1,28,032 |
| | Bank loan | | | 4,00,000 | | | | | |
| | Equity | | | 1,00,000 | | | | | |
| | Cash increase (decrease) for the year | | | (5,00,000.00) | 23,438 | 28,952 | 34,763 | 40,879 | 47,310 |
| | Closing balance | | | - | 23,438 | 52,390 | 87,153 | 1,28,032 | 1,75,341 |
| | **Income Statement** | | | | | | | | |
| | Revenue | | | | 4,50,000 | 4,81,500 | 5,15,205 | 5,51,269 | 5,89,858 |
| | Less operating expenses | | | | - 3,23,400 | - 3,46,038 | - 3,70,261 | - 3,96,179 | - 4,23,911 |
| | EBITDA | | | | 1,26,600 | 1,35,462 | 1,44,944 | 1,55,090 | 1,65,947 |
| | Less depreciation | | | | - 1,00,000 | - 1,00,000 | - 1,00,000 | - 1,00,000 | - 1,00,000 |
| | EBIT | | | | 26,600 | 35,462 | 44,944 | 55,090 | 65,947 |
| | Interest | | | | - 44,657 | - 36,779 | - 27,902 | - 17,900 | - 6,628 |
| | Gross taxable annual Income | | | | - 18,057 | - 1,317 | 17,042 | 37,191 | 59,319 |
| | Total tax payable | | | | 3,611 | 263 | - 3,408 | - 7,438 | - 11,864 |
| | EAITDA | | | - | - 14,446 | - 1,054 | 13,634 | 29,753 | 47,455 |
| | **Balance Sheet - year end** | | | | | | | | |
| | **Assets** | | | | | | | | |
| | Vehicle | | | 5,00,000 | 4,00,000 | 3,00,000 | 2,00,000 | 1,00,000 | - |
| | Closing cash | | | | 23,438 | 52,390 | 87,153 | 1,28,032 | 1,75,341 |
| | | | | 5,00,000 | 4,23,438 | 3,52,390 | 2,87,153 | 2,28,032 | 1,75,341 |
| | **Liabilities** | | | | | | | | |
| | Principal outstanding on lease | | | 4,00,000 | 3,37,884 | 2,67,890 | 1,89,019 | 1,00,145 | 0 |
| | Owner's equity | | | | | | | | |
| | Opening equity | | | 1,00,000 | *1,00,000* | *85,554* | *84,500* | *98,134* | *1,27,887* |
| | Add annual net EAITDA | | | 0 | - *14,446* | - *1,054* | *13,634* | *29,753* | *47,455* |
| | Net owner's equity | | | 1,00,000 | 85,554 | 84,500 | 98,134 | 1,27,887 | 1,75,341 |
| | | | | 5,00,000 | 4,23,438 | 3,52,390 | 2,87,153 | 2,28,032 | 1,75,341 |
| | **Return on Equity (ROE) computed on opening balance** | | | | **-14%** | **-1%** | **16%** | **30%** | **37%** |
| | *Average annual 7 year ROE* | *Irrelevant as data for 5 years only* | | | *14%* | | | | |
| | *Average annual 5 year ROE* | | | | *14%* | | | | |

**Annex 5**

# Fecal Sludge Treatment Plant-Musiri Town (near Madurai)

## Musiri Town

Musiri Town Panchayat is a small town located at 40 km from Tiruchirappalli city. River Cauvery flows at its maximum width in the town. All the major cities of the region, i.e. Trichy, Karur, Thuraiyur are located within a distance of 50 km from the town.




*Salient Features of MUSIRI Town*

| | |
|---|---|
| ***TOWN*** | **MUSIRI** |
| ***District*** | Tiruchirappalli |
| ***Area*** | 18.80 sq. km. |
| ***Geographic Location*** | 10.93° N 78.45° E and an average elevation of 82 meters (269 ft) |
| ***Census population*** | 27,941 (year 2001) |

## Area and Population

As per 2001 census, population of the town Panchayat is about 14,925 persons. The town constitutes of 18 wards. Gender ratio is about 50:50

## Sanitation-Existing Status

Underground Sewerage System: Musiri Town Panchayat does not have underground drainage. The septage from the households is conveyed through open side drains in the roads and then to the irrigation channels

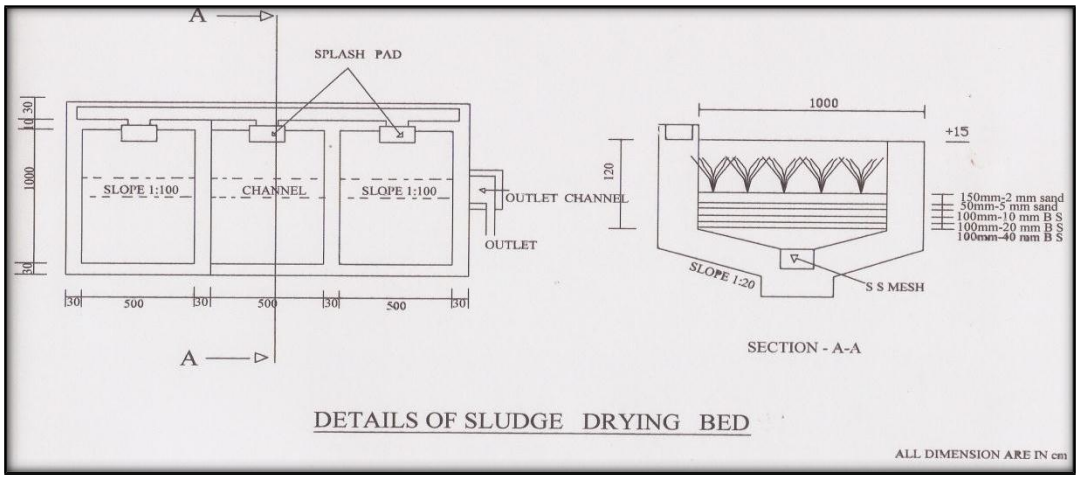
Sanitation Facilities: There are 25 Public Convenience complexes constructed under various schemes with the support of two NGOs viz. SCOPE and EXNORA. These toilets are free for public use and are maintained by the ULB. Another toilet complex at Velakanatham road has a Decentralized Waste Water Treatment system and a Bio-Gas plant, maintained by the ULB.


Thus Musiri is one of the town panchayats in the state, which is pioneering various localized scientific sanitation practices to protect the environment. In the areas of solid waste management composting is done through windrows method and excelling in the methods for best waste management practices across the region.

## Septage Treatment Plant

This is a new experiment. The septage treatment bed in Musiri town was commissioned in June 2010. The plant was constructed with the financial assistance from WASTE, Netherlands and District Rural Development Agency of Trichy District. The treatment bed is a low cost model with no use of electricity or chemical treatment.

A vertical flow constructed wetland (VCWL) has been constructed as a Pilot cum Demonstration Unit (PDU) for treatment of septage. The unit is essentially designed like a conventional Sludge Drying Bed (SDB).




The unit is divided in to three compartments for rotation of septage. All the three compartments are connected by a common feed channel for loading of sludge and a common under drain for removal of percolates. The feed channel is located on the one side of the beds and the percolate channel at the centre. The bottom floors of the beds are provided with a slope of 1/8 with the slope towards the channel. The media in each compartment is supported by a stainless steel mesh laid on the top of the channel. The beds are planted with select reeds. The locally available species of Phragmites Karka and Typha Latifolia are used in the PDU.

A few Canna Indica plants at the periphery of the beds have been planted for aesthetic reasons. The reeds are originally planted with a spacing of 300 mm c/c. The beds have grown into a thick vegetation cover. The reeds are trimmed periodically and the trimmings are used in the Compost Unit located close to the PDU. There is a small canal located adjacent to the property. At present, the proposal is to collect the percolate in a collection pit and drain the same to the canal. In future, as and when the loading rates increase, there will be a proportionate increase in the quantity of percolates and that time an additional treatment unit for the percolates using Horizontal flow constructed wetland (HCWL) is planned. Currently, desuldging and transportation service is provided by the town panchayat free of charge.

The PDU has three 3 compartments, each having a dimension of 1.0X0.5X1.2 m. The percolate drain measures 0.3X0.2m. It has 100 mm deep layer of 40 mm Broken Stone at the bottom, 100 mm deep layer of 20 mm Broken Stone as a second layer, 100 mm deep layer of 10 mm Broken Stone

as third layer, 50 mm deep layer of 5 mm Coarse Sand as fourth layer and 100 mm deep layer of 2 mm Fine Sand on top.

## Operation & Maintenance

Periodical harvest of the vegetation is typically recommended. The plant stems are cut at a point, which will still be above the top of the sludge layers expected. This allows the continued transfer of air to the roots and rhizomes. The harvesting is usually done in winter. In the spring, the new growth will push up through the accumulated sludge layers without trouble. The major purpose of the harvest is to physically remove this annual plant production and thereby allow the maximum sludge accumulation on the bed. The harvested material can be composted. Sludge application on a bed is stopped about 6 months before the time selected for cleaning. This allows additional undisturbed residence time for reduction of the pathogen content of the upper layer. Typically, sludge application is stopped in early spring and the bed is cleaned out in late winter. The cleaning operation removes all of the accumulated sludge plus the upper portion of the sand layer. New sand is then placed to restore the original depth. New plant growth occurs from the roots and rhizomes that are present in the gravel layer.

## Performance (yet to be confirmed)

It is estimated that 75-80 percent of the volatile solids (VSS) in the sludge will be reduced during the long detention time on the bed. As a result of this reduction and the moisture loss, a 3-m-deep annual application will be reduced to 6-10 cm of residual sludge. The useful life of the bed is therefore 6-10 years between cleaning cycles.

## Benefits

The major advantage of the CWL concept is the ease of operation and maintenance and the very high final solids content (suitable for landfill disposal). This significantly reduces the cost for sludge removal and transport. A 6 to 7 year cleaning cycle for the beds seems to be a reasonable assumption. Available field extra though limited, confirms this assumption. Annual harvest of the vegetation and disposal of that material is proposed. The presence of the compost plant within in the property is an advantage since the trimmings from the PDU can be utilised there.

Over a 7-year cycle, the total mass of sludge residue and vegetation requiring disposal will be less than the sludge requiring disposal from conventional sand drying beds or other forms of mechanical dewatering.

## Current Status

The PDU is operational for over 1year (up to July 2011). All the three beds are used and 560 trucks of septic sludge applied (each truck capacity of 1500 litres). The original proposal had a provision for treatment of the percolate from the CWL. However, due to paucity of funds that part of project is yet to be implemented.

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