CDD Society
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Economic Comparison

Assessment of FSM vs Piped sanitation: Case of Tiruchirappalli

Background

Trichy is a city in the state of Tamil Nadu. It has a population of 920,000 people living in 168 Sq.Km. The City has an established sewerage network catering to core areas of the city, these sewer lines discharge into a sewage treatment plant (STP) at Panjarpur. The treatment plant works on the principles of waste stabilisation pond, treating sewage to standards which can be discharged into an adjacent river.

The City has grown ever since the sewer lines were constructed and commissioned in 1992, post which several augmentation plans have been conceived and implemented. The latest of which was under the National River action plan, implemented in 2008, where several unsewered and new areas were included.

In the year 2015, the Tiruchirappalli City corporation applied for augmentation of the sewer network to include unsewered and new areas. It is for this that a Detailed project report was prepared and submitted under the AMRUT programme for seeking financial support from the Central government. The DPR is still under scrutiny by the state and central government, alternate approaches of sanitation to reduce the financial burden are being considered. In the light of such an initiative CDD Society developed an alternate approach towards non sewered sanitation. Under this proposal, faecal matter accumulated in onsite sanitation system present at unsewered households and non residential units was to be transported through existing vacuum trucks to a proposed treatment facility, where the sludge can be treated for safe disposal or reuse applications.

Further to this assessment, a detailed project report for implementing such as treatment plant has also been submitted and approved for construction.

Financial Assessment

Piped approach

The existing detailed project report for sewerage network prepared under the guidance of Directorate of Municipal administration was analysed and the below table highlights the financials of the implementation plan.

CAPEX of proposed augment sewer networks	**Rs. 3400 Million**
Number of Persons served	**402462**
CAPEX per person for sewer network	**Rs. 8500**
OPEX per person per annum	**Rs. 99**
Present value of OPEX per person for a 10 year period	**Rs. 765**
Present value of proposed plan per capita	**Rs. 9265**

The present value[1] of the proposed sewerage network is Rs. 9265. In the proposed intervention there is no provision for setting up a sewage treatment plant, since the existing STP is under-utilised and running at 52% of the designed capacity[2]. Hence, for assessing the opportunity cost of such an intervention, an estimated cost of treatment is added to the above figure.

Per Capita CAPEX of STP	**Rs. 2000**
Per capita OPEX of STP per annum	**Rs. 350**
Present value of OPEX per person for 10 year period	**Rs. 2700**
Present value for opportunity cost of a STP	**Rs. 4700**
Total per capita Cost for sewerage and treatment	**Rs. 13965**

In sum, the 10 year cost of providing sewer connection and treating the wastewater conveyed is Rs. 13965 per person, with the majority cost driver being the conveyance, which amount to 66% of the total cost.

[1] Present value was calculated using annuity tables for a period of 10 years and rate of return as 5%

[2] Source: Detailed project report prepared by Voyant solutions Pvt. Ltd.

Non piped approach

As an alternate to setting extensive infrastructure to collect, transport and treat sewage from the source, faecal sludge management considers using existing infrastructure and integrating them in a synchronous and planned manner to achieve objectives of improved sanitation. In the current case of Tiruchirappalli all non sewered household have an onsite containment unit ranging from single pits to septic tanks. The black water generated at the house or non residential units are treated using such onsite systems and the partially treated effluent is let into open drains adjoining these houses. In addition, Grey water from activities such as bathing, washing and cleaning is also directly let into these open drains.

The onsite containment units such as pits or septic tanks get filled over a period of time ranging between 6 months to 10 years and more. Once filled, these units are desludged and the partially digested faecal matter is disposed in water bodies, open fields by private and government owned vacuum truck operators. Though the faecal matter is partially digested, the pollution content in these remain considerable high, at times 100 times more concentrated in pollutants than normal sewage and hence have potential to cause severe environmental and health hazard when disposed untreated.

Faecal sludge management, prioritises sanitation by phasing interventions. It begins by addressing the current threat of sanitation - indiscriminate and unsafe disposal of faecal sludge. It also suggests means and systems across the sanitation value chain to ensure that 100% faecal matter contained in onsite systems are collected and treated for safe disposal or reuse.

In the case of Tiruchirappalli, there is no current means to treat faecal sludge. Though there exists an option of co-treatment in the existing sewage treatment plant, a detailed technical assessment needs to be carried out. Also, the treatment plant lies on the South eastern part of the city, while sludge collected from non sewered households in the North and eastern part of the city need to be transported across the city to be disposed into the treatment facility. Moreover, in the current phase 2 proposal for implementation of sewerage networks it is envisaged that the under-utilised STP be used to treat the additional sewage. Hence in addition to existing STP, the city requires a treatment plant for managing the faecal

sludge generated from onsite containment units located in periphery of the city and also for houses which would not be covered under the proposed sewerage plan.

The below table summarised the financial plan for the proposed faecal sludge management initiative

Number of people served	**55000**
CAPEX of Faecal sludge treatment plant	**Rs 38 Million**
OPEX of the Faecal sludge treatment plant per annum	**Rs. 2 million**
Present value of 10 Year OPEX of the faecal sludge treatment plant	**Rs. 15.44 million**
Total cost of treatment CAPEX and OPEX	**Rs. 53.44 million**
Per capita cost of above figure	**Rs. 972**

The total life cost of a faecal sludge treatment plant including its Capital and operational expenses for a period of 10 year amounts to Rs. 972, which is 20% of the value as compared to similar expenses for setting up a STP. In Tiruchirappalli, there already exists private and public sector for collection and conveyance of the faecal sludge and moreover these costs are directly paid by the household and is not a burden on the government. Hence, these costs are not included as project expenses, however for the sake of economic comparison, these costs will be included as opportunity cost, as below:

CAPEX for collection and conveyance of faecal sludge	**Rs. 10 million**
Present value of 10 year OPEX for the collection and conveyance mechanism	**Rs. 19.3 million**
Present value of per capita cost for both CAPEX and 10 year OPEX	**Rs. 533**
Total cost of FSM including collection, conveyance and treatment	**Rs. 1505**

As seen in the above table the total cost of providing a faecal sludge management solution costs Rs. 1505 per person. Though the costs are obtained, faecal sludge management as proposed only collects, conveys and treats the wastewater from onsite containment units, effluent from these systems and grey water which directly discharge into open drains are not

yet incorporated. Hence, to compare these approaches, cost for managing the above mentioned wastewater need to be added.

Tiruchirappalli, is a located on the banks of River Kaveri, there are many other small and minor tributaries which feed into Kaveri. The topography of the city is quite flat with a minor slope towards the river basin. The wastewater flowing through open drains (storm water drains) pass through a network of channels and drains to finally discharge at specific points into these minor tributaries. It is hence possible to divert the drains at the point of discharge, pass it through a treatment plant and discharge the treated effluent into these tributaries, thereby maintaining the flow of these rivers and rivulets. Such an option can complement the proposed faecal sludge management system. The financial cost for such a system is listed below:

CAPEX per capita for intercepting and building a wastewater treatment plant	**Rs. 2000**
Present value for 10 year OPEX per capita for the above system	**Rs. 2700**
Total cost of CAPEX and 10 year OPEX per capita	**Rs 4700**
Gross total : FSM + wastewater management	**Rs. 6205**

The total cost of implementing a complimentary system using existing infrastructure such as onsite containment units and storm water drains is Rs. 6205 as compared to Rs. 13965 for providing similar outcomes.

Conclusion

The case of Tiruchirappalli is not unique, it is common to many cities and towns in India, which face the question of piped vs non piped approaches. Traditionally we have approached wastewater management as a blackbox for polluters by conveying it to far off locations and probably treating it before discharging it into water bodies. Such an approach has kept the polluters in dark as to what happens after a flush, this lack of knowledge contributes heavily to low levels of willingness to pay for conveyance and treatment.

Access to capital has always remained a challenge for financing sanitation projects, in such scenarios it is prudent to use existing infrastructure and find means of tapping into

willingness of non governmental stakeholders to pay for the burden. By FSM, the burden is shared by the household and the government, making the beneficiaries pay a price for the benefits of improved sanitation.

Bringing back the blackbox syndrome, the invisibility of the sewerage network and treatment leads the operators of such systems to neglect proper operations, there by making such system dysfunctional over a short period of time. And the same syndrome, also prevents prioritising governments from monitoring and paying for the O&M of such systems. Thereby, though extensive investments are made and systems put in place to convey the sewage to far off location to treat, more often than not, these fail to provide the intended objectives.

FSM, as an approach puts the onus on the polluter to pay for certain components of the value chain, thereby unboxing the blackbox and making such interventions more visible to tax payer. This in return would increase the willingness to pay for improved sanitation and thereby fasten the means of achieving sustainable development goals within the committed time frames.