Training Needs Assessment: Masons

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Abbreviations

BMGF	Bill and Melinda Gates Foundation
FSM	Fecal Sludge Management
GoTN	Government of Tamil Nadu
IIHS	Indian Institute for Human Settlements
MAWS	Department of Municipal Administration and Water Supply
NNP	Narasimhanaicken-palayam
PNP	Periyanaicken-palayam
SBM	Swachh Bharat Mission
TNUSSP	Tamil Nadu Urban Sanitation Support Programme
TSU	Technical Support Unit

Executive Summary

Introduction and Objective of the Training Needs Assessment

As a part of developing the TNUSSP's capacity building strategy and action plan, a Training Needs Assessment (TNA) for masons was carried out from November – December 2016.

The assessment had the following objectives:

1. To study the masonry practices in building toilets and constructing onsite system in Tamil Nadu;
2. To identify the skill gap of masons in toilet and onsite system constructions vis-à-vis standard practices; and
3. To identify the training needs of the masons in toilet and onsite system construction.

Approach and Methods

The primary target group of the study were masons from Tiruchirappalli city and town Panchayats of Periyanaicken-palayam (PNP) and Narasimhanaicken-palayam (NNP). The study was conducted between November and December 2016 with a sample of 70 masons, 34 from Tiruchirappalli and 36 from PNP. 33 masons identified themselves as chief masons and 32 as skilled masons, one of those who was interviewed was a contractor of masons and the rest were working as assistant to chief mason. Typically, the construction of on-site containment systems is driven by factors other than site conditions and technical standards. It includes factors such as client preference for frequency of desludging and financial affordability. In this context, a structured questionnaire was designed to profile the masons according to the following criteria: their training and experience; their current knowledge in construction of toilet and containment structures; their training needs; and specific factors which influence the construction of on-site systems.

Key Findings

Education

None of the chief masons or skilled masons had undergone any technical education for masonry; most of them have learned this skill over time and through experience. When asked about how they were initiated into this profession, 63 per cent of the chief masons and 41 per cent of the skilled masons reported that they have simply continued on with their family's traditional occupation.

Work Experience

A majority of the masons in the sample stated that masonry is their primary source of income, and they worked anywhere between 6 and 12 months in a year. While it is expected that chief masons would work as helpers and skilled masons before assuming the role of chief masons, the reality is that the time spent in each role was varied, with some moving up quicker than others because of family associations. While half the masons had their own masonry business, they also worked with small or big contractors and builders to get additional work as needed. Most masons had experience building residential houses, residential apartments or industrial buildings, but very few had experience building wastewater treatments plants.

Construction of On-Site Systems

Construction of on-site systems, especially sub- structures, is driven by various aspects other than what the Indian standards recommend. This is due to two simultaneous processes: Factors such as space, affordability and required need for desludging by the customer are said to supersede considerations of standards and suitability in terms of soil conditions etc.; and secondly and more importantly, there exists a knowledge gap among the masons themselves in terms of how to build a structure considered suitable as per standards. This is proven by the fact that 80 per cent of the masons have indicated an oversized septic tank for a typical family of five, 40 per cent had built a soak pit for a water outlet, and around a tenth of the septic tank had two chambers. For twin pits as well, current masonry practices indicate a deviance from Indian standards in terms of materials used for the wall and base of the pits.

Training Needs

When asked about the "correct design" of a toilet system as per Government rules, 22 per cent were confident that they knew about it, 32 per cent were not confident, and 20 per cent depended on the engineers. Only 21 per cent of the masons reported undergoing training in their work life and 86 per cent of the masons said that they would participate in trainings if they were offered. All these point to a clear deviance from standards in construction of on-site containment systems, as well as a need for training them. Masons need to be sensitised to the standards of construction of on-site systems and given practical training.

1 Background, Objectives and Methods

1.1 Background

The Govt. of Tamil Nadu (GoTN) has been a pioneer in recognising and responding to the challenge of urban sanitation in the state. In 20??, the Chief Minister announced the Tamil Nadu Sanitation Mission to address sanitation issues, following which the 'Namma Toilet' ('Our own Toilet') scheme was implemented and Septage Management Operative Guidelines issued in September 2014.

With the support of the Bill and Melinda Gates Foundation (BMGF), the GoTN has set up a Technical Support Unit (TSU) within the Municipal Administration and Water Supply Department (MAWS) to improve urban sanitation. The project titled Tamil Nadu Urban Sanitation and Support Programme (TNUSSP), a consortium of organisations led by the Indian Institute for Human Settlements (IIHS), and comprising Gramalaya, Keystone Foundation and CDD Society, has been commissioned to implement this programme via TSUs at the state and the city levels.

The TSU will help the GoTN and cities in making improvements along the entire urban sanitation chain in their planning, implementation and monitoring processes. To facilitate easy implementation of this complex project, it has been divided into nine components, each of which will be implemented both at the state and city levels with differing activities. The components are as follows:

1. Enabling Environment and Governance
2. Engineering and Planning
3. Implementation Support
4. Behaviour Change and Communication
5. Enterprise Development Services
6. Knowledge Management
7. Capacity Building
8. Monitoring, Learning and Evaluation
9. Project Management

Sanitation and safe disposal of human waste are critical elements of public health with a direct impact on the wellbeing of people. The scoping study conducted by IIHS clearly points to gaps in the skills and practices followed by masons in the construction of containment systems. At the behest of the owner, builders and masons clearly deviate from the standards while constructing septic tanks which are based on household size besides other specifications. The optimal size of the containment is jointly decided by the house owner and mason based on factors such as affordability, space availability, and the desire to reduce the desludging frequency. These result in the construction of over-sized septic tanks which are often unlined and allow for the wastewater to percolate into the ground and further reduce the desludging frequency. Such practices have serious public health consequences along with associated environmental pollution due to untreated fecal sludge.

1.2 Objectives of the Study

As a part of the Capacity Building initiatives, a 'Training Needs Assessment of masons was conducted during November – December 2016. The Training Needs Assessment survey aims to profile the current levels of education and training of masons, their current knowledge levels and practices in toilet construction, and the construction of on-site containment structures, and then identify training needs accordingly.

The specific objectives of the TNA were as follows:

1. Study the masonry practices in building toilets and constructing on-site systems in Tamil Nadu
2. Identify the skill gap of masons in toilet and onsite system constructions vis-à-vis standard practices
3. Identify the training needs of masons in toilet and onsite system construction

1.3 Profile of Masons in Tamil Nadu

The quality of the sanitation system whether onsite or centralised is determined by the quality of construction of the system. Masons are one of the key stakeholders in the sanitation value chain as they advise and construct the on-site sanitation system. Therefore, they should be aware of both the standards for on-site sanitation systems as well as current trends in sanitation practices and advanced design and construction practices. However, a deeper looker at the organisation of masons in Tiruchirappalli and PNP reveals a hierarchical informal market where skills are built on the job, without adequate training.

The profile of masons in the Tamil Nadu construction labour market in Tiruchirappalli and in Coimbatore is informal consisting of four key players — Mastry (Chief Mason), Kothanar (Mason), Manvettialu (Male helper) and Chittal (Female helper). The details of their respective roles are profiled in Table 1. In Tiruchirappalli, many masons travel in the morning from up to a 20 km radius around the city to congregate in its main labour markets for work. Ramakrishna Theatre, Kumaran Nagar, Yedamalaipattipudur, Thiruvanai Kovil and Taranallur are some examples. Similarly, in PNP, masons from the outskirts travels to the two labour markets in PNP bus stand and Veerapandi bus stand.

Table 1.1: Sanitation Service Chain
Mastry or **Chief Mason** typically leads a team of 10 people. He is a fully skilled mason and can also undertake masonry work on his own while leading a team. He typically undertakes 3-4 projects simultaneously and organises the work in terms of manpower and materials, if needed. He works through his network of labourers which he is able to leverage when needed at short notice. Typically, his per day rate is INR 1,000 if he works under someone, a profit margin basis if he has undertaken a contract.
Kothanar or **Skilled Mason**, is a key member who actually does skilled tasks such as plastering, levelling the wall, laying the tiles and giving instructions for mixing mortar. Each *mastry* has contacts with a few *kothanars*, who are contacted when big construction contracts are undertaken. Otherwise *kothanars* undertake day labour which is available in the market. A *kothanar* can become a *mastry* based on his ability to bag a contract. Day rates for a *kothanar* vary from INR 700 – INR 800 in Tiruchirappalli, and INR 600 – INR 800 in Coimbatore. Typically, a *kothanar* would have demonstrated expertise as *manvettialu* before they assume this role.
Manvettialu or **unskilled male assistant** helps the *kothanar* in bringing materials, hiring equipment, and mixing mortar among others tasks. Typically, a *manvettialu* works under a *kothanar* for some time and if he demonstrates dedication, interest and aptitude to cope with intricacies of the job, he moves up to be a *kothanars*. Otherwise, he continues as *manvettialu*. Any able-bodied adult can be a *manvettialu* and there are is no eligibility criteria for selection. Day rates for are INR 350 and in cases where they are below 18 years of age, they may be paid INR300.
Chittal or **unskilled female assistant** helps in hauling bricks, carrying water, cleaning the work site and other sundry tasks. Typically, *chittals* are widows and agricultural labourers and earn INR 300 per day.
Source: Key Informant Interviews, TNUSSP, 2016

Contractors are external to this hierarchical chain and could be builders or licensed engineers who have undergone a due diligence process with the government and acquired a license to bid for government projects. They often interface with the *mastry* to organise a team for projects at hand. Each contractor/*mastry* selects his team for the day based on his requirement. If the work is for a long period of time, workers are asked to report directly to the site and payments are made on a weekly basis. Labourers contracted for the day are paid their day rate at the end of the day. Typically, working hours are from 9 am till 5.30 pm, post which they clean the work site and leave. Although there has been an influx of labour from the northern states in lieu of the higher labour rates prevalent in both places, it has not resulted in the lowering of the labour rate.

Mastrys and *Kothanars* are involved in all aspects of the building of on-site toilet systems including giving advice on and construction of the super-structure and sub-structure. Typically, a male labourer starts off as a *manvettialu,* and based on his aptitude, progresses to the role of a *kothanar* learning all his skills primarily on the job. Thus, although they are skilled in construction and have learnt masonry at the work site, they have not had the requisite training to assess the appropriate on-site toilet system that needs to be constructed as per standards. Hence, upskilling of masons is one of the most important aspects in sustainable urban sanitation programmes.

1.4 Methods

The scope of the study was limited to the two cities of Tiruchirappalli, PNP and NNP in Tamil Nadu. Although masons in the study may have originally come from various parts of the state, the survey focused on understanding practices in their current workplace.

Realising the need to sensitise masons on standards in construction of on-site systems and provide practical training, a capacity building initiative for masons is included in TNUSSP. The mason training programme aims at creating an awareness among the masons in FSM practices and standards therein and strengthening the skill set of masons in toilet construction. It also aims at creating behavioural change among the masons in construction practices. A training needs analysis was conducted as the initial step of the capacity building programme.

1.4.1 Questionnaire

A structured questionnaire was designed for data collection and included sections on the following four heads:

1. Demographic details such as age, gender, location and education of the respondents
2. Occupation related details such as how they chose this occupation, work experience, busy work season and type of structures constructed
3. Current practices in toilet and containment structure construction and factors which influence them
4. Past training experience and willingness to participate in future trainings

Field testing of the questionnaire was done in Thiruverkadu and all insights were incorporated into the survey. The questionnaire was prepared in English and administered in Tamil.

1.4.2 Sampling

Construction workers practicing in Tiruchirappalli city and the town panchayat of PNP were selected regardless of their place of origin. Based on preliminary discussions with builders associations, officials of local bodies, contractors and hardware traders, key labour markets were identified. A combination of judgmental, convenience and snowball sampling was used to select participants for the survey. In Tiruchirappalli, the point where daily wage labourers met was a key point where respondents were selected, while for Coimbatore, the labourer meeting point of PNP, which is the larger labour market of the two town panchayats (PNP and NNP) was selected. Henceforth, results will be presented for PNP, as masons who come to the labour market in PNP also work in NNP. It is important to bear in mind that although sampling has been done in Tiruchirappalli city and PNP, the practices of the masons cannot be said to be localised to these areas because they travel in and around these places for work.

1.4.3 Field Visits

Since the survey was conducted post the Government of India's decision to demonetise INR 500 and INR1,000 rupee notes in November and December 2016, construction activity had slowed down as people did not have legal tender to make payments. This enabled masons to fully participate in the survey. A group of eight trained interviewers fluent in Tamil administrated the questionnaire and entered the data into a spreadsheet.

1.4.4 Limitations

1. Given the nature of the sampling, the results of the survey are indicative of the trends in construction of on-site systems and are not statistically representative of trends in Tiruchirappalli city and PNP.
2. Since Fecal Sludge and Septage Management is a new practice area, respondents were not able to articulate the gap in their competency.

2 Findings

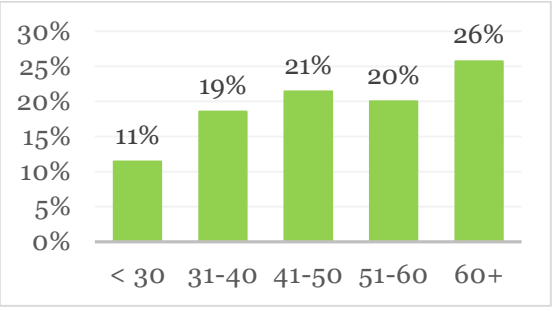
2.1 Demographic Profile

All 70 masons interviewed were male. 34 were from Tiruchirappalli and 36 from PNP. When asked about their roles at work, 47 per cent identified themselves as chief masons, 46 per cent as skilled masons, and the rest were assistants or contractors.

Age Profile

Only 11 per cent of the masons were less than 30 years of age while over a quarter of them were over 60 years of age (Figure 1). Twenty-one per cent of the masons were aged between 41 and 50 years and 20 per cent between 51 and60 years.

Figure 2.1: Age Profile of Masons

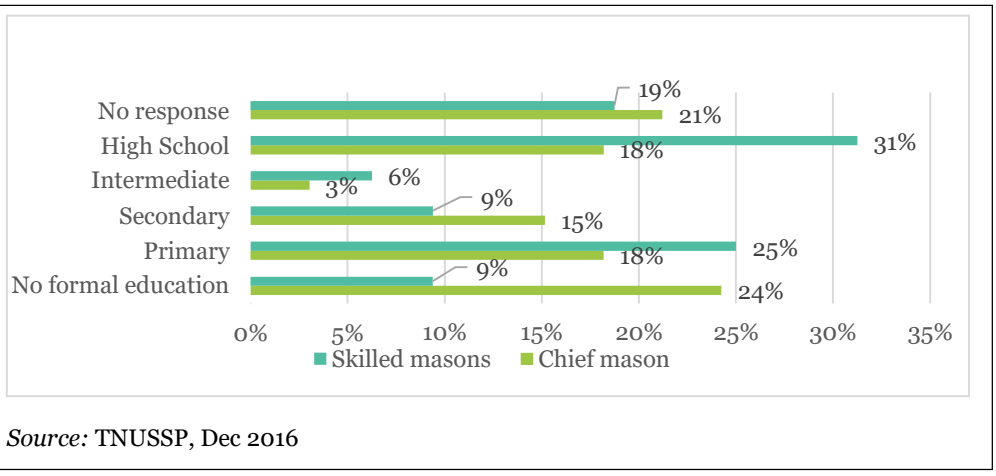


Source: TNUSSP, Dec 2016

Education

Twenty-four per cent of the chief masons reported having no formal education at all, 18 per cent had completed primary schooling and only 18 per cent had completed high school (Figure 2). None of the chief masons had undergone any technical training to be masons. Education levels among skilled masons were higher, with a quarter of them having completed at least primary schooling and 31 per cent having completed high school. There is no difference between the education levels of masons from Tiruchirappalli and PNP. Three fourths of the Assistants (*Manvettialu*) reported having completed primary schooling and only one contractor in the sample reported having undergone polytechnic training. Thus, none of the chief masons or skilled masons reported having undergone any vocational education for masonry.

Figure 2.2: Education Levels of Masons



Source: TNUSSP, Dec 2016

Initiation into the Profession

Asked on their means of initiation into this profession, 63 per cent of the chief masons reported that they have only continued with the family occupation, while the rest have learnt the skills on the job. Among skilled masons, 41 per cent reported continuing with their family tradition while the rest reported learning on the job. The four assistants in the sample also reported taking up masonry for their livelihood and only then learning on the job. Thus, about half the masons in the sample reported continuing with their family occupation, had no vocational degree, and had learnt on the job.

2.2 Work Experience

Years of Training on the Job

All masons were asked about how many years of experience they have had as helpers, skilled masons and chief masons. Forty-five per cent of the chief masons reported having no experience as helpers, and 36 per cent reported having worked up to five years as helpers before moving up the ladder (Table 2). Nine per cent of the chief masons reported having worked from anywhere between 6 and10 years as helpers and 3 per cent had worked over 10 years. Among skilled masons, 63 per cent reported having had no experience as helpers, while 19 per cent reported having worked up to 5 years and 13 per cent reported having worked 6 to10 years as helpers.

One in every four chief masons reported not having any experience as skilled masons before assuming the role of chief mason (Table 2). One third of the chief masons reported having worked for up to 5 years as skilled masons, while 24 per cent reported having worked 6 to 10 years as skilled masons before being elevated to the role of chief mason. Only three per cent of the skilled masons have had no experience in that role, while 29 per cent have had anywhere between 6 to 15 years' experience, and 31 per cent have had over 20 years' experience.

Table 2.1: Sanitation Service Chain Years of experience as a Skilled Mason and Helper

	Years as Helper		
	Assistant	Chief mason	Skilled mason
No experience	25%	45%	63%
Up to 5 years		36%	19%
6-10 years	75%	9%	13%
Over 10 years		3%	3%
No response		6%	3%
Years as Skilled Mason			
No experience	50%	24%	3%
Up to 5 years		33%	22%
6-10 years	25%	24%	16%
11-15 years		3%	13%
16-20 years			16%
Over 20 years		3%	31%
No response/ Not applicable	25%	12%	100%

Source: TNUSSP, Dec 2016

Source of Income

About half the masons across both locations reported doing their own masonry business, while also working with small-time contractors (30 masons), big contractors (27 masons) and big builders (10 masons) in order to diversify their source of income. Skilled masons were more likely to work with small-time and big contractors, while chief masons liaised with big builders to find work. In the sample, 86 per cent of the masons reported that the profession provided for more than half their income. This was true for almost all skilled masons, as well as 78 per cent of the chief masons. Also, variations across locations remained with 97 per cent of the masons reporting masonry to account for half their income in PNP and only 74 per cent of the masons reporting the same in Tiruchirappalli.

Type of Construction Undertaken

When masons were asked about the type of construction undertaken in the past (Table 3), the majority reported constructing residential houses, while 72 per cent reported constructing residential apartments. Construction of industrial and commercial buildings was reported by 77 per cent and 87 per cent of the masons respectively, with percentages being higher in PNP than Tiruchirappalli. Only 11 per cent and 3 per cent of the masons reported constructing water treatment plants and wastewater treatment plants respectively.

Table 2.2: Type of Construction Work Undertaken (% of masons)

	All	PNP	Tiruchirappalli
Residential houses	97%	100%	95%
Residential apartments	72%	78%	67%
Industrial buildings	77%	86%	68%
Commercial buildings	87%	90%	85%
Institutional buildings	75%	77%	74%
Water treatment plant	11%	3%	2%
Wastewater treatment plant	3%		6%
Bridges	44%	41%	47%
General maintenance	67%	58%	76%

Source: TNUSSP, Nov-Dec 2016

Work Related Travel

To get to work, masons typically travel within the city (47 masons), within and outside the city (36 masons), far-off places (23 masons) and some (3 masons) even travel out of state to undertake work.

Number of Months Worked in a Year

About 41 per cent of the masons reported being employed 6 to 9 months, and a quarter reported to being employed for 9 to 12 months in a year. Of this, 75 per cent of the masons in Coimbatore and 59 per cent of the masons in Tiruchirappalli were employed between 6 to12 months in a year.

Thus, for a majority of the masons in the sample, masonry was a primary source of income as they worked anywhere between 6 to 12 months in a year. While it was expected that chief masons would have worked as helpers and skilled masons before assuming the role of chief masons, reality showed that the years spent in each role may be varied, with some moving up

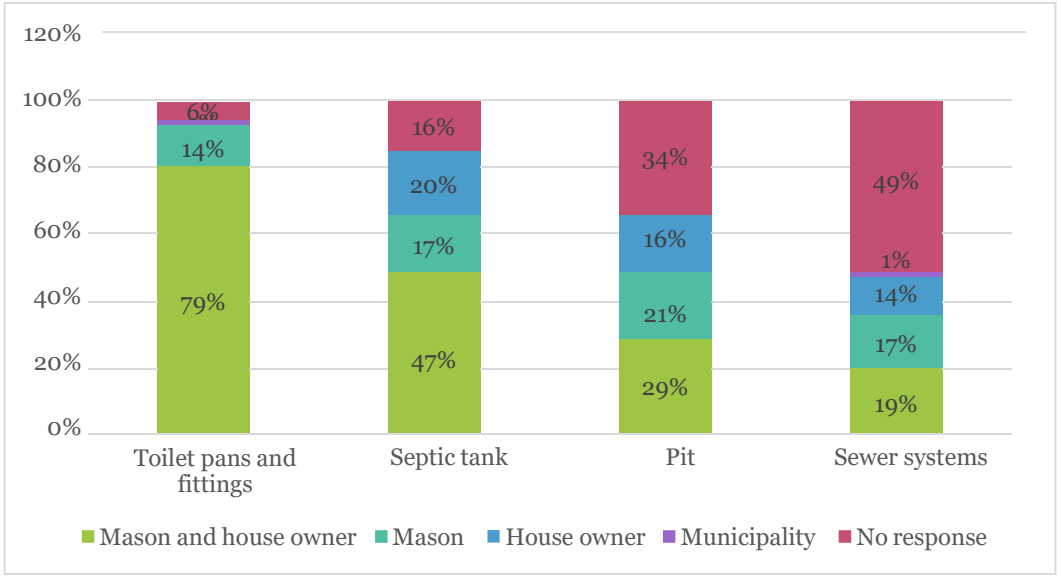
quicker than others because of family associations. While half the masons did their own masonry business, they also worked with small or big time contractors and builders to get additional work when need. While most masons had experience building residential houses, residential apartments or industrial buildings, very few had experience building wastewater treatments plants.

2.3 Construction of On-site Systems

Factors Influencing Construction of Toilets and On-site Systems

The majority of masons reported constructing super-structures and sub-structures, although they reported that the type of structures or toilet systems constructed was influenced by various factors / aspects other than technical standards. These included space availability at site (91 per cent), geographical conditions (83 per cent), cultural habits (80 per cent), affordability (77 per cent), family size (31 per cent) and availability / shortage of water (29 per cent). Affordability in this context is meant to indicate the cost of construction of a particular structure and its maintenance thereof, especially of sub-structures. Other factors influencing construction decisions included *vaastu* (is a traditional system of architecture based on culture of the land) and health (as many in villages still believe that building toilets inside the house would cause diseases and ill health). Given that various factors drove the decision making on super-structures and sub- structures, masons and house owners have a greater role on the various aspects of construction of toilet systems.

Figure 2.3: Decision Makers for Construction of On-site Systems



Source: TNUSSP, Dec 2016

2.3.1 Super Structure

Masons were asked about the components of the toilet constructed, and 89 per cent of them reported constructing super-structures (Table 4). Both Indian and Western toilets were used by masons, with western toilets used especially for elderly users. Masons reported providing taps in toilets in 87 per cent of the cases. One mason reported a tap was not provided if it were a Government toilet; it was only provided for a private one. Seventy-nine per cent of the masons reported deciding on the toilet pan and fittings along with house owners and in 14 per cent of the cases, masons themselves chose for their customer.

Table 2.3: Components of toilet constructed (% of masons)			
	All	PNP	Tiruchirappalli
Superstructure	89%	88%	88%
Slab along with pan and other fittings	74%	83%	65%
Sub-structure	94%	94%	94%
Sewers	61%	52%	71%
Septic tank	81%	78%	85%
Pit latrine	64%	56%	74%
Source: TNUSSP, Dec 2016			

Besides superstructures, slab along with pan and other fittings was also a commonly constructed toilet option reported by 74 per cent of the masons and was especially reported by PNP masons (83 per cent) compared to those in Tiruchirappalli (65 per cent).

Connection Between Super-Structures and Sub-Structures

Masons were asked further details on the connection from the super-structure/ toilet to the sub-structure. Seventy per cent of the masons reported using a P-trap, 7 per cent reported using an S-trap and 21 per cent reported using either one of them. For the pipe used for carrying the waste from the pan to the containment structure, the Indian standards recommend a minimum diameter of 3 inches. In the sample, 46 per cent of the masons reported using 4-inch diameter pipes, 9 per cent used 6-inch diameter pipes and 16 per cent reported using pipes with a diameter ranging from 3 to 6 inches. One fourth of the masons did not respond to this question. Ninety per cent of the masons across locations used pipes made of PVC which is the preferred material as per Indian standards. Of the rest, three per cent reported using ceramic pipes and 7 per cent used PVC or ceramic.

Location of the Sub-Structure with respect to the Toilet

Thirty per cent of masons reported that the sub-structure was located away from the toilet as a separate structure if conditions permitted. An equal per cent of masons reported building sub-structured within the building allowing for access to the structure from outside. Four per cent of masons reported building a sub-structure under the toilet, which corroborated with the fact that space constraint was a key factor in deciding the construction of on-site systems. The rest of the masons reported building systems which could be any one of the three above-mentioned, depending on the site situation.

2.3.2 Sub-Structure

All three types of sub-structures — sewers, septic tank and pit latrine — were more commonly reported to be constructed by masons in Tiruchirappalli than PNP, although PNP itself has no sewer system (Table 4). It is worth highlighting that although sewers and septic tanks were more commonly seen in Tiruchirappalli, masons also reported constructing pits, which points to the fact these masons worked in and around Tiruchirappalli and its suburbs where such containments systems may be constructed.

Experience in Constructing Sub-structures

Masons sampled had experience in building different types of containment structures:90 per cent had built septic tanks, 19 per cent had built off-set single pit, 11 per cent had built a pit below toilet, with no tangible difference across locations. Half the masons reported building off-set twin pit, with 62 per cent of the Tiruchirappalli masons reporting the same as against 38 per cent from PNP.

Location of the Sub-structure with respect to the Building

Sub-structures were located 'away from the building' as reported by 47 per cent of the masons, and 'inside the building' by 40 per cent of the masons. This was defined by space availability at the site as well as its local culture. There was a sharp difference in this indicator when analysed by locations. Sixty-two per cent of the masons in PNP reported that the sub-structure was away from the building and 25 per cent reported that it was located inside the building. In Tiruchirappalli, 53 per cent of the masons' reported that the sub-structure was constructed inside the building, while 35 per cent reported it to be away from the building. One mason reported that the location of the sub-structure was decided by *vaastu,* and another reported that in towns, it was typically inside the building and in villages, it was outside.

Decision Making on Sub-structures

The Indian Standards specify that the size of the containment structure is to be based on family size and desired desludging frequency. However, masons along with house owners are among the key persons deciding on the construction of various aspects of on-site systems (Figure 3). House owners often have a disproportionate say in decisions relating to the construction of a septic tank which should actually be undertaken as per standards — about 20 per cent of the masons reported that house owners themselves decide on the type of septic tank to be built, 47 per cent reported jointly deciding with the house owners, and 17 per cent of the masons reported deciding on their own. The statistics on the construction of pits are similar. 44 per cent of the masons reported deciding jointly with house owners, and 21 per cent reported taking the decision themselves. Joint decision making with owners is understandable to the extent that cost and space are variables which are critical to decision making and owners need to be involved. However, qualitative inputs from masons suggested that they recommended the best alternatives to their customers, but owners insisted on containment structures which only fit their budget without considering other inputs from the mason. If the masons refused to construct based on the house owner's input, they hired another mason to do the job. Site conditions such as rocks, sand and space availability were some of the other constraints faced by masons while building containment systems. They overcome this by using machines, concrete and packing chemicals.

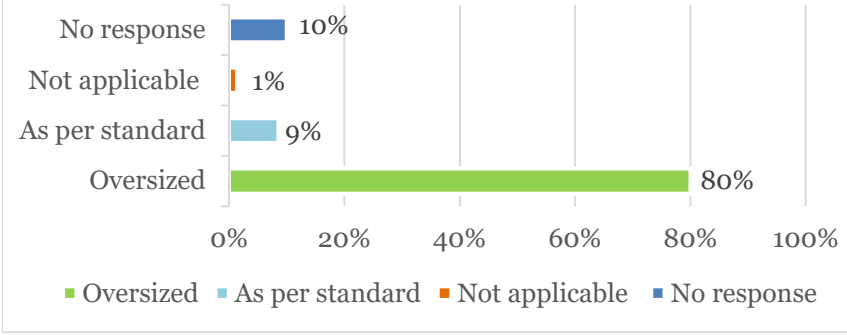
Further details were sought from the masons about the type of sub-structures built to see if they were as per standards. The survey specifically focused on understanding the current practices in the construction of septic tanks and twin pits.

2.3.2.1 Septic Tanks

Comparison of Construction Practices against Standards

Masons were asked to draw the on-site containment toilet system they normally built for a family of five people, and based on the dimensions provided, their structure was classified as 'as per standard' or 'oversized'. Per Indian standards, the dimension of a septic tank for a family of five persons is 5*2.5*3.4 feet (l*b*h). Of the 70 masons, 10 per cent did not draw any containment structure and only 9 per cent reported dimensions as per standards. 80 per cent of the masons drew oversized septic tanks for a family of five persons (Figure 4).

Figure 2.4: Size of Septic Tank Constructed



Source: TNUSSP, Dec 2016

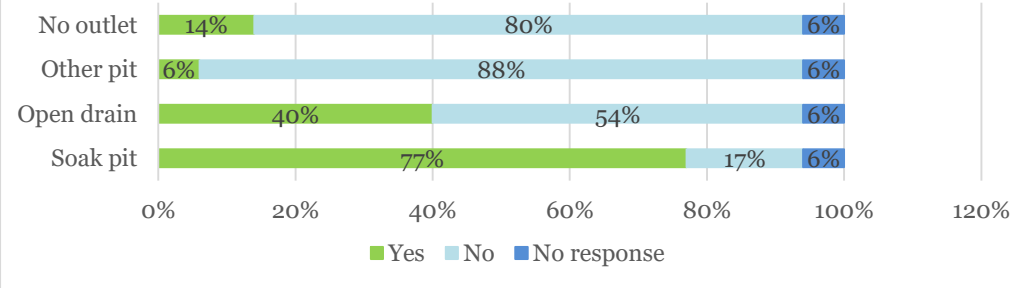
Of the sample of 62 masons who drew a septic tank, 25 masons drew an oversized one with a soak pit of which 7 had at least two chambers. Two thirds of these 25 masons were from Tiruchirappalli and the rest were from PNP. Twenty-one per cent of the masons reported installing baffles, 9 per cent did not install them, and there was no response from the rest. About a third of the masons reported using vent pipes while constructing septic tanks mainly to allow gases to escape. When asked about the 'correct design' of a toilet system as per Government rules, 22 per cent were confident, 32 per cent were not confident of knowing the correct design, and 20 per cent depended on the engineers.

As per standards, the size of septic tanks is to be determined based on the household size and desired desludging frequency, but in practice masons and builders oversize the septic tanks, often at the behest of the house owner. The actual size of the septic tank is a function of financial capability, space availability and the imperative to avoid frequent desludging. The initial incremental cost of constructing a bigger septic tank is offset by the benefits of minimizing the recurring cost of desludging them. Hence, households prefer to have larger and deeper septic tanks built if they can afford it and have sufficient space.

Wastewater outlet from Septic Tanks

Septic tanks generate liquid effluents which come out of outlets every day, and settled solids in the form of sludge that needs to be removed once in two or three years. For the liquid effluents, treatment is deemed appropriate by methods such as soak pits or dispersion trenches with the caution that these sub-soil dispersion systems shall be at least 20 m away from any drinking water source.

Figure 2.5: Wastewater Outlets from Septic Tanks



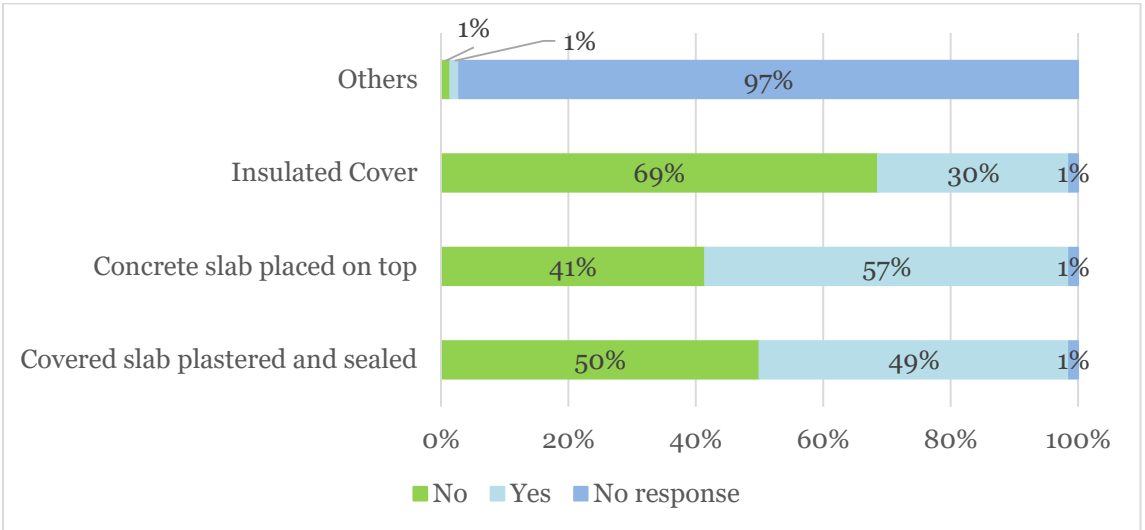
Source: TNUSSP, Dec 2016

Masons from both places were asked questions relating to the provision of waste water treatment while constructing septic tanks. Three out of every 4 masons reported making provisions for septic tank wastewater overflow, with the percentage as high as 88 in Tiruchirappalli and 61 per cent in PNP. Overflow from septic tanks can be connected to multiple structures, most commonly soak pits which was reported by 77 per cent of the masons, open drains which was reported by 40 per cent, while about 14 per cent did not provide for an outlet (Figure 5). Connecting to open drains and soak pits was more common in Tiruchirappalli, while providing for no outlet for wastewater was more common in PNP (25 per cent).

Access for Cleaning

For de-sludging the settled solids in the septic tank, it needs to be easily accessible, have a removable cover and the tank should accessible from the road for the de- sludging vehicle to access. Indian standards suggest the use of removable concrete slabs to cover septic tanks and pits (Figure 6). In practice, pits/ septic tanks are commonly covered in multiple ways with – removable concrete slab on top (57 per cent), slab plastered and sealed (49 per cent) or an insulated cover (30 per cent) (Figure 6). Placing a concrete slab or plastering the slab and sealing was more common in Tiruchirappalli (71 per cent) than in PNP (42 per cent). For emptying the septic tank, 55 per cent of the masons reported providing a slab on top (more commonly reported in Tiruchirappalli), 24 per cent reported providing an easily removable manhole cover, 6 per cent provided for a pipe till the bottom and another 6 per cent did not make any provision.

Figure 2.6: Covering for Septic Tanks and Pits



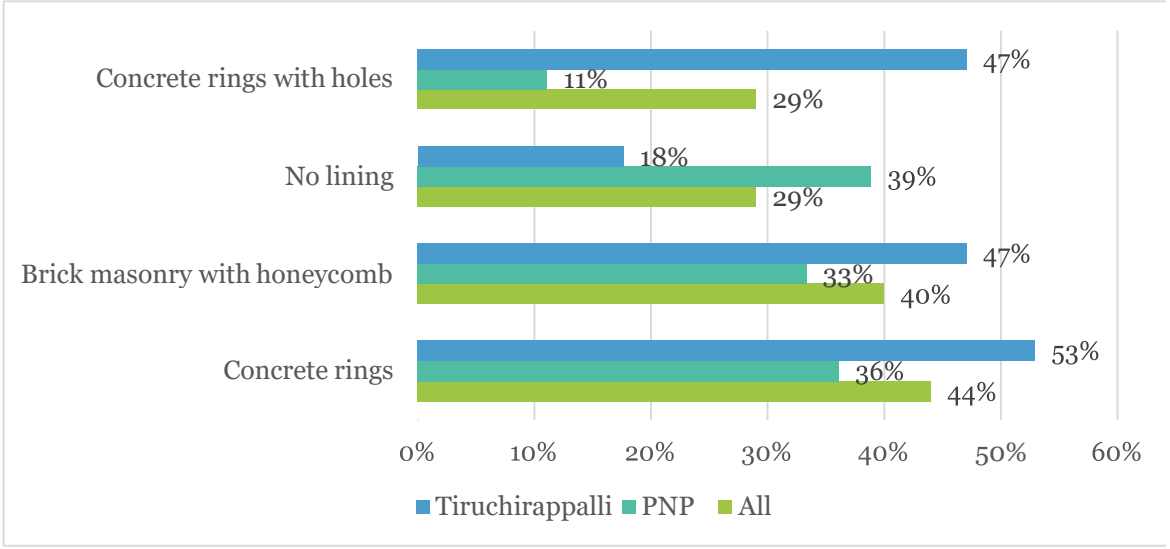
Source: TNUSSP, Dec 2016

2.3.2.2 Twin Pits

Comparison of Construction Practices against Standards

As per the standards, the correct diameter of a twin–pit for a family of five is 3.3 feet with a depth of 4.3 feet. Of the eight masons who also drew twin pits (four each from Tiruchirappalli and PNP) to indicate the type of containment structures constructed, six were of appropriate size as per standards and 2 were oversized (from PNP). If there was insufficient space between two pits, then some masons reported dividing one pit into two. Standard spacing between two pits designed for a family of five persons is 4.3 feet. When asked about the standard spacing between two pits, 55 per cent did not respond, 10 per cent responded with the current distance as per standards, while others either gave the wrong distance or reported managing as per space availability.

Figure.2.7: Materials Used for Lining Pit Walls



Source: TNUSSP, Dec 2016

Pit Walls

As per the norms, pit walls could be lined with honey-comb brick work. The survey showed that pit walls were lined with concrete rings (44 per cent), honeycomb brick masonry (40 per cent), concrete rings with holes (29 per cent) or not lined at all (29 per cent) (Figure 7). However, there were differences between practices in Tiruchirappalli and PNP, with 'no lining' being the most commonly reported method in the latter at 39 per cent. In Tiruchirappalli, brick masonry with honeycomb (47 per cent) and concrete rings with holes (47 per cent) were most commonly reported by masons.

Base of the Pits

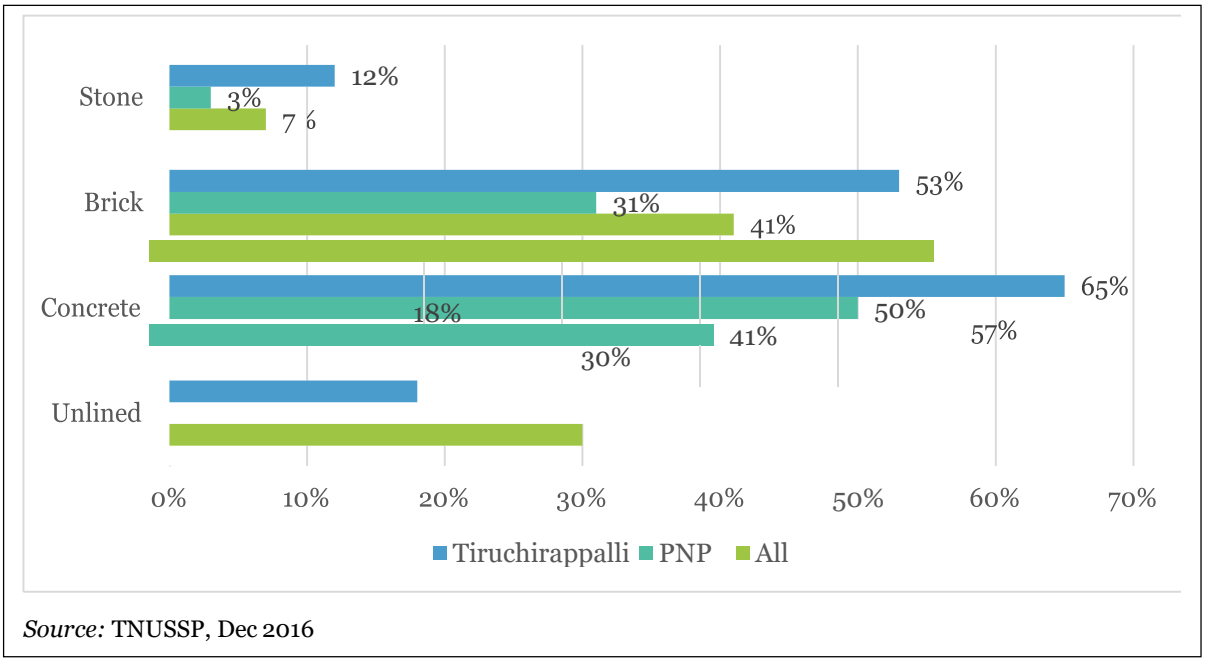
As regards the base of the pit, Indian standards recommend that they not be lined. In reality however, masons reported using concrete (57 per cent) and brick (41 per cent) to line the base of the sub-structure of the pit, while about 30 per cent of the masons also reported not lining them at all (Figure 8). The use of brick and concrete was particularly reported by the masons in Tiruchirappalli, while 41 per cent of those from PNP reported not lining the pit.

As per Indian standards, spacing between the pits and existing structure if the structure was constructed within the premises is 2.6 feet. Only one mason reported leaving a distance of less than two feet, 63 per cent of masons left a distance of up to 10 feet, over 7 per cent left a distance of over 10 feet and 27 per cent did not respond to this question.

Indian standards also suggest a distance of 6 feet between the existing structure and water bodies. Only two masons reported allowing for a distance of 2-3 feet between toilet structures and water sources. About 56 per cent reported allowing for a distance of 7 to 25 feet, and the rest did not respond to this question.

Thus, construction of on-site systems especially sub-structures is driven by various aspects other than what the Indian standards recommend. This is on account of two simultaneous processes. Factors such as space, affordability and required need for de-sludging are said to supersede considerations of standards and suitability in terms of soil conditions etc. Secondly and more importantly, there is a knowledge gap among masons themselves in terms of how to build a structure considered suitable as per standards. This conclusion has been reached because 80 per cent of the masons have indicated an oversized septic tank for a typical family of five, and only 40 per cent of them had built a soak pit for water outlet and around a tenth had two chambers. For twin pits as well, current masonry practices indicate a deviance from Indian standards in terms of materials used for wall and base of the pits.

Figure 2.8: Materials Used for Lining Base of the Pit



Source: TNUSSP, Dec 2016

2.4 Training Needs

All masons were asked if they had undergone any training during their work life. Only 21 per cent of the masons reported undergoing training (mainly through cement companies) and the rest had not undergone any training (71 per cent) or did not respond (14 per cent). Importantly, when asked if they would participate in any training, 86 per cent (60 out of 70) of the masons said that they would participate in trainings if offered, four masons declined to participate and six masons did not respond. This clearly points to an urgent need for training for construction of on-site systems as per standards.

References

IS 2470-1 (1985): Code of practice for installation of septic tanks, Part I: design, criteria and construction [CED 24: Public Health Engineering.]

IS 12314 (1987): Code of Practice for Sanitation with Leaching Pits for Rural Communities, Bureau of Indian Standards

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Skill India website: http://skillindia.gov.in/