



Training Needs Assessment: Masons

December 2016

TECHNICAL SUPPORT UNIT:

iihs TM

INDIAN INSTITUTE FOR
HUMAN SETTLEMENTS

IN ASSOCIATION WITH:



Keystone

CD Consortium for
DEWATS
Dissemination
Society

Document History and Status Sheet

S. No.	Issue	Issued by	Issued Date	Reviewed By	Review Date	Approved by
1.	Training Needs Assessment for Masons on building on-site systems	Molly Hepzibha Grace	16/12/16	Somnath Sen	06/01/17	Kavita Wankhade

Name of Document	Training Needs Assessment for Masons on building on-site systems
Document Version	Version 1
Printed	14/02/2017
Last Saved	14/02/2017
File Name and Location	Training Needs Assessment for Masons , 16 th December, 2016
Document Team	Molly Grace, Chithra R, Sam Daniel Rajkumar, Gayathri Sarangan, Somnath Sen, Kavita Wankhade
Team Leader	Kavita Wankhade
Project Director	Somnath Sen

This document is produced as part of Tamil Nadu Urban Sanitation Support Programme (TNUSSP). TNUSSP supports the Government of Tamil Nadu (GoTN) and cities in making improvements along the entire urban sanitation value chain. The TNUSSP is being implemented by a consortium of organisations led by the Indian Institute for Human Settlements (IIHS), in association with CDD Society, Gramalaya, and Keystone Foundation.

For citation: *TNUSSP, 2016. Training Needs Assessment for Masons*



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ABBREVIATIONS

BMGF	Bill and Melinda Gates Foundation
FSM	Feacal 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 Bha
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 objectives of the study were:

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

APPROACH AND METHODS

The primary target group of the study were the masons from Tiruchirappalli city and town Panchayats of Periyanaickenpalayam (PNP) and Narasimhanaickenpalayam (NNP). The study was conducted between November - December 2016, with a sample of 70 masons, 34 from Tiruchirappalli and 36 from PNP, and 33 masons identified themselves as chief masons and 32 as skilled mason. Typically, construction of on-site containment systems is driven by factors other than site conditions and technical standards and include factors such as client preference for frequency of desludging and financial affordability. In this context, a structured questionnaire was designed to profile the masons in terms of - their training and experience; understand their current knowledge in construction of toilet and containment structures, training needs and understand specific factors which influence construction of on-site systems.

KEY FINDINGS

Education: None of the chief masons or skilled mason have undergone any technical education for masonry and most of them have learned this skill overtime through experience. Asked on their means of initiation into this profession, 63 per cent of the chief masons reported that they have continued with the family occupation, while among skilled masons, 41 per cent report continuing with their family tradition.

Work experience: For a majority of the masons in the sample, masonry is a primary source of income working anywhere between 6- 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, in reality the years spent in each role may be varied, with some moving up quicker than others because of family association. While half the masons do their own masonry business, they also work with small or big time contractors and builders to get additional work when need. Most masons have experience building residential houses, residential apartments or industrial buildings, but very few have experience in 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 on account of 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. Secondly and more importantly, there is knowledge gap among masons themselves in terms of how to build a structure considered suitable as per standards. This is borne out by the fact that 80 per cent of the masons have indicated an oversized septic tank for a typical family of five, and just 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.

Training needs: 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 twenty per cent depended on the engineers. Just 21 per cent of the masons report undergoing training in their work life and 86 per cent of the masons said that they will participate in trainings if offered. All these point to a clear deviance from standards in construction of on-site containment system by masons and need for training them. Masons need to be sensitized 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. The Chief Minister has announced the Tamil Nadu Sanitation Mission to address sanitation issues in the coming years. The 'Namma Toilet' ('Our own Toilet') scheme was implemented by the state, and Septage Management Operative Guidelines were issued in September 2014 to strengthen this mission target.

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

The TSU will help the State Govt. 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, the project has been divided into nine components, each of which will be implemented both at the state and the city levels, albeit the exact activities will be different at these two levels. The components are:

1. Enabling Environment and Governance
2. Engineering and Planning
3. Implementation Support
4. Behaviour Change and Communications
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. Scoping study conducted by IIHS clearly points to gaps in skills and practices among masons in of construction of containment systems. At the behest of the owner, builders and masons clearly deviate from the standards for construction of septic tank which are based on household size besides other specification. Optimal size of the containment is jointly decided by the house owner and mason based on factors such as affordability, space availability and desire to reduce the de-sludging frequency. This results in construction of over-sized septic tanks which are often times unlined to allow for wastewater to percolate into ground and further reduce de-sludging frequency. Such practices have serious public health consequences along with associated environmental pollution associated with untreated fecal sludge.

1.2 OBJECTIVES OF THE STUDY

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

The specific objectives of the TNA are as follows:

1. To study the masonry practices in building toilets and construction of on-site system in Tamil Nadu
2. Identify the skill gap of masons in toilet and onsite system constructions vis-à-vis the standard practices
3. Identify the training needs of the 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 both advice and construct the on-site sanitation system. Hence they should be aware of both the standards for on-site sanitation system as also the current trends in sanitation practices and the advanced design and construction practices. However, a deeper looker at the organization of masons in Tiruchirapalli and PNP reveals a hierarchical informal market where skills are built on the job, without adequate training.

Profile of Masons in Tamil Nadu Construction labour market in Tiruchirapalli and in Coimbatore is an informal market consisting of four key players - Mastry (Chief Mason), Kothanar (Mason), Manvettialu (Male helper) and Chittal (Female helper), details of their respective roles is profiled in Table 1.1. In Tiruchirapalli, many masons travel from places up to 20 km radius around the city to congregate in its main labour markets in the morning for work – Ramakrishna Theatre, Kumaran Nagar, Yedamalaipattipudur, Thiruvanai Kovil and Taranallur. Similarly, in PNP, masons from outskirts travels to the two labour markets in PNP bus stand and Veerapandi bus stand.

Table 1.1: Sanitation Service Chain

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

Contractors are external to this hierarchical chain and could be builders or licensed engineers who have undergone due diligence process with Government and acquired a license to bid for Government projects. They often interface with the mastry to organize a team for project at hand. Each contractor / mastry selects his team for the day, based on his requirement. If the work is for long duration, workers are asked to report directly to site till the duration of work and in such cases, 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 northern states to both cities in lieu of the higher labour rates prevalent in both places, it has not resulted in lowering of labour rates.

Mastrys and Kothanars are involved in all aspects of building on-site toilet systems including advice on and construction of super-structure and sub-structure. Typically, a male labourer starts off as a *manvettialu* and based on his aptitude, progresses on to be a *kothanar* and learns all his skills primarily on the job. Thus, although they are skilled in construction and have learnt masonry at work site, they do not have the requisite training to make assessment of the appropriate on-site toilet system to construct and undertake construction of toilets system as per standards. Hence, upskilling of masons is one of the important aspects in sustainable urban sanitation programs.

1.4 METHODS

The scope of the study is limited to the two cities of Tiruchirapalli and 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 impart 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 a behavioural change among the masons in construction practices. A training needs analysis was conducted as the initial step of capacity building program.

1.4.1 Questionnaire

Structured questionnaire was designed for data collection and included section 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 choose this occupation, work experience, major work season and type of structures constructed
3. Current practices in toilet and containment structure construction and factors which influence them
4. Training needs were discussed to understand 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 Tiruchirapalli 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 Tiruchirapalli, daily wage labour meeting point was a key point of respondent selection, while for Coimbatore, labour meeting point of PNP, which is the larger labour market of the two town panchayats (PNP and NNP) was selected. Henceforth, result 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 although sampling has been done in Tiruchirapalli city and PNP, given that masons travel in and around these places for work, their practices cannot be said to be localised to these areas.

1.4.3 Field Visits

The survey was undertaken during November and December 2016. Since the survey was conducted post the Government of India's decision to demonitise Rs. 500 and Rs.1,000 rupee notes, 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 administered the questionnaire and data entry was done in Microsoft Excel.

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 Tiruchirapalli city and PNP.
2. Since Fecal Sludge and Septage Management is a new practice area, respondents were not able to articulate their competency gap.

2 FINDINGS

2.1 DEMOGRAPHIC PROFILE

All the 70 masons interviewed were male, 34 are from Tiruchirapalli and 36 are from PNP. Asked about their roles at work, of the 70 masons, 47 per cent identified themselves as chief masons (33 masons) and 46 per cent as skilled masons (32 masons), and the rest are assistant (4 masons) or contractor (1 mason).

Age profile: Just 11 per cent of the masons were less than 30 years old while over a quarter of the masons were over 60 years in age (Fig 3.1). Twenty one per cent of the masons were aged between 41 and 50 years and 20 per cent of the masons between 51-60 years.

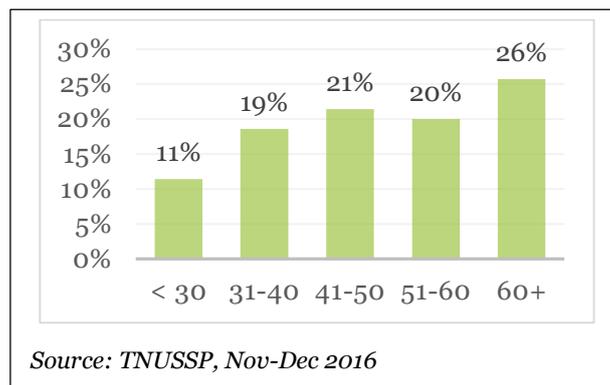


Figure 2.1: Age profile of Masons

Education: In terms of education level, 24 per cent of the chief masons report having no formal education at all, 18 per cent have completed primary schooling and just 18 per cent report completing high school (Fig 3.2). None of the chief masons have undergone any technical training to be masons. Education levels among skilled masons is higher, with a quarter of them completing at least primary schooling and 31 per cent have completed high school. There is no difference between the education levels of masons from Tiruchirapalli and PNP. Three fourths of the Assistants (*Manvettialu*) report completing primary schooling and just one contractor in the sample reports to have polytechnic education. Thus, none of the chief masons or skilled mason report having undergone any vocational education for masonry.

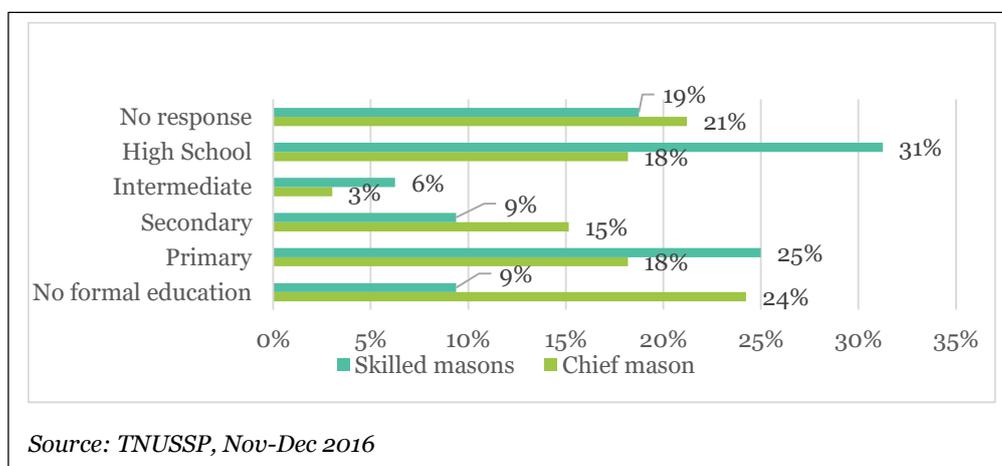


Figure 2.2: Education levels of masons

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

2.2 WORK EXPERIENCE

Years of training on the job: All masons were asked on their years of experience as helpers, skilled masons and chief masons separately. Forty five per cent of the chief masons reported having no experience as helpers, and 36 per cent report having worked up to five years as helpers before moving up the ladder (Table 3.1). Nine per cent of the chief masons report working anywhere between 6-10 years as helpers and 3 per cent have worked over 10 years. Among skilled masons, 63 per cent report having no experience as helpers, while 19 per cent report working up to five years and 13 per cent report 6-10 years as helpers.

One in every four chief mason reports not to have any experience as skilled mason before assuming the role of chief mason (Table 3.1). A third of the chief masons report working for up to 5 years as skilled masons, while 24 per cent report working 6-10 years as skilled masons before being elevated to chief masons. Just three per cent of the skilled masons have no experience in that role, while 29 per cent have anywhere between 6 years to 15 years' experience and 31 per cent have over 20 years' experience.

<i>Table 2.1: Sanitation Service Chain Years of experience as a Skilled Mason and Helper</i>			
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%
<i>Source: TNUSSP, Nov-Dec 2016</i>			

Source of income: About half the masons across both locations report doing their own masonry business, while also working with small-time contractors (30 masons), big contractors (27 masons) and with big builders (10 masons) to diversify their source of income. Skilled masons are more likely to work with small-time and big contractors, while chief masons liaise with big builders to get work. In the sample, 86 per cent of the masons report that this profession provides for more than half their income. This is true for almost all skilled masons, while 78 per cent of the chief masons report the same. Also, variations across locations remain with 97 per cent of the masons reporting masonry to account for half their income in PNP and just 74 per cent of the masons reporting the same in

Type of construction undertaken: Masons were asked about the type of construction undertaken in the past (Table 3.2). Majority of the masons report constructing residential houses, while 72 per cent report constructing residential apartments. Construction of industrial and commercial building is reported by 77 per cent and 87 per cent of the masons respectively, with percentages being higher in PNP than Tiruchirapalli. Just 11 per cent and 3 per cent of the masons report constructing water treatment plants and wastewater treatment plants respectively.

<i>Table 2.2: Type of Construction Work Undertaken (% of masons)</i>			
	All	PNP	Tiruchirapalli
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%
<i>Source: TNUSSP, Nov-Dec 2016</i>			

Work related travel: Tiruchirapalli. Masons typically travel within the city (47 masons), within and outside the city (36 masons), faraway places (23 masons) to get work and some (3 masons) even travel out of state to undertake work.

Number of months worked in a year: In terms of number of months in a year worked as masons, about 41 per cent of the masons report being employed 6-9 months and a quarter report being employed for 9-12 months in a year. In terms of location, 75 per cent of the masons in Coimbatore and 59 per cent of the masons in Tiruchirapalli are employed between 6-12 months in a year.

Thus, for a majority of the masons in the sample, masonry is a primary source of income working anywhere between 6- 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, in reality the years spent in each role may be varied, with some moving up quicker than others because of family association. While half the masons do their own masonry business, they also work with small or big time contractors and builders to get additional work when need. While most

masons have experience building residential houses, residential apartments or industrial buildings, very few have experience in building wastewater treatments plants.

2.3 CONSTRUCTION OF ON-SITE SYSTEMS

Factors influencing construction of toilets and on-site systems: Majority of the masons report constructing super-structures and sub-structures, although they report that the type of structures or toilet systems constructed is influenced by various factors / aspects other than technical standards. These include 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 here is meant to indicate the cost of construction of a particular structure and the maintenance thereof, especially of sub-structures. Other factors influencing construction decision include vastu and health. Given that various factors drive the decision on super-structures and sub-structures masons and house owners have a greater role on various aspects of construction of toilet systems

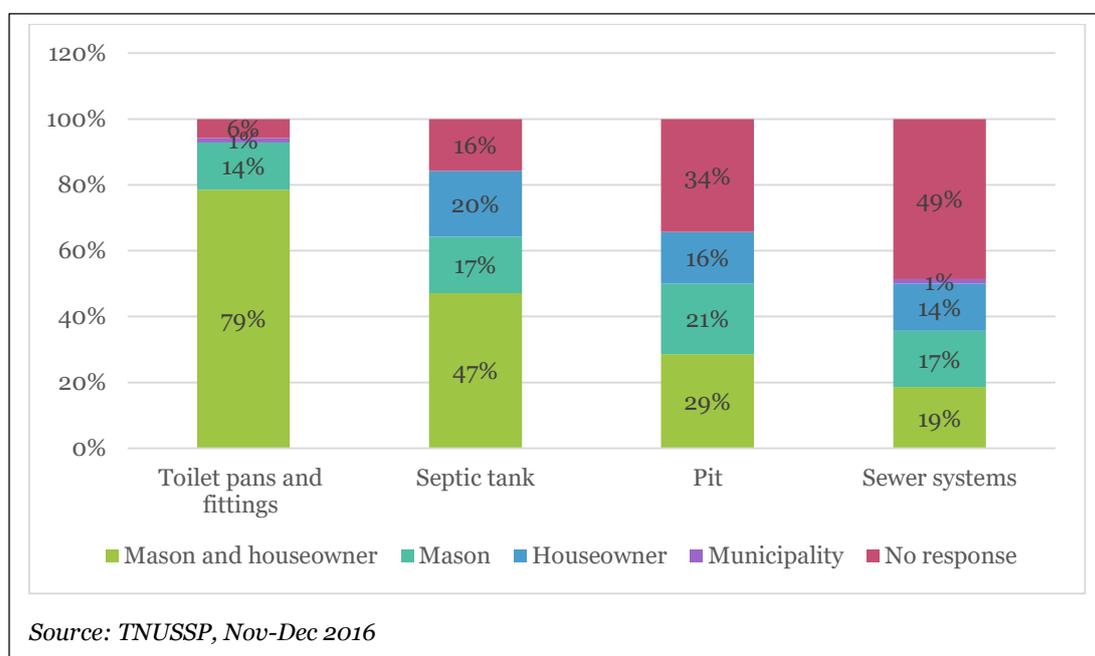


Figure 2.3: Decision makers for construction of on-site systems

2.3.1 Super-structure

Masons were asked about the components of the toilet constructed, and 89 per cent of the masons report constructing super-structures (Table 3.3). Both Indian and Western toilets are used by masons, with western toilets used especially when elderly users are involved. Masons report providing taps in toilets in 87 per cent of the cases, with one mason reporting that if it is a Government toilet, tap is not provided and in case of a private toilet it is provided. Seventy nine per cent of the masons report deciding on the toilet pan and fittings along with house owners, in 14 per cent of the cases, masons themselves choose for their customer.

	All	PNP	Tiruchirapalli
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%
<i>Source: TNUSSP, Nov-Dec 2016</i>			

Besides superstructures, ‘slab along with pan and other fittings’ is also a commonly constructed toilet option which is reported by 74 per cent of the masons and is particularly reported by PNP masons (83 per cent) compared to those in Tiruchirapalli (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 report using P trap, 7 per cent report using S trap and 21 per cent report using either of them. For the pipe used for carrying the waste from the pan to the containment structure, the Indian standards recommends a minimum diameter of 3 inches. In the sample, 46 per cent of the masons report using 4 inch diameter pipes, 9 per cent use 6 inch diameter pipes and 16 per cent of the masons report using pipes with diameter ranging from 3-6 inches (a fourth of the masons did not respond to this question). Ninety per cent of the masons across locations use pipes made of PVC which is the preferred material as per Indian standards. Of the rest, three per cent report using ceramic pipe and 7 per cent use PVC or ceramic.

Location of the sub-structure with respect to the toilet: If site conditions permit, the sub-structure is located away from the toilet as a separate structure as reported by about 30 per cent of the masons. An equal per cent of the masons report building sub-structure within the building allowing for access to the structure from outside. Four per cent of the masons report building sub-structure under the toilet, which corroborates with the fact that space constraint is a key factor in deciding construction of on-site systems. Rest of the masons report building systems which could be one of the three mentioned above, depending on the site situation.

2.3.2 Sub-structure

All three types of sub-structures - sewers, septic tank and pit latrine more commonly reported to be constructed by masons in Tiruchirapalli than PNP (although PNP itself has no sewer system) (Table 3.3). It is worth highlighting the fact that although sewers and septic tanks are more commonly seen in Tiruchirapalli, masons also report constructing pits, which points to the fact these masons work in and around Tiruchirapalli 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 have built septic tanks, 19 per cent have built off-set single pit, 11 per cent have built pit below toilet, with no tangible difference across locations. Half the masons report building off-set twin pit, with 62 per cent of the Tiruchirapalli masons reporting the same as against 38 per cent from PNP.

Location of the sub-structure with respect to the building: Sub-structures are 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, which could be defined by space availability at the site and local culture. There is a sharp difference in this indicator when analysed by locations. Sixty two per cent of the masons in PNP report the sub-structure to be away from the building and 25 per cent report that it is located inside the building. In Tiruchirapalli, 53 per cent of the masons’ report that the sub-structure is constructed inside the building, while 35 per cent report it to be away from the building. One mason reports that location of the sub-structure is decided by vaastu and another reports that in towns, it is typically inside the building and in villages, it is outside.

Decision making on sub-structures: The Indian Standards specify the size of the containment structure to be based on family size and desired desludging frequency. However, masons along with house owners are among the key persons deciding on construction of various aspects of on-site system (Fig 1.3). When it comes to decision on septic tank, which should actually be undertaken as per standards, house owners have a disproportionate say - about 20 per cent of the masons report that house owners themselves decide on the septic tank to be built, 47 per cent of the masons report jointly deciding with the house owners on the type of septic tank to build, and 17 per cent of the masons report deciding on their own. When it comes to construction of pit, 44 per cent of the masons report deciding jointly with house owners, and 21 per cent report 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 suggest that they recommend the best alternatives to their customers, but owners insist on containment structure which just fits their budget and in case masons refuse to construct, they hire another mason to do the job. Site conditions such as rocks, sand and space availability are 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 masons about the type of sub-structures built to see if they are as per standards. The survey specially focused on understanding the current practices in 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 build for a family of five people and based on the dimensions provided their structure was classified as ‘as per standard’ or ‘oversized’. As 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, seven (10 per cent) did not draw any containment structure. Just nine per cent reported dimensions as per standards and majority (80 per cent) of the masons drew oversized septic tank for a family of five persons (Fig 3.4).

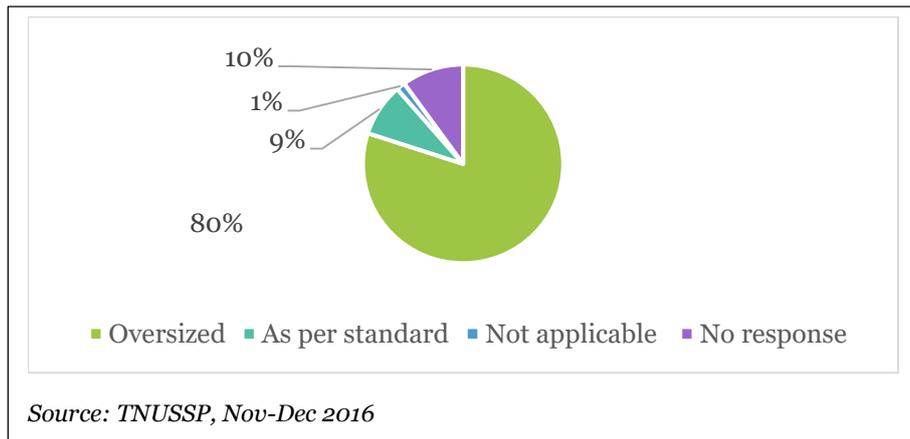


Figure 2.4: Size of septic tank constructed

Of the sample of 62 masons who drew a septic tank, 25 masons drew a septic tank (although oversized) with a soap pit of which seven had at least two chambers. Two thirds of these 25 masons were from Tiruchirapalli and rest from PNP. Twenty one per cent of the masons report installing baffles, 9 per cent do not install them, whereas from the rest there was no response. About a third of masons report 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 twenty 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 avoiding frequent desludging. The initial incremental cost of constructing a bigger septic tank is offset by the benefits of minimizing the recurring cost of desludging the septic tanks. 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 effluent which comes out of outlet every day and settled solids in the form of sludge that needs to be removed once in two or three years. For the liquid effluent, treatment is deemed appropriate by methods like 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.

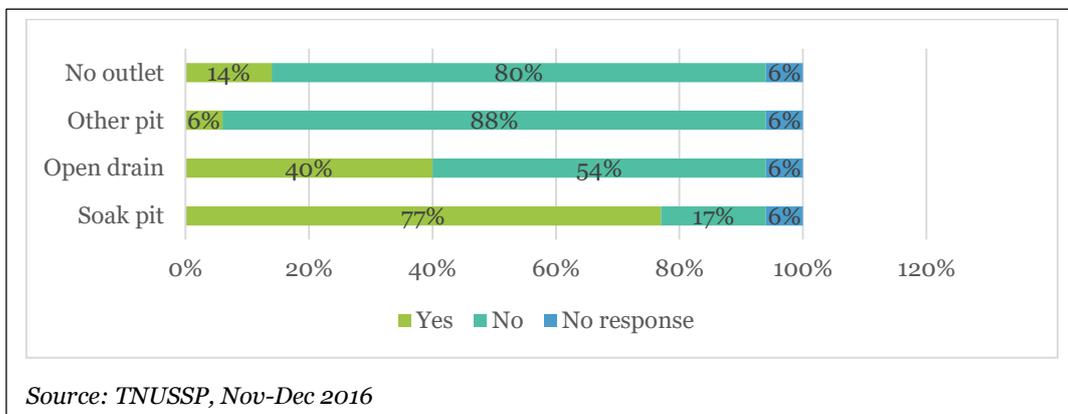


Figure 2.5: Wastewater outlets from Septic tanks

Masons from both places were asked question on provision for waste water treatment while constructing septic tanks. Three out of every four mason reports making provision for septic tank wastewater overflow, with this per cent as high as 88 in Tiruchirapalli and 61 per cent in PNP. Overflow from septic tanks can be connected to multiple structures, most common being soak pit which is reported by 77 per of the masons, ‘open drain’ which is reported by 40 per cent while about 14 per cent do not provide for an outlet (Fig 3.5). Connecting to open drain and soak pits is more common in Tiruchirapalli, while providing for no outlet for wastewater is 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 be accessible from the road for the de-sludging vehicle. Indian standards suggest the use of removable concrete slabs to cover septic tanks and pits (Fig 3.6). 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 is provided (30 per cent) (Fig 3.8). Placing a concrete slab or plastering the slab and sealing is more common in Tiruchirapalli (71 per cent) than in PNP (42 per cent). For emptying the septic tank, 55 per cent of the masons report providing a slab on top (more commonly reported in Tiruchirapalli), 24 per cent report providing an easily removable manhole cover, 6 per cent provide for a pipe till the bottom and another 6 per cent do not make any provision.

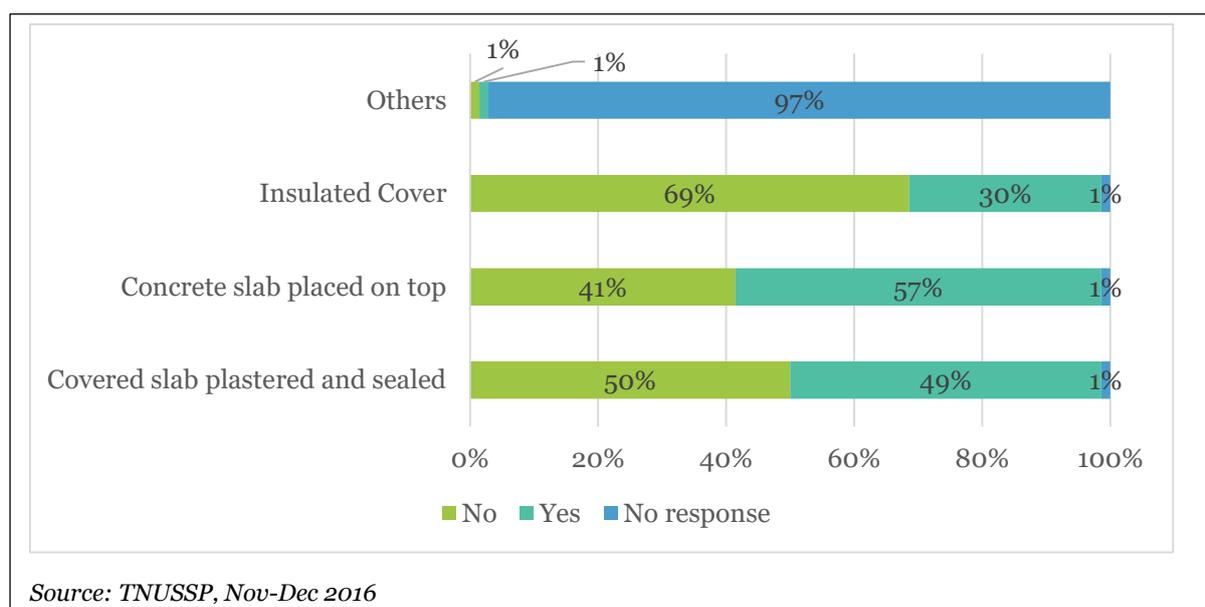


Figure 2.6: Covering for septic tanks and pits

2.3.2.2 Twin Pits

Comparison of construction practices against standards: As per the standards, the rights diameter of a twin-pit for a family of five is 3.3 feet and depth is 4.3 feet. Of the eight masons who also drew twin pits (four each from Tiruchirapalli and PNP) to indicate type of containment structures constructed, six were of appropriate size as per standards and two were oversized (from PNP). If there is insufficient space between two pits, then the some masons report dividing one pit in to 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 wrong distance or reported to manage as per space availability.

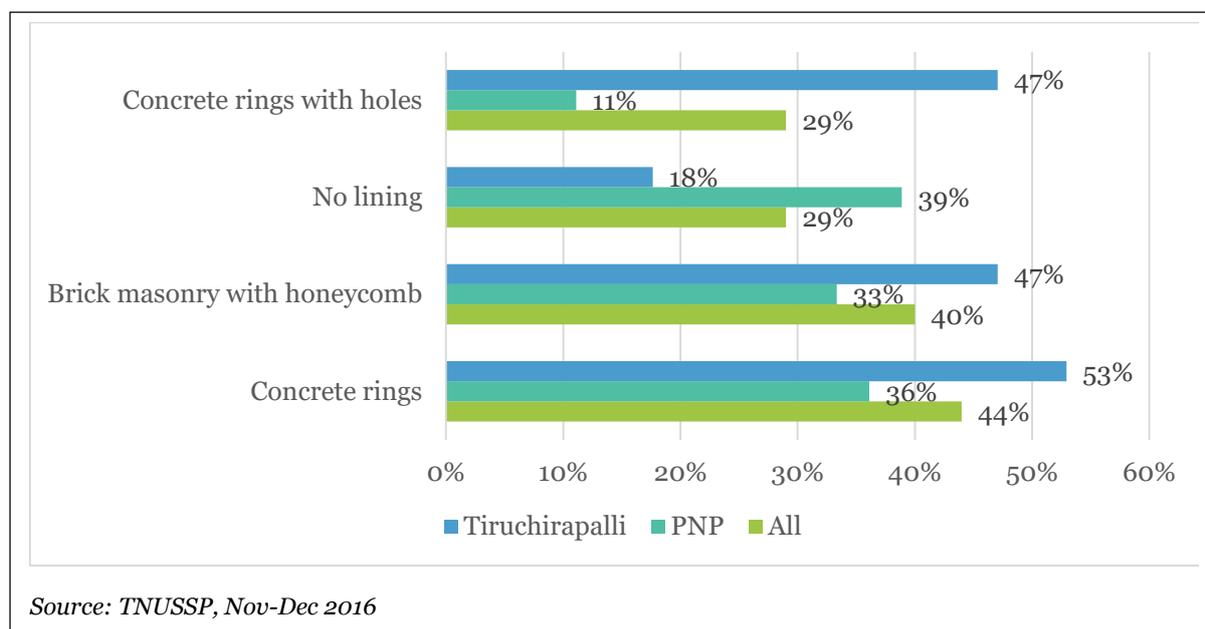


Figure 2.7: Materials used for lining pit walls

Pit walls: As per the norms, pit walls could be lined with honey-comb brick work. In the survey, pits walls are 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) (Fig 3.7). However, there are differences between practices in Tiruchirapalli and PNP, with ‘no lining’ being the commonly reported method in the latter at 39 per cent. In contract, in Tiruchirapalli, brick masonry with honeycomb (47 per cent) and concrete rings with holes (47 per cent) are commonly reported by masons.

Base of the pits: As regards, base of the pit, Indian standards recommend not to line them. In reality, masons report 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 report not lining the pits (Fig 3.9). The use of brick and concrete is particularly reported by the masons in Tiruchirapalli, while 41 per cent of those from PNP report not lining the pit.

As per Indian standard, spacing between pits and existing structure if the structure is constructed within the premises is 2.6 feet. Just one mason reports leaving a distance of less than two feet, 63 per cent of masons leave a distance of up to 10 feet, over 7 per cent leave 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. Just two masons report allowing for 2-3 feet distance between toilet structures and water sources. About 56 per cent report allowing for a distance between 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 desludging are said to supersede considerations of standards and suitability in terms of soil conditions etc. Secondly and more importantly, there is knowledge gap among masons themselves in terms of how to build a structure considered suitable as per standards. This is borne out by the fact that 80 per cent of the masons have indicated an oversized septic tank for a typical family of five, and just 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.

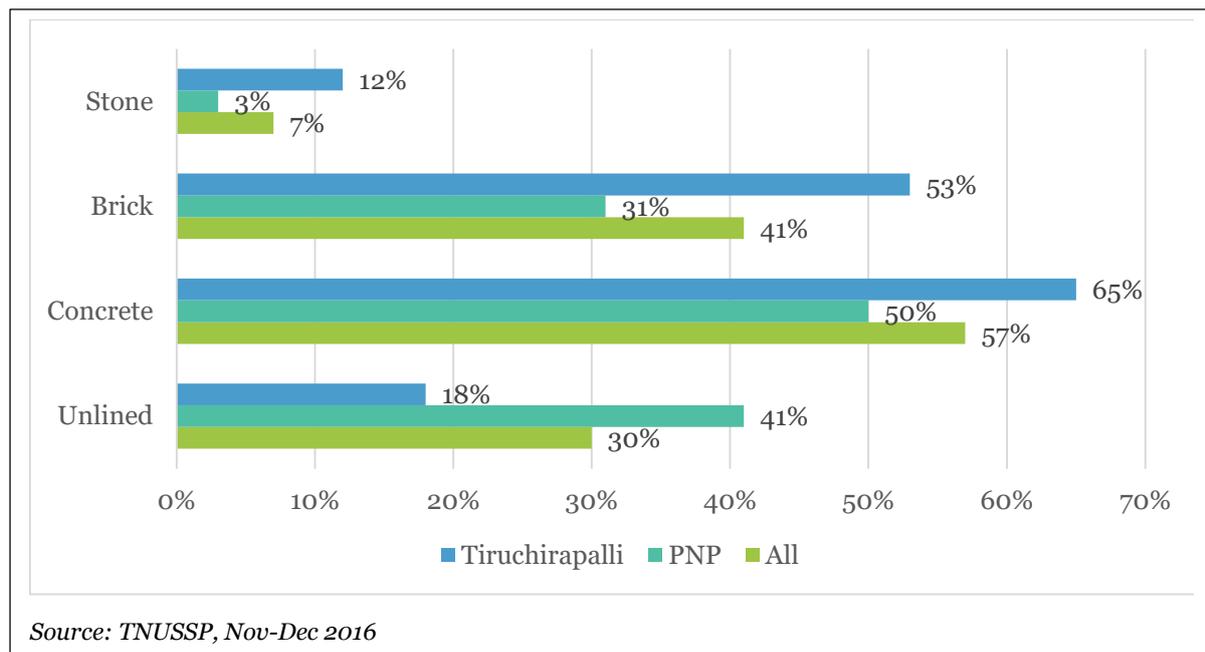


Figure 2.8: Materials used for lining base of the pit

2.4 TRAINING NEEDS

All masons were asked if they have undergone any training during their work life. Just 21 per cent of the masons report undergoing training (mainly through cement companies) and the rest have 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 of the 70 masons) of the masons said that they will 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.

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