



Sanitation Capacity
Building Platform

ADVANCED TRAINING ON FAECAL SLUDGE AND SEPTAGE MANAGEMENT

Part C: Trainer's Manual



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National Institute of Urban Affairs



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CONTENT

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CONTACT

National Institute of Urban Affairs

1st and 2nd floor Core 4B,

India Habitat Centre,

Lodhi Road, New Delhi 110003, India

Website: www.niua.org, scbp.niua.org

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ABOUT SANITATION CAPACITY BUILDING PLATFORM



National Institute of Urban Affairs (NIUA) is a national nodal institute that works closely with the Ministry of Housing and Urban Affairs (MoHUA), Government of India. The Sanitation Capacity Building Platform (SCBP) anchored by NIUA aims to build local capacity for planning, designing and implementing non-sewer decentralized sanitation solutions, with specific focus on Faecal sludge and septage management (FSSM) and waste water.

SCBP is a partnership of various research organizations and non-profit institutions (CPR, BORDA/CDD, CEPT, CSTEP, UMC, CSE, CPR, WASHi, iDECK, Dasara, Ecosan Services Foundation, AILSG). The platform works in in partnership with national nodal training institutes working for Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and Swachh Bharat Mission (SBM), with universities and research organizations and all stakeholders in the urban sanitation space. SCBP is supported by a grant from the Bill and Melinda Gates Foundation (BMGF).

ABOUT THIS HANDBOOK

The Swachh Bharat Mission has aimed to make India open defecation free by October 2019. The wide prevalence of on-site sanitation system in India necessitates the need to explore safe management of septage along with improved access to toilets. Recognising this, the Government of India has also emphasised septage management in its flagship programme of AMRUT and has also issued policy guidelines on Faecal Sludge and Septage Management (FSSM).

This document is a part of the advanced training module on faecal sludge management for engineers. It provides engineers with a comprehensive understanding on various aspects of FSM such as planning, design of treatment systems, contracts for implementation and O&M, etc.

This document consists of details pertaining to the concept of the training, session plan, objectives and key take aways from each session and lesson plan. The purpose of this document is to facilitate the resource person in conducting the training program.

ABOUT THE TRAINING MODULE

Day 1, Session 1 Introduction and need for FSM	This session introduces the importance and global need for faecal sludge management to realize public health, environmental, social, and economic benefits.
Day 1, Session 2 Faecal Sludge Management - Over view	This session facilitates understanding of the problems in FSM implementation and also have an idea about tentative solutions to overcome these problems
Day 1, Session 3 Case Studies	This session covers the FSM case studies from around the world and helps to understand the applicability and efficiency of FSM in various scenarios
Day 1, Session 4 Collection and Conveyance of FS	This session introduces the various options for collection and conveyance of faecal sludge and enables the participant to calculate the number of trucks for their town/city
Day 1, Session 5 Approach to Faecal Sludge Treatment	This session helps to understand the difference between sewage and faecal sludge and to familiarize with treatment principles, objectives, and outcomes
Day 1, Session 6 Faecal Sludge Treatment Technologies	This session introduces at least five treatment technologies for faecal sludge and to understand the need for combination of treatment technologies
Day 1, Session 7 Planning for FSTP Implementation	This session introduces the process involved in implementing an FSTP in different cities and explains various contract methods for implementing FST
Day 1, Session 8 Preparation for feasibility study	This session elaborates the different data collection points and methods for a feasibility study to implement FSM
Day 2 Feasibility Study	This session allows the participants to gain hands on experience in data collection for feasibility study to implement FSM
Day 3, Session 1 Presentation on feasibility study	This session is an activity where the participants prepare and presentation of the data collection during the feasibility study and discuss the scenarios
Day 3, Session 2 Treatment concept - Sludge drying	This session helps to understand the concept and characteristics of sludge drying using planted and unplanted drying beds
Day 3, Session 3 Design of drying beds	This session enables the participants to carry out preliminary design of the treatment module - Sludge drying and planted sludge drying bed
Day 3, Session 4 Treatment concept - effluent	This session introduces the components of effluent treatment that is required in a faecal sludge treatment plant
Day 3, Session 5 Design of Treatment Systems	This session helps the participants to put together modules for treatment of faecal sludge to achieve the desired objective
Day 3, Session 6 Operation and Maintenance	This session deals with the various O&M requirements of the technology options discussed during the training
Day 3, Session 7 Components and Review of a DPR	This session elaborates the various components that must be included in an FSTP DPR and provides a framework for assessing an FSTP DPR prepared by external



Introduction

Non-sewered sanitation is a recent and novice topic in the field of sanitation planning and implementation in India. Though these systems have been existent for quite some time in the country, not much focus was laid on the proper and sustainable treatment of waste generated from such systems. The focus over the years has largely been towards networked or sewerage based sanitation with the focus to connect all household's wastewater sources to a network and provide an end of the pipe treatment. Though such an approach might be the mainstream of planning, the dearth of funds and sustainable operation model has led to very few urban local bodies being sewerred. As a result, most ULB still primarily rely on non-networked sanitation such as septic tanks, pits, community cess pits etc. There is not much that has been done or planned for treatment or conveyance of the waste from such systems and their treatment.

However, with the recent changes in the policy and emphasis by civil society, the focus is now also towards safe conveyance and treatment of wastewater generated from such on-site sanitation systems. Urban local bodies have been provided mandate and direction by the central and state governments to promote FSM (a major part of non-sewered sanitation). However, the capacities within the ULB or other engineering departments are limited in this field. It is hence the need of the hour to equip the team of these engineers with knowledge and skill to implement effective solutions.

A module on advanced faecal sludge management is hence developed for building the capacities of staff and decisions makers related to FSM. This document is a manual to assist the trainer in delivering sessions related to this module. This compilation is divided into three sections:

a. Concept note

Discusses the need for the training, target audience and rationale for the selection of topics.

b. Training schedule

List the delivery scheme of sessions based on the learning capacities of the target audience.

c. Session plan

A note to the trainer on objectives of each session, preparations required, story line and instructions to activities if any.

This document is to assist the trainer to carry out the sessions as per the intended design of the modules and each session. It also helps the trainer plan for each session before hand, in arranging for logistics and any external assistance.

CONCEPT NOTE

A concept note is a roadmap for the preparation of a training program for government engineers working with the state or local bodies and who would be intimately or partly involved in planning and implementing an FSTP. The concept note intends to document and delineate the course and content of the training. The training program envisaged is for a three-day duration, mostly consisting of engineers from all the states of India. This training comes as a capacity building initiative to the staff of implementors of Faecal sludge management solutions under the AMRUT program of the Central government.

TARGET AUDIENCE

Engineers with a background in civil/environmental working with the state government departments such as Ministry of Urban development, State water supply and sewerage board, Directorate of Local bodies, PDMC – Sanitation and sewerage projects or engineering staff of the AMRUT towns are the target audience. This advanced training is mainly targeting participants who are already oriented on various topics of FSM. For better designing, the training curriculum, the profile of the target audience can be assessed under three aspects: Existing skill set, Existing Knowledgebase, and requirement of the Job profile. Below table describes a typical (or ideal) audience for this training program under these three aspects. It should be noted that due to time constraints, most of these descriptions have been arrived based on the experience of interacting with these staff or by making reasonable assumptions.

Existing Skillset	<div>1. Read and write in English and Hindi</div> <div>2. Ability to comprehend and understand engineering drawings</div> <div>3. Ability to carry out simple arithmetic calculations</div> <div>4. Ability to conduct field investigations and collect data using a tool</div>
Existing Knowledgebase	<div>1. Knowledge of current sanitation practices by households at their ULB</div> <div>2. Basic knowledge (understand the part and its importance) on onsite sanitation systems – Septic tanks and pits</div> <div>3. Basic understanding (remember concepts) of sewage treatment (Pre-treatment, primary and secondary treatment)</div>
Work responsibilities	<div>1. Review and approve DPRs (Technical components)</div> <div>2. Carry out pre-feasibility studies for bidding of works related to STPs, water treatment, drains, etc.</div> <div>3. Estimation and design of treatment units (State water supply and sewerage board)</div> <div>4. Contract management</div>

NEED FOR TRAINING

The target audience is a diverse set of implementing staff ranging from responsibilities of design to contract management. Implementation of any wastewater treatment infrastructure in several states of India could be broadly explained as two processes, either of which could be undertaken by the ULB.

1. Implementation through the state water supply and sewerage board
2. Implementation through project management consultants (PMC)

Given that a scientific body like the state water supply and sewerage board has been implementing STPs across several states of India, there is a considerable amount of knowledge base the engineers working on it have with regards to STP and Water treatment. Similarly, a few of these AMRUT towns have sewerage networks and STPs for a particular portion of their cities, enabling a fundamental understanding of these systems.

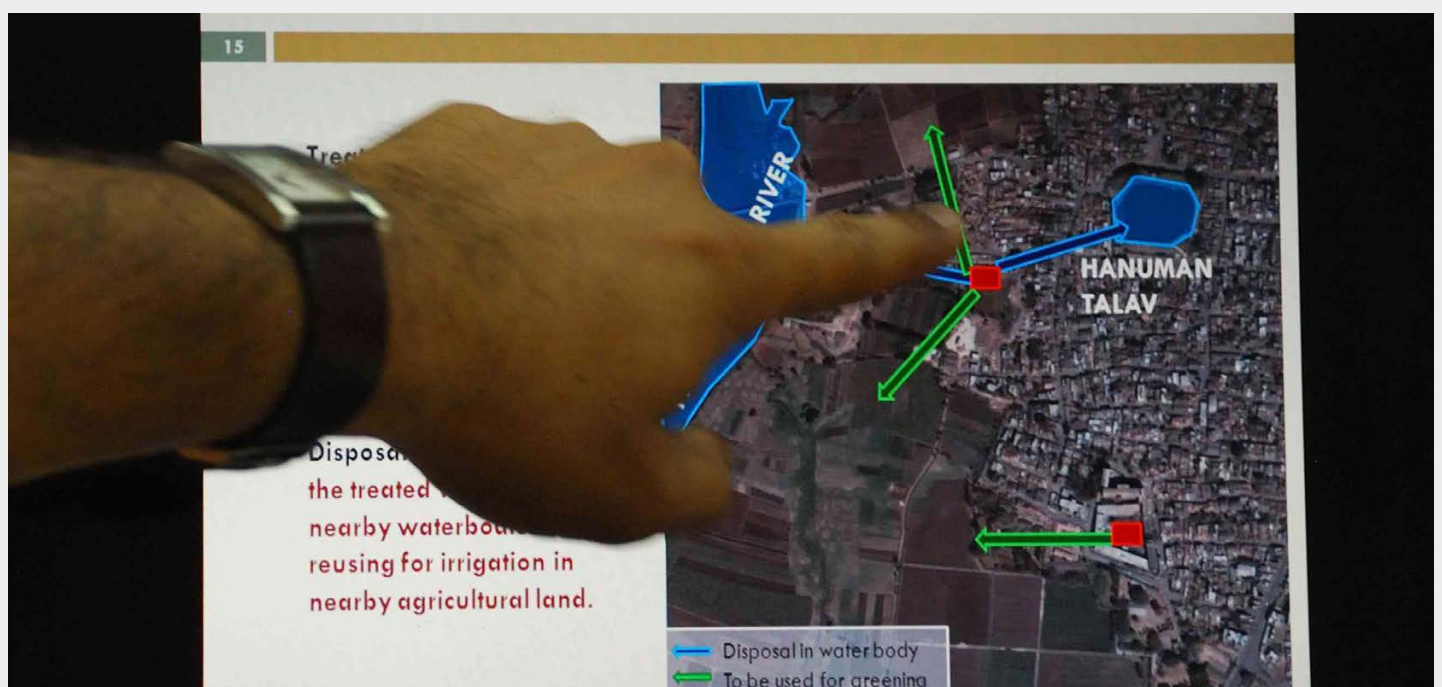
However, given that Faecal sludge management is different, not just from the treatment perspective, but also from its management of integrating and harmonizing various stakeholder associated, requires additional knowledge and capacities to implement them. Through this training, the aim is to bridge the gap between existing knowledge base and the capacity requirements to implement an effective and sustainable FSM solution.

TRAINING OUTCOMES

Upon completion of the training, the target audience must be able to perform the following functions:

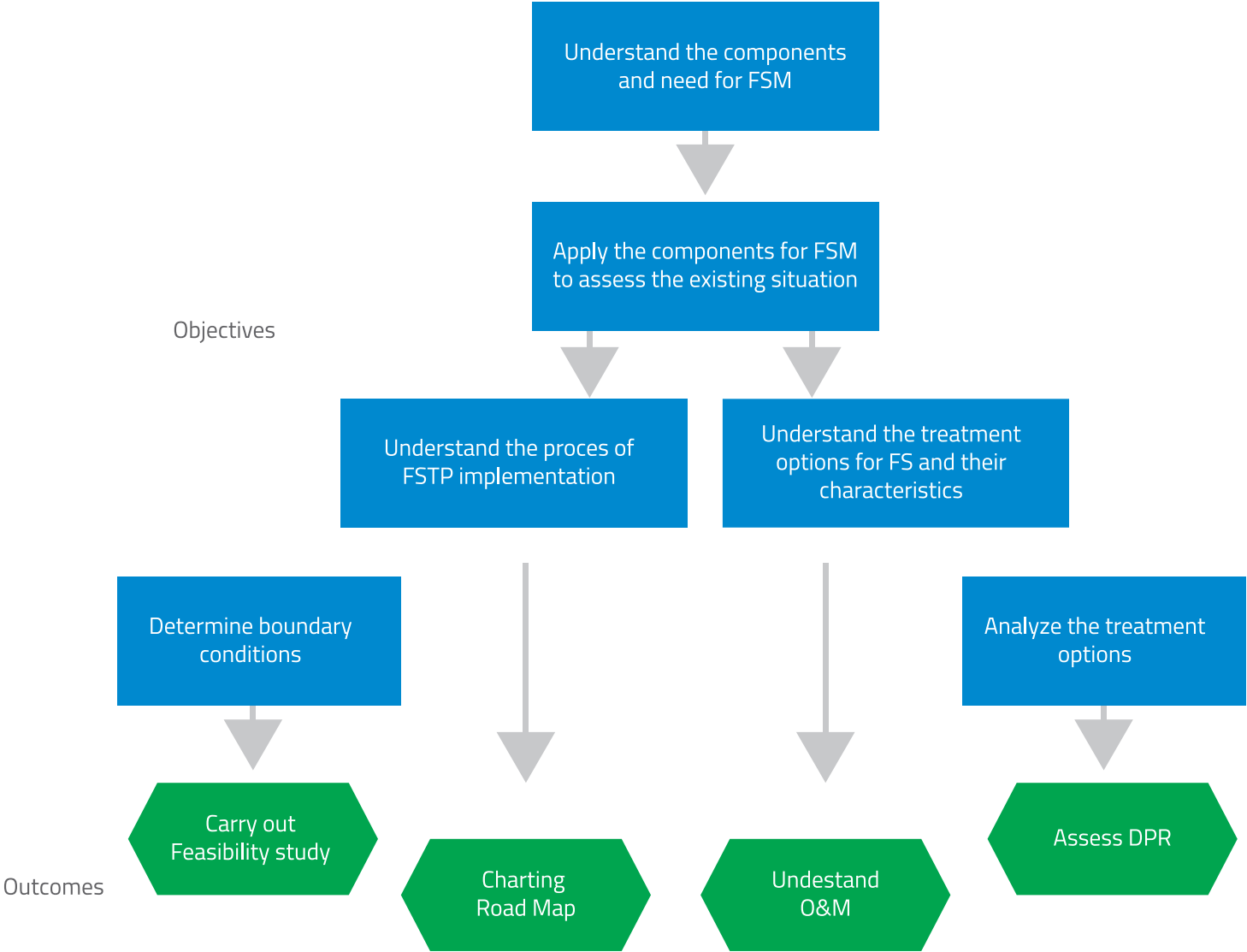
- a. Assist the ULB in charting a roadmap for FSTP implementation
- b. Carry out a feasibility study to determine size and input parameters for treatment, discharge standards, site conditions for setting up the treatment plant and requirement of desludging vehicles
- c. Assess technically DPRs submitted by consultants for their efficacy and fit into the needs of the ULB
- d. Evaluate contracts for O&M of the treatment plant

Though the training module would cover within its course design of treatment plants, the depth and knowledge provided would not be sufficient for the participants to undertake to design by themselves for varied situations.



TRAINING OUTCOMES

The training outcomes determine the Objective of the training. The flow diagram below illustrates how the objectives of the training are linked to the outcomes, given an appropriate enabling environment exists post training. The objectives are at various levels of cognitive understanding from remembering concepts to the application of learnings. These levels are again determined based on the role requirements for the target audience to implement FSTPs.

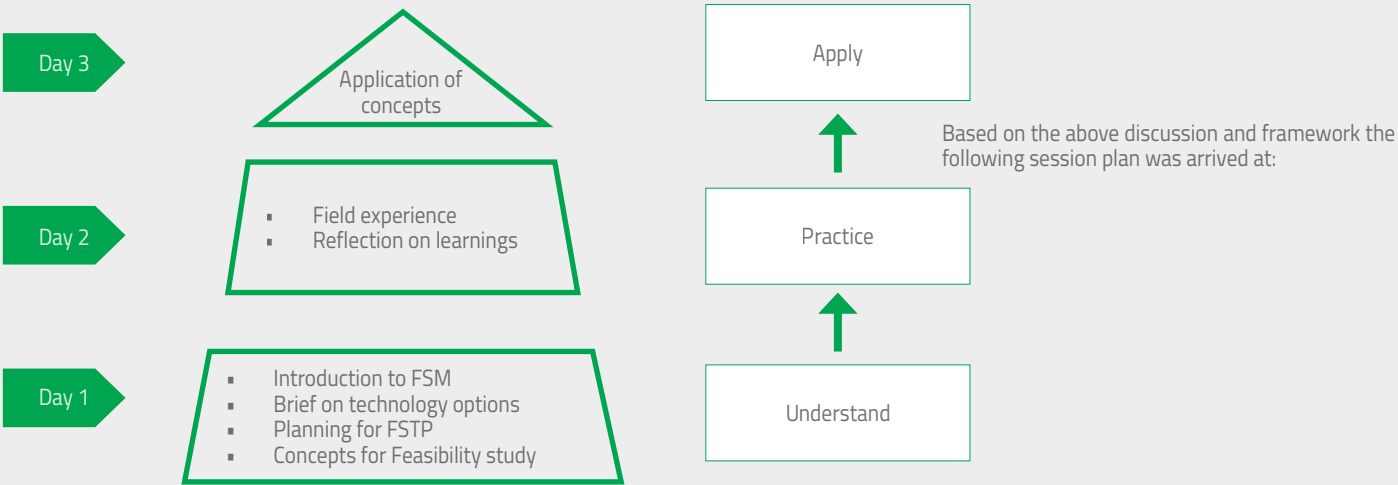


TRAINING MODULES

The training sessions are arranged in a way that understanding becomes intuitive and learning is engaging. Learning is a complex process which includes the subject, trainer and the environment. To enable effective learning, it is necessary to create a safe learning environment, ensure participants stay motivated and allow opportunities for practicing the skills imparted. The training is designed to cater to the three aspects in below ways:

Safe Learning environment	<div><div>1. Atmosphere for learning – Clustered seating, 6 hours of sessions per day, small heterogeneous groups for activities</div><div>2. Site visits close to training venue</div><div>3. Facilitating trainers</div><div>4. Most verbal communication in Hindi/language of convenience to participants</div><div>5. Learning materials in all forms, written, oral, and videos.</div></div>
Motivation	<div><div>1. Use of existing knowledge and experiences of participants.</div><div>2. Linking training modules to outcomes and job roles</div><div>3. Peer to peer experience sharing</div></div>
Practice	<div><div>1. Hands on experience of relevant concepts</div><div>2. Peer and group reviews to revise and reflect</div><div>3. Template and tools for use</div><div>4. Takeaways in the form of "knowledge bites," additional reading</div></div>

The modules are designed to stress and give participants time and space to reflect. Essential learning sessions are succeeded by practice and review modules. The training module also includes a day of a site visit to practice a feasibility study for FSTP implementation; this will provide the participants realistic on the job experience. The training program is planned for three days in the following framework:



TRAINING SCHEDULE

DAY 1

Time	Session name	Session outcomes	Content	Learning style
0930 – 1000	Registration and introduction	Participants introduction and training outcomes and expectations		
1000 – 1045	Introduction and need for FSM	<ul style="list-style-type: none"> Participants understand the concept and need for FSM Participants remember shit flow diagram (SFD) as a tool for assessing sanitation Participants can list the stakeholders involved in FSM 	<ol style="list-style-type: none"> FSM introduction Current sanitation situation – ODF, the progress of UGD, FSM, etc. Shit flow diagram Stakeholder mapping for FSM and their roles 	Remember Understand Reflect
1045 – 1130	Faecal sludge management – Overview	<ul style="list-style-type: none"> Participants will learn the components of FSM. Participants have an understanding of the problems in FSM implementation and also have an idea about tentative solutions to overcome these problems 	<ol style="list-style-type: none"> FSM components Noninfrastructure components of FSM Group work: Problems related to FSM implementation Strategies to deal with problems 	Understand Reflect
1130 – 1145	Tea break			
1145 – 1230	Case studies	<ul style="list-style-type: none"> Participants are confident of FSM as a solution Participants can remember benefits accrued to the public and ULB due to FSM 	Case study on Devanahalli, Leh, Senegal, Unnao, emphasizing on the treatment, regulation, and outcomes	Remember Reinforce new concept
1230 – 1300	Collection and conveyance of Faecal sludge	<ul style="list-style-type: none"> Participants are aware of various options for collection and transport of faecal sludge Participants are able to estimate the number of vehicles required for desludging. 	<ol style="list-style-type: none"> Powerpoint on various technologies available for collection and transportation Exercise for C&T estimation 	Remember Practise
1300 – 1400	Lunch break			
1400 – 1445	Approach to Faecal sludge treatment	<ul style="list-style-type: none"> Participants understand the difference between sewage and faecal sludge Participants are familiar with treatment principles, objectives, and outcomes 	<ol style="list-style-type: none"> Characterisation of Faecal sludge Treatment methods and approach End products use 	Remember Understand
1445 – 1530	Faecal sludge treatment technologies	<ul style="list-style-type: none"> Participants are aware and remember at least five treatment technologies Participants understand the need for combination of treatment technologies 	<ol style="list-style-type: none"> Treatment concepts of anaerobic digestion, planted drying beds, Mechanical dewatering, Cotreatment in STP, Thermal drying will be discussed and presented along with a case study Participants will be introduced to a systems approach to treatment along with case studies on Deumagetta (Philippines), Thailand and Biomass control systems. 	Remember Understand
1530 – 1545	Tea break			
1545 – 1630	Planning for FSTP implementation	<ul style="list-style-type: none"> Participants are aware of the process involved in implementing an FSTP for their cities Participants are aware of various contracting methods for FSTP implementation 	<ol style="list-style-type: none"> Participants are asked to list down the process in STP implementation Discussion on changes to existing process for FSM Formulate steps for FSM implementation in collaboration with participants 	Relate existing knowledge Understand Reflect Create
1630 – 1700	Preparation for feasibility study	Participants are aware of data collection methods for a feasibility study	<ol style="list-style-type: none"> Relevance of the study Components of feasibility study Outcomes of the study 	Remember Understand
1700 – 1715	Debriefing on days learning	Participants reinforce their learnings	Participants reflect on their learnings and share anecdotal experience	Reinforce
1715 – 1730	Feedback	Participants co-create the learning environment based on their needs.	Autonomous but detailed feedback from participants on the trainer, logistics, and subject will be sought	

DAY 2

Time	Session name	Session outcomes	Content	Learning style
0930 – 0950	Briefing	Participants are aware of the day's agenda and remember critical data to be collected		
0950 – 1100	Travel to site			
1100 – 1300	Data collection in groups	Participants have necessary data for feasibility study	Group work: Participants will be split into groups, each group headed by a resource person and interaction with different stakeholders such as EO, desludging operator, engineer (for the site).	Practice
1300 – 1345	Lunch at site			
1345 – 1500	Return travel			
1500 – 1515	Debriefing	<ul style="list-style-type: none"> Participants learn new perspectives from others/ groups 	Participants are asked to share their experience of data collection – difficulties and insights from the collected information	Reflection
1515 – 1700	Group work	<ul style="list-style-type: none"> Participants have information for preparing feasibility study 	Group work: Participants work in groups to analyze the data collected and fill the data gathered in a feasibility report template	Practice



DAY 3

Time	Session name	Session outcomes	Content	Learning style
0930 – 1000	Preparation for Feasibility study		Participants prepare for presenting the feasibility study report	
1000 – 1100	Presentation on Feasibility study	Participants have experience of a feasibility study	Group work: Participants present the findings from previous day assignment in groups on the conclusions of the feasibility study	Peer review
1100 – 1130	Treatment concept – Sludge drying (Planted and unplanted drying beds)	Participants understand the concept and characteristics of sludge drying using planted and unplanted drying beds	Participants are introduced to the concept of sludge drying using planted and unplanted drying beds. Working and design principles are discussed	Understanding
1130 – 1145	Tea break			
1145 – 1215	Design of sludge drying bed	Participants carry out preliminary design of the treatment module – Sludge drying and planted sludge drying bed	Participants calculate the dimensions of the treatment module using tools for calculation	Application of concepts
1215 – 1300	Treatment concept – Effluent treatment	Participants can list and understand the components of effluent treatment	Participants are introduced to technologies for treatment of liquid effluent.	Understanding of new concepts
1300 – 1400	Lunch break			
1400 – 1500	Design of a treatment system	Participants can put together modules for treatment of faecal sludge to achieve the desired objective	<ul style="list-style-type: none">▪ Group activity: Participants in the group and are given a scenario with boundary condition. They choose the appropriate treatment modules and sequence them to achieve the desired output.▪ Groups present their work and reflection session are held	Integration and application of concepts
1500 – 1530	O&M of Treatment technologies – sludge drying beds, planted drying beds and Effluent treatment	Participants are aware of th various O&M requirements of the technology options discussed during the training.	<ol style="list-style-type: none">1. Participants are provided information on the O&M requirement for each of these technologies:<ul style="list-style-type: none">▪ Planted drying beds▪ Unplanted drying beds▪ Settler, AF, PGF, Sand – Carbon filter	Understanding
1530 – 1545	Tea break			
1545 – 1630	Components and review of DPR	<ul style="list-style-type: none">▪ Participants know the various components that must be included in an FSTP DPR▪ Participants posses a framework for assessing an FSTP DPR prepared by external consultant	<ol style="list-style-type: none">1. Participants brainstorm and list the different components of DPR (based on experience of STP)2. Trainer identifies missing components, explains their importance and add to the discussion3. Participants are provided with a review framework and are briefed on use of this framework	Understanding and reflection
1630 – 1700	Debriefing	To assess the learning of the participants	<ol style="list-style-type: none">4. Participants share their learning and way forward plan for their cities5. Participants also receive participation certificates.	Reflection
1700 – 1715	Feedback	Participants can share their learning experience	Structured feedback collected from participants on the methodology, content, subject, trainer, and logistics	Evaluation



Session plan

Session plan is a document that assists the trainer to plan the key topics and takeaways of a session. A session plan mainly consists of the following components:

- Session outcomes
- Introduction
- Main content

These components are designed to incorporate the elements of session plan design: hook/beginning, student exploration, and summary/reflection. In addition to these components, session plans include: time, materials, preparation, and reflections on lesson. These supporting components help trainers to prepare for a lesson and reflect on how it went. As you read about the components, consider how they support what learners and trainers need to be successful in a lesson.

SESSION OUTCOMES

Session outcomes define the purpose of a session. They are short statements describing the knowledge, skills or attitudes that participants should acquire by the end of a session. The activities in the session should be designed to meet the session outcomes. Sharing the session outcomes at the beginning of the lesson helps learners to understand what is expected of them and how they should focus their energy. Checking session outcomes at the end of the lesson helps participants to assess how effectively they are meeting their learning goals. Similarly, as a trainer, having a clear understanding of the session outcomes allows you to adjust a session plan to more effectively support the learners in reaching the outcomes. Evaluating whether the learners have reached the outcomes also helps you to gauge

INTRODUCTION

The introduction is often called “the hook” because it grabs the attention of learners and entices them to learn more about the topic of the lesson.

The introduction:

- Motivates participants to engage with the topic
- Connects the topic to participants’ existing knowledge
- Helps participants to understand the learning outcomes of the lesson

A short activity, story, question, reflection, or statement is used to capture learners’ attention and connect their previous knowledge to the topic of the lesson. During the introduction the learning outcomes are also shared so that participants know what to expect and what to work toward during the rest of the session. The introduction is an opportunity for trainers to assess how much participants already know about a topic. They can also learn more about participants’ motivation. This information helps the trainer to adjust the information delivered during the main activities in the lesson.

MAIN CONTENT

———— This is the body of the lesson. It consists of a series of participatory activities designed to address each of the learning styles. Topics are organized in a logical flow that builds upon participants' existing knowledge. Information is delivered in small, manageable chunks to leave time for practice and assimilation of new content. The topics include a mix of large group discussion, small group or partner work/discussion, and hands-on activities to promote active learning. By slowly building up the complexity of activities, participants gain the knowledge and confidence they need to be successful in learning. This is essential in maintaining a safe learning environment, and continuing to motivate learners. During the topics of the lesson trainers have the opportunity to discover more about learners, and to adjust activities according to their individual strengths, challenges, and interests. Not all participants will move through activities at the same pace. Similarly, some may be interested in certain aspects of a subject than others. Topics need to be designed with enough flexibility that individual learners can explore things at a different pace and depth, while still providing continuity and a clear path for all participants.

SUPPORTING SESSION PLAN COMPONENTS

Time: Session plans include an estimate of the total time required and the time required for each component of the introduction, topics, and review. These time estimates help you plan your workshop effectively and budget your time when you are delivering a lesson. When you allow enough time to deliver a lesson well, you promote a safe learning environment for your participants by giving them opportunities to contribute ideas and participate in activities without feeling rushed. By following the time suggestions in the lesson plan, you also ensure that topics and activities move forward at an appropriate pace without becoming too slow and causing participants to disengage.

Materials: Each lesson plan contains a complete list of required materials. You can refer to this list of materials in advance to ensure you have everything you need to facilitate the lesson. If you do not have some of the materials, be sure to either find them or to adapt the lesson so that you can still cover the learning outcomes in a participatory manner.

Preparation: This section briefly outlines the steps you should take to prepare for the lesson. It is important to review this section in advance and follow these steps so that the lesson will go smoothly without interruption.

Discussion: This space is provided for you to write your comments on how the lesson went, what worked well, and what could be improved. Self-reflection is an important part of your professional development as a trainer, and will help you to be more effective in supporting your participants' learning in the future.

Good lesson plans help you to facilitate optimal learning experiences. Each component of a lesson is designed to meet the learner's need for motivation, connection to existing knowledge, practice and a safe learning environment. By thinking carefully through the flow of a lesson, delivering captivating introductions, participatory topics, and thorough reviews, you can support participants in achieving the learning outcomes.

SESSION NAME: INTRODUCTION AND NEED FOR FSM

SESSION PLACE: DAY 1, SESSION 1

DURATION: 45 MINUTES

SESSION OUTCOMES

- Participants can list the stakeholders involved in FSM
- Participants understand the concept and need for FSM
- Participants remember shit flow diagram (SFD) as a tool for assessing sanitation

MATERIALS REQUIRED

1. Presentation
2. Board for writing or Flipchart
3. Marker pens

PREPARATION

1. Co-trainer to assist the trainer in economic calculations.

REVIEW (5 MIN)

1. Ask participants to calculate the CAPEX requirement for their town and also estimate the OPEX per person/household and discuss with them on the recovery of this cost.

INTRODUCTION (10 MIN)

- Trainer ask the question "What happens to wastewater generated at the household?". The trainer then draws on the board the information provided by participants, using the shit flow diagram framework.
- The trainer then asks the participants as to what can be probably solutions and compares them economically to assess the CAPEX required.
- Through this, the trainers draw participants in understanding the constraints in resources to implement sewerage and introduced FSM as an alternate (or means) to sanitation.
- The trainer then explains the idea of FSM briefly.

KEY TAKE AWAYS

1. Faecal Sludge management is here to stay, as most of India's current and future sanitation relies on this.
2. By doing faecal sludge management a city can improve its sanitation outcomes at a fraction of cost than that of sewerage networks.

POWERPOINT CONTENT (30 MIN)

1. Sanitation story of the country – using shit flow diagram and pictures, as to how it has moved from open defecation to toilets to what next? But what is the impact on receiving waters?
2. Introduction to shit flow diagram as a tool to assess sanitation situation in the city.
3. Defining the objectives and vision of FSM
4. Listing the stakeholders and highlighting the role they plan in FSM
5. Revisiting the introductory case with numbers from FSM (CAPEX and OPEX) and establishing the economics with FSM.

SESSION NAME: FAECAL SLUDGE MANAGEMENT - OVERVIEW

SESSION PLACE: DAY 1, SESSION 2

DURATION: 45 MINUTES

SESSION OUTCOMES

- Participants will understand the components of FSM
- Participants have an understanding of the problems in FSM implementation and also have an idea about tentative solutions to overcome these problems

MATERIALS REQUIRED

- Presentation
- Board/ flip chart
- Markers
- Flip chart/chart papers
- Writing instruments

INTRODUCTION (5 MIN)

- The trainer poses a question to participants " Why is it called Faecal sludge – " management"? If it is all about a treatment plant, what is the big deal?"
- Trainer probes for non-engineering reasons for the above question and tries to bucket the answers into policy and regulation, behavior change, infrastructure – O&M, monitoring, and capacity.

PREPARATION

- The arrangement of seating to be made in a way to enable easy formation of four groups.
- Co-trainer to assist in bucketing the answers provided by participants during the introduction and during the activity.

ACTIVITY (30 MIN)

- Participants are split into four groups – each representing a stakeholder
- The four stakeholders are – commissioner, Health officer, truck operator and FSTP operator.
- A one page case sheet is distributed among participants and reading time of 5 minutes is provided.
- A time of 3 minutes is provided within the group to discuss on
 - What are the problems faced by your group as stakeholders and what could have lead to this issue.
 - Who is to solve this problem and how?
- After the discussion, participants are engaged in a structured discussion using a probing questions. (Discussion time: 12 minutes)

SUMMARY (10 MIN)

- Trainer sums the activity using a presentation and discusses on the enabling environment required for a successful FSM implementation
- The enabling environment is categorised into various buckets such as state list/ULB list, thereby providing more clarity on roles and responsibilities of various governments.
- Conclusion – Non engineering planning is as important as engineering.

KEY TAKE AWAYS

- A successful FSM planning process requires understanding the incentives and addressing the issues faced by stakeholders in the value chain.
- The success of a treatment plant depends closely on the involvement of various people involved such as operator, ULB, truck operator, households etc. It is hence required that all these stakeholders are made to get a buy in into the project.

SESSION NAME: CASE STUDIES

SESSION PLACE: DAY 1, SESSION 3

DURATION: 45 MINUTES

SESSION OUTCOMES

- Participants are confident of FSM as a solution
- Participants can remember benefits accrued to the public and ULB due to FSM

MATERIALS REQUIRED

1. Presentation
2. Caselets/one pagers on each of the four models

PREPARATION

1. Caselets or one pager to be provided to participants along with the kit.

INTRODUCTION (2 MIN)

- The trainer asks the participants to share their knowledge on successful case studies of FSM in the world or India.
- If participants respond with known case studies, the trainer will ask them to elaborate and share with the group.

MAIN CONTENT (35 MIN)

- Case study of Devanahalli – Video
- Case of Leh – Private model
- Case of Senegal – Public, private partnership
- Brief of Unnao FSTP

DISCUSSION (5 MIN)

- The trainer asks the participants for reasons of success in each/all of these cases and discusses the relevance in their states

VIDEOS

1. Senegal introduction - <https://www.youtube.com/watch?v=8tdlqjGIN3A>
2. Devanahalli - <https://www.youtube.com/watch?v=WZgT2Vwfvwc>

KEY TAKE AWAYS

1. Most successful case studies involve private participation : Private financing and innovative management of infrastructure with performance linked benchmarks shall reduce the burden on the ULB and increase service efficiency in FSM



SESSION NAME: COLLECTION AND CONVEYANCE OF FS

SESSION PLACE: DAY 1, SESSION 4

DURATION: 30 MINUTES (CAN ALSO BE REDUCED TO 20 MINUTES IF REQUIRED)

SESSION OUTCOMES

- Participants are aware of various options for collection and conveyance of faecal sludge
- Participants are able to estimate the number of trucks for their town/city.

MATERIALS REQUIRED

- Posters of the five modes of collection and conveyance
- Metacards
- Writing instruments

PREPARATION

- Estimation tool – print out to be provided to all participants
- Compendium of collection and transport technologies to be provided to participants.

KEY POINTS

- Collection and transport solutions should aim at increasing access, increase asset turn around and use simple and readily fixable solutions.

CONTENT (20 MIN)

- Trainer asks the participants on the existing facility for collection and transportation in their city, also discusses the issues they face. (Probes into access, O&M, equipment failure and desludging thick sludge) (this step can be skipped for time constraints)
- Collection and conveyance systems shall be classified under five buckets – Handheld, small scale, medium scale, large scale and transfer stations.
- Details about these systems with examples, pictorial representations, and characteristics will be presented in slides
- Presentation –
 - Factors for choosing the type of containment systems
 - Type of collection and containment systems
 - Estimation on the number and type of containment units

ACTIVITY – INDIVIDUAL (5 MIN)

- Participants are provided with a tool sheet to estimate the number and type of vehicles required in their town.
- Participants are asked to estimate the number and different type of trucks for their town based on certain calculations portrayed in slides.

SUMMARY (5 MIN)

- In the end, the participants are introduced to the compendium of collection and conveyance technologies and explained how it could be used.

KEY TAKE AWAYS

- Collection mechanisms if not estimated properly for its demand and technical viability, could lead to resorting to manual scavenging at a few instances. One technology for collection and conveyance cannot satisfy the diverse needs of the city. It is hence required that various options be considered and implemented as per the efficacy of the ULB or private sector.

SESSION NAME: APPROACH TO FAECAL SLUDGE TREATMENT

SESSION PLACE: DAY 1, SESSION 5

DURATION: 45 MINUTES

SESSION OUTCOMES

- Participants understand the difference between sewage and faecal sludge
- Participants are familiar with treatment principles, objectives, and outcomes

MATERIALS REQUIRED

1. Presentation
2. Meta cards
3. 1-litre transparent bottle each of low strength sewage and high strength FS
4. Gloves and tissue paper
5. Board/Flip chart
6. marker and writing instruments
7. Dried faecal sludge in small packets to be distributed or kept for participants to visualize.

KEY TAKE AWAYS

1. faecal sludge is quite different from sewage given its high BOD, nutrients and solids. Improper understanding of the characteristics and using systems atypical to STPs could lead to treatment failure or increased O&M.
2. While in a STP design the main focus is on liquid component, in FSTP there is equal emphasis on the solid and the liquid components of the sludge.

PREPARATION

1. Disturbed samples of sewage and sludge to be placed on a table near to trainer
2. Co-trainer to assist in showing the sample bottles to the participants for a closer and better look (must wear gloves)
3. Dried FS samples to be distributed to interested participants
4. Co-trainer to write down on the board, characteristic differences during the introductory session.
5. Meta cards to be provided to each participant

INTRODUCTION (5 MIN)

- Trainer asks the participants the difference in characteristics between sewage and faecal sludge
- The trainer will ask probing questions and get answers for physical, chemical and biological properties.
- Trainer juxtaposes and sums up the difference and need for a different treatment approach other than regular STPs

MAIN CONTENT (35 MIN)

- Introduction to typical wastewater parameters such as BOD, COD, TS, TSS, E-coli and comparing the characteristics of sewage and faecal sludge for each of the above parameters.
- Objectives of treatment and end product standards
- Introduction to treatment approaches – steps for treating faecal sludge (screening, solid, liquid separation, solid and liquid handling, etc.)
- Concepts or methods for each of the above steps – to be discussed in brief.
- Brief on end products and reuse applications

ACTIVITY (5 MIN)

- The trainer asks the participants to write down the possible reuse applications they can adapt for their cities to increase sales revenue from FSTP.
- The meta cards are posted next to the previously calculated CAPEX requirement for each of their towns

SESSION NAME: FAECAL SLUDGE TREATMENT TECHNOLOGIES

SESSION PLACE: DAY 1, SESSION 6

DURATION: 45 MINUTES

SESSION OUTCOMES

- Participants are aware and remember at least five treatment technologies
- Participants understand the need for combination of treatment technologies

MATERIALS REQUIRED

1. Presentation
2. One-pagers on treatment systems – Philippines, Biomass control and Thailand
3. Board
4. Markers

PREPARATION

1. One-pagers on the treatment systems to be provided along with the participant kit
2. Videos to be downloaded and checked for AV quality.

REVIEW (5 MIN)

- The trainer asks the participants to remember and list down the steps involved in FS Treatment; this is then listed on the board.

MAIN CONTENT (40 MIN)

1. Trainer introduces in detail, treatment technologies. He explains how they work and under what circumstances they can be used. Below technologies will be revealed to the participant using slides or videos:
 - Anaerobic digestion
 - Planted drying bed
 - Mechanical dewatering
 - Disposal mechanism – Geo bags and trenching
 - Thermal treatment
2. Introduction to systems approach to treatment – Integrating various technologies to achieve desired results
3. Treatment systems – case studies on:
 - Mechanical dewatering with drying beds – Philippines model
 - Anaerobic digestion – Thailand model

KEY TAKE AWAYS

1. Many options for treatment of faecal sludge exists, however the decision to choose the correct systems is a complex decision making process involving technical, social, economic and capability considerations of the ULB and the stakeholders.
2. Choosing the treatment system must compliment the sustainability planning for FSM activities.



SESSION NAME: PLANNING FOR FSTP IMPLEMENTATION

SESSION PLACE: DAY 1, SESSION 7

DURATION: 45 MINUTES

SESSION OUTCOMES

- Participants are aware of the process involved in implementing an FSTP for their cities
- Participants are aware of various contract methods for implementing FSTP

MATERIALS REQUIRED

- Presentation
- One pager on the process flow for FSTP implementation

PREPARATION

- One page on process flow to be provided to all participants.

INTRODUCTION (5 MIN)

- Trainer asks a participant to volunteer and explain the process of Sewerage and STP implementation for a city – Starting from the feasibility study
- In case of no volunteer, the trainer plots a roadmap for sewerage/ STP implementation with the support from participants
- The trainer then leads the team to highlight the steps which are crucial for a good design and implementation.

MAIN CONTENT (35 MIN)

- Trainer highlights the criteria for FSTP design – FS parameters, quantity, and frequency of loading, end products, O&M, etc.
- Trainer lists the key data points required for FSTP design based on above buckets and describes them in detail.
- Trainer charts out the process of FSTP implementation
- Types of contract – DBOT, BOT, Licensing, etc.

REVIEW (5 MIN)

- The trainer asks the group “what will be the tentative timelines for such a process?” and writes it down next to each step to come up with the total time required for implementation.

KEY TAKE AWAYS

- FSTP cannot be successful without implementing other aspects of FSM plan such as operational model for desludging, regulation and monitoring plan, behaviour change of stakeholders etc. It is hence imperative that a standalone treatment infrastructure in FSM without its supporting systems shall not be successful or would be always at a risk of inefficiencies.
- Contracts for FSM implementation is advisable to be made in an integrated manner with emphasis on reuse and user fee collection.



SESSION NAME: PREPARATION FOR FEASIBILITY STUDY

SESSION PLACE: DAY 1, SESSION 8

DURATION: 45 MINUTES

SESSION OUTCOMES

- Participants are aware of data collection methods for a feasibility study

MATERIALS REQUIRED

- Presentation
- Data collection tools – Household, ULB, Desludging operator, farmers, land
- Soft copy of data collection tool

PREPARATION

- Printed copy of the tools to be provided to all participants
- Co-trainers to assist participants in understanding the tool and its usage.

FEEDBACK (10 MIN)

- Trainer to seek feedback from participants on the ease of using these tool and suggesting appropriate changes (if required) to suit the requirements of the site visit.

MAIN CONTENT (35 MIN)

- Need and contents of a feasibility study
- Introduction to data sources – Households, desludging operator, ULB, farmers and land characteristics.
- Trainer uses the tools provided along with the participant kit in explaining the below: (These tools will also be used during site visit by participants for data collection, hence explicit instruction on use of these tools to be provided)
 - Data collection from household – methods, and need. Tool: Household questionnaire
 - Data collection from Desludging operators – methods and need. Tool: Semi-structured interview
 - Data collection from ULB – methods, and need. Tool: Semi-structured interview
 - Data collection from farmers – methods and need. Tool: Structured interview
 - Data collection from land – methods, and need. Tool: checklist
- Trainer to also brief on the agenda for the site visit and related instructions.

KEY TAKE AWAYS

- Tools such as survey forms and templates help in collecting data, however this data needs to be analysed in the context of local conditions. In many cases averages and mean attributes may mislead the planning process, hence sufficient attention is to be provided for understanding abnormalities and their causes.
- A good data collection mechanism is the foundation for any FSM intervention



SESSION NAME: SITE VISIT
SESSION PLACE: DAY 2
DURATION: 1 DAY (0930 - 1730) - 480 MIN
TRAVEL TIME (BOTH WAYS): 120 MIN
LUNCH (1300 - 1345): 45 MIN
REFRESHMENTS (BOTH TIMES): PROVIDED DURING TRAVEL

SCHEDULE

Timings	Agenda
0930	Assemble at training venue
0930 – 0950	Agenda setting and instruction for the site visit
0950 -1100	Travel to site
1100 – 1300	Data collection
1300 – 1345	Lunch
1345 – 1500	Travel back to training venue
1500 – 1515	Debriefing
1515 – 1700	Group work



SESSION NAME: SITE VISIT

SESSION OUTCOMES

- Participants have experience in conducting feasibility studies.

MATERIALS REQUIRED

1. Portable addressal systems - 2 nos
2. Data collection, toolkit, and framework printouts
3. Writing pads and instruments
4. Water bottles
5. Snacks and refreshments

PREPARATION

1. Stakeholders must be informed priorly, and necessary logistic arrangements are made such as lunch, transport, water, etc.
2. Toolkit to be provided to each group
3. Framework for representation of the study to be made available to each group.
4. Coordination and logistics planning (as per detailed planning sheet)
5. Co-trainers to assist the groups in their work

INSTRUCTION (20 MIN)

- Every participant to make his/her observations
- A group can appoint within itself one person who can lead in asking questions with the stakeholders.
- Participants to use relevant tools from the toolkit provided for data analysis
- A framework will be provided for representation of data as feasibility study outcomes¹
- Participants not to disclose their identity or impress/dominate over stakeholders during the process of data collection

FIELDWORK (120 MIN)

- Groups of participants collect data from various data sources through following methods

Data sources	Tools	Method
Household	Questionnaire	Survey
Desludging operators	Checklist	Semi-structured interviews
ULB	Checklist	Semi-structured interviews
Farmers	Checklist	Semi-structured interviews
Site	Checklist	Observation

- Each group spends around 20 minutes with a data source, each participant in the group makes his/her observations/data collection.

DEBRIEFING (5 MIN)

1. Participants arrive at the training venue and are asked questions about the site visit. The questions are targeted in understanding the learning and difficulties in gathering information from such visits.

GROUP WORK (90 MIN)

- Participants work in their respective groups in consolidating, analyzing and presenting the data collected into a format for feasibility study report.

¹ Trainers will explain the use of tools during their onward journey and the framework for representation on their return journey. In case it is not feasible a separate session (of 30 min) on this will be scheduled for their return to the training venue

SESSION NAME: PRESENTATION ON FEASIBILITY STUDY

SESSION PLACE: DAY 3, SESSION 1

DURATION: 60 MINUTES

SESSION OUTCOMES

- Participants have experience of a feasibility study

MATERIALS REQUIRED

- Presentation
- FSM canvas from site visit
- Camera

PREPARATION

- Pictures of the FSM canvas from site visit are captured and projected for the participants
- Co-trainers to assist participants in preparing the presentation on feasibility study

PRESENTATION AND PEER REVIEW (60 MIN)

- Participants present the findings from previous day assignment in groups on the conclusions of the feasibility study
- After every group presents their feasibility study report, there is a peer review and discussion on findings

KEY TAKEAWAYS

- A successful FSM feasibility study requires understanding the on ground reality and site conditions



SESSION NAME: TREATMENT CONCEPT – SLUDGE DRYING

SESSION PLACE: DAY 3, SESSION 2

DURATION: 30 MINUTES

SESSION OUTCOMES

- Participants understand the concept and characteristics of sludge drying using planted and unplanted drying beds

MATERIALS REQUIRED

- DED of sludge drying and planted sludge drying beds
- Presentation

PREPARATION

- Participants to be provided with detailed engineering drawings of both the technologies (plan, section and detailing)

REVISION (5 MIN)

- Participants are asked to remember and mention the steps involved in the treatment of FS. They are also requested to list technologies discussed for sludge drying.
- The trainer can also show images of an un-planted and planted drying bed and ask participants to name them.

MAIN CONTENT (25 MIN)

- Unplanted sludge drying beds
 - Working concept
 - Parts
 - Basis for design
- Planted drying beds
 - Working concept
 - Parts
 - Plantation types
 - Basis for design

KEY TAKEAWAYS

- Planted drying beds can be effective when O&M capabilities are low and reuse of dried bio-solids are not so preferred by farmers.
- Sludge stabilisation prior to drying of sludge in unplanted drying beds reduce the risk of odour and also aid in better dewatering.



SESSION NAME: DESIGN OF DRYING BEDS

SESSION PLACE: DAY 3, SESSION 3

DURATION: 30 MINUTES

SESSION OUTCOMES

- Participants carry out preliminary design of the treatment module – Sludge drying and planted sludge drying bed

MATERIALS REQUIRED

- Print out of design sheets
- Presentation
- Calculator

PREPARATION

- Design calculation sheets to be provided to all participants
- Co-trainers to move around and facilitate the calculation

INSTRUCTION (5 MIN)

- Participants are requested to use the tools provided for design
- Input and output of the tool are described

INDIVIDUAL ACTIVITY (25 MIN)

- Participants calculate the area and number of beds required for sludge drying beds
- Participants calculate the area, freeboard, and the number of beds needed for planted sludge drying beds
- The trainer will stepwise aid the participants in designing the drying beds with the support of a presentation

KEY TAKEAWAYS

- Design of drying beds must always consider worst cases of climate and faecal sludge characteristics
- Understanding of local climate is very important in designing drying beds



SESSION NAME: TREATMENT CONCEPT – EFFLUENT

SESSION PLACE: DAY 3, SESSION 4

DURATION: 45 MINUTES

SESSION OUTCOMES

- Participants can list and understand the components of effluent treatment

MATERIALS REQUIRED

- Presentation
- Detailed engineering drawings of modules to be given along training kit

KEY TAKEAWAYS

- Many options exist for treatment of percolate or supernatant from sludge handling units. However attention needs to be given in choosing the appropriate system based on O&M capabilities.
- FS is high on non bio-degradable COD and nutrients, which are not so easy to remove using conventional treatment systems. Hence sufficient system and process changes need to be incorporated while designing treatment plant to match with standards.

INTRODUCTION (5 MIN)

- The trainer asks the participants on the possible treatment options for effluent of the drying beds. Probes for STP technologies, by providing a hint on the quality of effluent
- Seek participants knowledge on low-cost STP technologies, including DEWATS, constructed wetlands, etc.

MAIN CONTENT (40 MIN)

- Effluent characteristics and quantity estimation
- Output standards
- Settling tank – concept and design characteristics
- Anaerobic filter – concept and design characteristics
- Planted gravel filter – concept and design characteristics
- Sand and carbon filter – concept
- UV filtration and chlorine treatment - con



SESSION NAME: DESIGN OF TREATMENT SYSTEMS

SESSION PLACE: DAY 3, SESSION 5

DURATION: 60 MINUTES

SESSION OUTCOMES

- Participants can put together modules for treatment of faecal sludge to achieve the desired objective

MATERIALS REQUIRED

- One pager on technologies
- Print out of case sheets
- Flip charts
- Glue
- Markers
- Stand for presenting the flip charts
- Representative diagrams of each technology

PREPARATION

- Co-trainers to assist in group activity
- Flip charts, stationery, diagrams to be provided to each group.
- Seating to be arranged for group work

INTRODUCTION (10 MIN)

- Trainer introduces the need for systems planning using a probing questions and presentation.
- The same presentation will be used to provide instructions to the participants.

INSTRUCTIONS (5 MIN)

- Participants are clustered into groups of 5.
- Each group is provided with flip charts and drawings of various modules
- They are also provided with a case sheet consisting of boundary conditions on Population, land size, capex, opex, skill and output requirements.
- One pager on various technologies are also provided to each group; participants can make use of the information provided on these sheets.

GROUP ACTIVITY (20 MIN)

- Appropriate treatment technology is selected based on boundary conditions and information provided.
- The right combination of treatment modules are selected, and hydraulic flow diagram is made by sticking the pictures on the chart paper.

PRESENTATION (20 MIN)

- Groups present their work and explain the treatment system – concept

SUMMARY (5 MIN)

- Trainer concludes the discussion on treatment technologies and systems.

KEY TAKEAWAYS

- Although many technologies are available for various components of faecal sludge treatment, designing a system requires analysing the complementary nature of these technologies to work in tandem.
- Faecal sludge treatment is incomplete without addressing the stabilisation, drying and hygienisation of solids.



SESSION NAME: OPERATION AND MAINTENANCE

SESSION PLACE: DAY 3, SESSION 6

DURATION: 30 MINUTES

SESSION OUTCOMES

- Participants are aware of the various O&M requirements of the technology options discussed during the training

MATERIALS REQUIRED

- Presentation

KEY TAKEAWAYS

- Understanding the O&M requirement upfront while selecting the FS treatment technology helps in effective use of the infrastructure along its design life.

MAIN CONTENT (30 MIN)

- Participants are briefed on the Operations and upkeep of the following treatment modules
 - Sludge drying beds
 - Planted drying beds
 - Settler
 - Anaerobic filter
 - Planted gravel filter
 - Sand – carbon filter
- Along with the O&M, the Do's - Don't and safety equipment required while carrying out the O&M is also presented.



SESSION NAME: COMPONENTS AND REVIEW OF A DPR

SESSION PLACE: DAY 3, SESSION 7

DURATION: 45 MINUTES

SESSION OUTCOMES

- Participants know the various components that must be included in an FSTP DPR
- Participants possess a framework for assessing an FSTP DPR prepared by external consultant

MATERIALS REQUIRED

1. Presentation
2. Soft copy of Unnao DPR to be provided to participants
3. Board and marker

PREPARATION

- Co-trainer to assist the trainer in writing participant's answers over a board.

KEY TAKEAWAYS

- A DPR must have a plan for various component of the FSM chain such as transportation, treatment , operations , financing and monitoring of the system or infrastructure in place.
- DPRs must be made in consultation with key stakeholder groups such as ULB, Desludging operators, state apex bodies for infrastructure planning, ect.

INSTRUCTION (5 MIN)

- The trainer asks the participants to share various sections and inclusions of DPR prepared for STP. Trainer notes these points on the board and discusses the need for adding new components for an FSTP

MAIN CONTENT (30 MIN)

- Components of an FSTP which are to be included in the DPR –
- Sections of a DPR – to include a section on the conveyance of FS and FS estimation, IEC, Business model, O&M etc.
- Introduction to checklist for assessment of a DPR
- Explain the components of the list and methodology of assessment
- Show and take the participants through an FSTP DPR and related documents.

SUMMARY (10 MIN)

- Trainer addresses Q & A and also concludes the section on DPR review





National Institute of Urban Affairs

1st and 2nd Floors, Core 4B, India Habitat Centre,
Lodhi Road,
New Delhi - 110003, INDIA
www.niua.org

CDD Society

Survey No.205 ,Opp. Beedi Workers Colony, Kommaghatta
Road, Bandemath, Kengeri Satellite Town,
Bengaluru, Karnataka 560060
www.cddindia.org