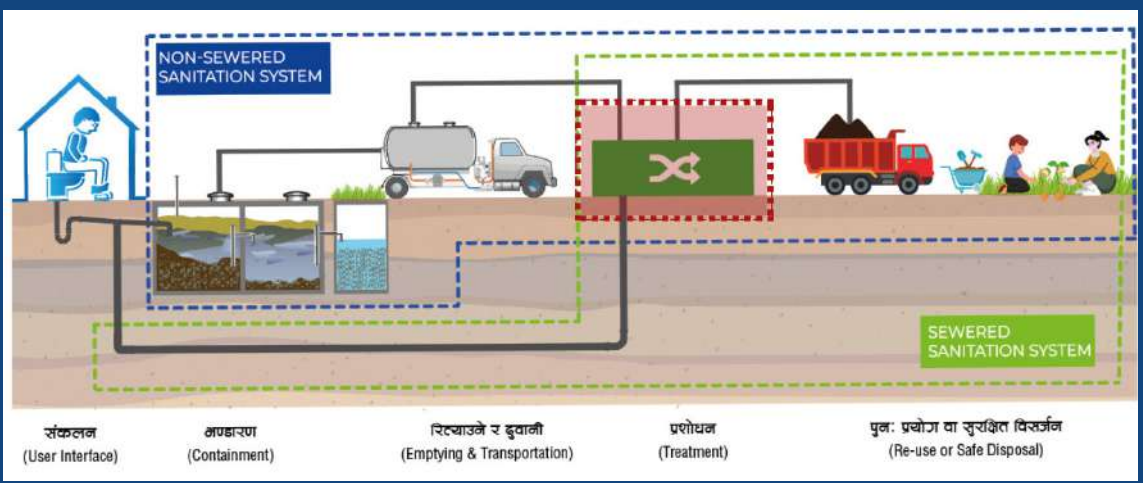
Government of Nepal
Ministry of Water Supply
National Water Supply and Sanitation Research,
Innovation and Capacity Development Center

Design of Faecal Sludge Treatment Plant

Training Manual



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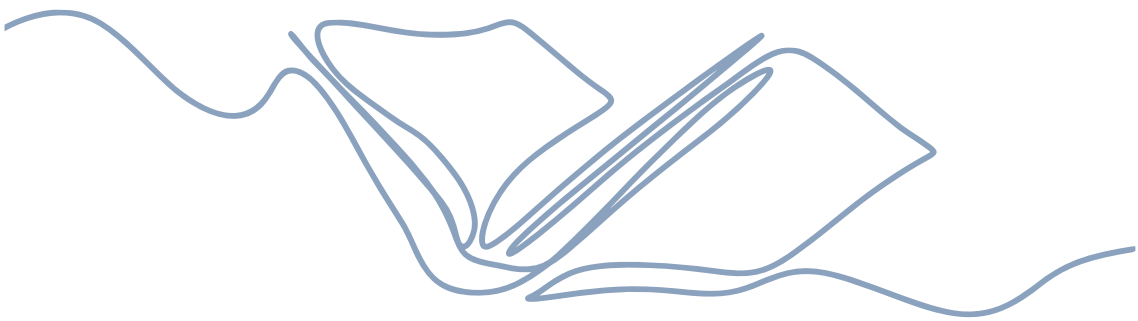

Material and Learning Application

For government, under authority of NWSSRICDC, this material is prepared by Environment and Public Health Organization (ENPHO) with the support from "CWISAN Thematic group" for Training Material Development and is to be used for training purposes only. Materials used in the package are for the reference to understand the concept and or to show the practices around the globe and at national level. The package development team do not claim for the materials used in the package as of their own but is the sole property of the respective organization.

Foreword

Nepal's progress toward improved sanitation has been commendable, particularly with the achievement of Open Defecation Free (ODF) status. However, with most sanitation systems being on-site—such as pit latrines and septic tanks—the safe management of faecal sludge is now a critical priority. As we move toward Municipality-Wide Inclusive Sanitation (MWIS), simply constructing toilets is no longer enough. End-to-end faecal sludge management (FSM) is essential to protect public health and the environment.

Yet, the number of Faecal Sludge Treatment Plants (FSTPs) remains limited, and many existing facilities are either underutilized or non-functional. Addressing this challenge requires technical expertise that can design, implement, and sustain appropriate treatment infrastructure.

This training package fills that vital gap. It is designed to equip sanitation professionals, engineers, and planners with the competencies needed to size, site, and configure FSTPs suited to local conditions—taking into account population dynamics, desludging logistics, climate variability, land availability, energy constraints, and opportunities for resource recovery. The curriculum emphasizes fit-for-purpose technologies, phased expansion, cost-effective operations and maintenance, and alignment with municipal planning instruments and environmental and social safeguards.

By enhancing your technical capacity, this training empowers you to lead the design and implementation of effective FSM systems. At the same time, it supports broader institutional goals by strengthening municipal and utility capabilities and enabling sustainable service delivery through stronger governance and financing mechanisms.

I commend the experts and institutions who have developed this important resource. I urge all participants—across government, private, and non-governmental sectors—to fully engage with the materials. Your contributions will be key to building safe, functional, and resilient sanitation systems that support the health and development of our communities.

Ram Kumar Shrestha
Executive Director
NWSSRICDC

Table of Contents

1. INTRODUCTION

This Trainer's Manual is to support people who facilitate or conduct the "Design of Faecal Sludge Treatment Plant (FSTP)" training. This introduction section provides background on how to use the manual and lesson plan, tips that help plan for a successful training, and several tools to help delivering the training, including lessons plans and materials. The main objective of this trainer manual is to guide the trainer, for effective delivery of the training while conducting the sessions. The instruction on the manual goes hand on hand with the presentation slides. It is recommended that one adapt the tools to suit their style and the needs of the audience.

To this, this manual comes with other materials, a folder compiled of Power-point slide deck, slides compiled along with slide notes for the trainer's reference. For the effective delivery of the package, it is highly recommended to use the documents/ files simultaneously.

2. TRAINING OVERVIEW

Faecal Sludge Management (FSM) plays a critical role in the successful implementation of a City-Wide Inclusive Sanitation (CWIS) system. The technical expertise in FSM, including the design, operation, and maintenance of Faecal Sludge Treatment Plants (FSTPs), is crucial for effective CWIS implementation. This training package focuses on providing key technical knowledge in FSM, from selecting the most suitable faecal sludge collection methods, to choosing the right transportation technology, and identifying the most effective treatment solutions. It also includes guidance on designing FSM systems tailored to specific local contexts.

The resource person engaged in the development of the package, or the subject experts, will be delivering relevant sessions to the target audiences.

The training package primarily covers topics such as the global and local sanitation context, faecal sludge characterization and quantification, and detailed information on various sanitation technologies and their design principles.

2.1 Training Objective

The general objective of the package is to enhance knowledge on various sanitation technologies and their design.

Specific Objectives

1. To discuss global and local urban sanitation scenarios.
2. To categorize and quantify the faecal sludge as per physical, chemical and biological parameter.
3. To detail out and design various components of faecal sludge treatment plant.

2.2 Participatory Learning

Participatory learning styles are widely used for the active engagement of the participants throughout the training. Effective learning comes from shared experiences and participants learning from each other. Various methods for active engagement of participants are used for the delivery of the course content through interactive presentations, demonstrations, group discussions, case studies and assignment for further practice and discussion.

Use of short sentences, pictures and illustrations, graphs, gestures, demonstrations, small group discussions and hands-on practice are highly recommended for active learning. These methods will help all participants understand and remember the information better.

3. TRAINING PLANNING

The following activities should be undertaken to get started with training planning and arranging logistics.

3.1 Trainers and the Planning Team

For each training:

1. **Choose a training course coordinator or anchor.** This person should be present throughout the training and is responsible for overall coordination, timing, and mood of the training course. To this, he/she is also responsible for allocating sessions and preparing as necessary along with delegating responsibilities with deadlines.
2. **Coordinate with Trainers** for the session delivery. This will probably be a mix of availability, expertise, style, and gender. It is beneficial to establish the strengths and weaknesses of each trainer and work to the strengths during the different training components.
3. **Allocate sessions (or part)** for each of the chosen trainers – these trainers will be responsible for:
    - Preparing for the sessions they are responsible for
    - Ensuring that all resources for their sessions are collated and ready
    - Collaborating with the other trainers – the role each trainer will have at each point in a day - delivering the assigned sessions, supporting other trainers for delivery of their sessions, must be planned and known to maintain the flow of the training, avoid confusion and embarrassment
    - Ensuring the session runs on time.

3.2 Targeted Participants

The main targeted audience for this training consists of sanitation professionals, engineers, and other experts from various sectors, including government agencies, private organizations, international and national non-governmental organizations (I/NGOs), and academic institutions. These individuals are typically responsible for the design, implementation, and management of Faecal Sludge Treatment Plants (FSTPs).

3.3 Selecting Participants

For the most effective training, it is important to take care of inviting participants by considering:

- **Number of participants:** It is important to choose the correct number of participants. You may want to have a small group to provide intensive training and support, or a larger group to have a wider range of participation. A common reason for training sessions failure is that too many participants attend. In the same case, a total number of 15 to 20 participants are highly recommended so that everyone has the chance to fully participate in the training and also have a good range to share and learn the experiences.

- **Criteria for participation:** This training program is specifically designed in selecting appropriate faecal sludge treatment plant, making it particularly relevant for professionals in the field, such as sanitation engineers and municipal engineers. This is basically to make learning more effective.

3.4 Logistics Management

The training planning team (the trainers and the host) will need to determine the training logistics such as:

Pre-training

- What is the budget?
- Who will invite the participants and trainers and communicate with them?
- Who will organize and coordinate food and accommodation?
- Who will manage participant's travel?
- Who will organize the training site and set up?
- Who will purchase and organize the training equipment and materials?
- Who is responsible for pre-training registration?
- Who is responsible for onsite registration?
- Who is responsible for printing the participant's materials including training evaluation form?
- Who is responsible for facilitating the whole training?
- Who is responsible for the logistical arrangements, like banner preparation, stationeries?
- Who is responsible for coordination with trainers and resource person?

During Training

- Who will coordinate with the resource person?
- Who will check for the time management?
- Who will ensure internet and power facility?
- Who will check that snacks and food are ready at the appropriate times?
- Who will prepare the room in the morning and reorganize in the evening?
- Who will prepare the necessary flip charts for the day?
- Who is in-charge of checking participant list details, ensure attendance of all?
- Who is in-charge of preparing evaluations, certificates and USB sticks?

Post Training

- Who will type up the training evaluations?
- Who will clean up the training materials and space?
- Who is responsible for replacing materials if needed?
- Who is responsible for the reporting, consolidating participants' feedback, photos, and video documentation?
- Who is responsible to maintain communication and follow up with the participants?

4. TRAINING PREPARATIONS

There are several things that you will need to do to get ready for the training.

4.1 Training Space

As there are various interactive activities inbuilt in the session, an open space for the group division and work is required for the activities in the training, a venue with the facility should be selected.

Visit the training site at least a couple of days before the event for finalizing the venue itself; specify and ensure all the requirements like rest room for women and men with adequate sanitary facilities like soap, sanitizer, tissues, dustbins, internet connection with appropriate bandwidth, seating arrangements, etc. Visit the training site before the participants are due to arrive and set up your electrical equipment and materials. Try to identify potential sources of distraction in the room, both to yourself and participants, and make changes to mitigate them.

Seating arrangements have a big influence on the training. It is recommended to arrange the tables and chairs so that participants can make eye contact with one another and can break into small groups easily. Participants will also need to be able to view the facilitators/ trainers, the PowerPoint slides, and flipchart posters.

4.2 Equipment and Materials

You will need to gather and bring the following materials and equipment to the training.

Equipments	Materials
Computer/Laptop	Name Tags
Projector	Markers
Camera	Pen
Speaker	Paper- A4 Size
Extension Cord(s)(optional)	Meta-Cards
	Newspaper prints or large size of paper
	Masking Tape

Some equipment and materials are optional depending on how you use the lesson plans. Check the lesson plans and determine what equipment and materials you will need. Be aware that certain things may need to be purchased and gathered well in advance of the training, possibly prior to your arrival.

For all other materials required for individual sessions refer to the lesson plans.

4.3 Presentation Slide

This training includes presentation slides that can be used as a learning aid. Most presentation slides have suggested wording or scripts to use as you deliver the information (the slide notes in each presentation – also known as speaker's notes). As part of your preparation, you should look at each slide to make sure you understand how the whole presentation flows. The slide notes also give additional guidance on how to use a slide.

The timing allowances are based on the trainer following the speaker's notes at a moderate pace. Adding extra wording will take more time so be aware of impacts on other parts of the presentation or training.

5. Facilitating High Quality and Effective Trainings

The significance of the trainer/facilitator cannot be overstated. Training success is usually a function of how well it is facilitated. This entire trainer's manual provides guidance on what to deliver and makes suggestions as to how this might best be done. However, participants attending the training will differ, and their interaction will also shape the training and ultimately the learning experience.

There are several qualities a trainer/facilitator should try to develop to achieve the most from a group of participants, many of whom will not know each other. The following is general advice which applies to this and other training you may facilitate.

Introduction: Introduce yourself to instil confidence that you are qualified to provide the training.

Serve the participant: Facilitating a training may be an achievement, but it is important to remain grounded and keep your focus on the participants. Your trainer/facilitator's role is to facilitate learning, not to only impart knowledge, get through the material or to tell participants what to do.

Respect and be respected: Attending a training will be costly for participants, or their organization, in both time and money. Respect their desire to learn and don't fabricate expertise. No question should be dismissed as irrelevant or stupid. If you don't know the answer, say so and seek out someone who can help respond or direct the participant to where they can find the answer.

Take charge, when necessary, e.g., managing disruption: There may be times when you need to take charge. For example, when a participant is being disruptive – during a break, you could have a quiet word with the person in question to request an adjustment to their behaviour. Break-time could be moved earlier if the problem needs urgent attention.

Encourage questions: Any form of discussion, especially those developed through questions, should be actively encouraged. Participants are more likely to ask questions if they feel physically and socially comfortable, relaxed with their fellow participants and the facilitator. Therefore, you should work to build a rapport with participants as soon as possible. In addition to clarification and further detail, asking questions will help you to gauge the level of understanding, which in turn should influence what and how material will be delivered.

Be responsive: Participants' opinions and questions should not be seen as an unwelcome interruption, but as an opportunity to explore perceptions and to offer any clarification as needed. Consider opening the question up to the training for an answer. But keep an eye on the clock and encourage people to be brief.

Responding to wrong answers: During the training questions are asked to the participants. If they answer incorrectly, it is important first to check whether you have understood the answer by rephrasing and asking if that is what was meant. At this point, their answer can be rephrased to be more accurate but without deviating too much from the participant's answer. If their answer is still incorrect, then it is important not to simply dismiss the answer but to identify the thinking behind it and then work towards a correct answer. It is essential that the participant's view is always respected.

Honouring the answer: You can use a flipchart to record discussions or feedback from exercises. When you do this, it is important not to paraphrase their comment but instead write it down as stated. This ensures that their meaning is not lost and acts as a method of affirmation for the participant – that their opinion is worthy.

Deviate, but not too much: The learning material supplied in this Trainer's Guide is only a starting point. Sharing first-hand experience and nationally relevant, practical examples to emphasize a point can solidify the subject material for some learners. Interjecting the theory sessions with 'real-life stories' should be encouraged. However, care should be taken to not deviate too much or go over the time allocated time or confuse the participants.

Alternate delivery approaches: This Trainer's Guide has made suggestions as to how to deliver the material. If a trainer prefers to 'lecture' this is unlikely to result in achieving the learning objectives and is not an effective way to run the training. Each participant has a different way of learning; some prefer images, some individual thinking, some prefer to listen, others like reading, some doing group work etc. The training needs to include a range of styles so that each participant has an opportunity to learn in their preferred style.

Work with passion: If the trainer/facilitator is enthusiastic about the material it is likely to engage the participants more.

Be confident with the material: Confidence will come as understanding of and familiarisation with the material is developed. Prior preparation is essential.

Stick to time: The timetables suggested are guidelines, but it is important that breaks, lunch and the end-of-day deadlines do not overrun unnecessarily. Appropriate arrangements for meals and refreshments are essential. Participants' learning is enhanced through regular breaks and in order to prevent participants from becoming overtired or demoralised it is important to start and end the day on time.

Help participants appreciate time management: Any overrun in time often comes from lengthy presentations by rapporteurs following group discussions. Make it clear at the start that presentations are time-bound, and people must learn how to present in allotted time. Trainer/facilitators should be very firm but friendly, and simply end presentations when the allotted time is up. Using a timer or buzzer will help.

Handling digital and electronic tools and equipment: Using the tools and equipment independently is one of the basic skills of the trainer. As a trainer, one should be aware on the digital and electronic tools and equipment that he/she uses during the training. Preparing before the training, knowing the equipment well - how it functions are few ideas to get started with handling the digital and electronic tools and equipment.

6. HOW TO USE THIS MANUAL

This section explains the training agenda and individual sessions that have been developed to meet the participant learning expectations.

6.1 Lesson Plan

For each session of training, a lesson plan has been developed with a detailed guide for the trainer. Here is a list of the icons used in this Trainer Manual and their explanations.

	**Learning Outcomes:** Describes what the participants will be able to do by the end of the session to demonstrate increased knowledge, improved skills or changes in attitude.
	**Time:** The clock symbol appears next to the amount of time the session may take. This is an estimated time, and the session may be longer or shorter depending on how you facilitate it.
	**Materials.** Lists all the materials that will be required for the session.
	**Preparation:** The clipboard represents preparation that needs to be done prior to the session including materials required and things to prepare in advance.
	**Introduction:** The hook signals the introduction to a topic. The introduction connects participants' personal experience to the topic of the lessons and motivates their interest.
	**Main Activity:** The puzzle appears at the beginning of a main learning activity.
	**Trainer Notes (TN):** The exclamation point appears to remind you of things to do or consider while facilitating the session.
	**Handouts.** This appears when there are handouts for the participants.
	**Assignment:** This appears when the participants are to go for a discussion on the task assigned to participants

6.2 Icons Used in Power Point

The following icons and images are used throughout the Power Points:

Icons/ Images	Explanation
	Group Activity
	Documentary show
	Case study
	Time

6.3 Learning Outcomes

The learning outcomes describe what the participants will be able to do by the end of the training to demonstrate increased knowledge, improved skills, or changes in attitude. Each lesson plan refers to the specific learning expectations covered in that lesson.

Lesson Plan	Topics	Learning Outcomes
1	Opening session	1. Introduce participants and trainers in participatory methods. 2. Discuss the group's expectations and agenda for the training.
2	Sanitation practices in global and local context	1. Discuss global and local urban sanitation scenarios. 2. Recognize the challenges and solutions in urban sanitation. 3. Identify specific sanitation context of Nepal.
3	FS characterization	1. Categorize the faecal sludge as per physical, chemical and biological parameter
4	Introduction to FSM	1. Explain the sanitation service chain. 2. Discuss different technologies related to faecal sludge management.
5	Technological awareness on FSM	1. Detail out the 5 components of sanitation service chain 2. Explain various treatment processes and technologies
6	Quantification of FS	1. Calculate the quantity of faecal sludge from different methods
7	Design of FSTP	1. Detail out the components of faecal sludge treatment plant. 2. Design various treatment technologies.
8	Presentation of Design and Discussion	1. Present their design workout. 2. Clarify any issues that arise during the design of various components of FSTP.
9	Q and A session; Experience Sharing	1. Clarify any technical doubt related to the design of FSTP 2. Share personal experiences, insights and learning from real-world scenarios
10	Training evaluation and Training closing	1. Evaluate whether learning expectations were met. 2. Analyze the training and provide feedback on the training.

6.4 Training Agenda

The general outline of the training is as follows:

- **Training opening**: To welcome people and allow participants and trainers to get to know one another.
- **Individual lessons**: To focus on a selected topic. Each lesson includes an introduction, a main lesson, and a closing activity to review the content.
- **Breaks and lunch:** To keep people working and feeling positive, breaks are needed. Plan for a mid-morning and mid-afternoon break that allows people to use the washroom and have a snack. While planning your training it is also important to clarify with participants in advance as to whether food and snacks will be provided.
- **Review of previous day:** Start the day with a review of the material learned during the previous day. This also helps focus the participants and trainers' minds on the content of the training.
- **End of training closing:** The end of the training can be official or unofficial depending on what is appropriate. Certificates are typically handed out. The lesson plan "Training Closing" describes this session.
- **End of training evaluation:** To allow participants to assess the strengths and weaknesses of the training for further improvement. See the end of training evaluation for a template of this evaluation.
- **Organizer and trainers debrief:** A daily exercise to discuss what went well, what areas of the day can be improved and what needs to be done for the next day and in the future. A major debrief is held at the end of the training.

7. TRAINING SCHEDULE

Training on design of Faecal Sludge Treatment Plant

Day 1	
Time	**Topics**
09:00 - 09:30	Training Opening
09:30-10:00	Introduction Session
10:00-11:00	Sanitation practices in Global and Local Context
11:00-11:15	**TEA BREAK**
11:15-12:45	FS and its characterization
12:45-13:45	**LUNCH**
13:45-15:15	Introduction to FSM
15:15 – 15:30	**TEA BREAK**
15:30 – 17:00	Technological awareness on FSM
17:00 – 17:10	**Day Closing**

Day 2	
Time	**Topics**
09:00 - 09:30	Previous Day Review
09:30-11:00	Technological awareness on FSM
11:00-11:15	**TEA BREAK**
11:15-12:45	Design Parameter and Quantification of FS
12:45-13:45	**LUNCH**
13:45-15:15	Design of Sludge Drying Bed and Septic Tank
15:15 – 15:30	**TEA BREAK**
15:30 – 17:00	Design of ABR and AF
17:00 – 17:10	**Day Closing**

Day 3	
Time	**Topics**
09:00 - 09:30	Previous Day Review
09:30-11:00	Design of Constructed Wetland and Design practice
11:00-11:15	**TEA BREAK**
11:15-12:45	Presentation of Design and Discussion
12:45-13:45	**LUNCH**
13:45-15:15	Q and A session Experience Sharing
15:15 – 15:30	**TEA BREAK**
15:30 – 17:00	Training Evaluation Training Closing
17:00 – 17:10	**Day Closing**

LESSON 1

Training Opening & Introduction Session

60 Minutes

Learning Outcomes

At the end of this session participants will be able to:

1. Introduce participants and trainers in participatory method.
2. Discuss the group's expectations and agenda for the training.

Materials

- Markers
- Meta-cards
- Newsprint paper
- Name Tags
- Pens (1 per person)
- Notebooks or paper (1 per person)
- Introduction PowerPoint

Preparation

- Write the agenda for the day on the flip chart paper
- Write the heading "Group Learning Expectations" on flip chart paper
- Write the heading "Group Agreements" on flip chart paper
- Put a notebook, name tag and pen at each seat (1 per person)
- Print the pre-test form or prepare an online form for pre-test

In certain situations, a formal welcoming ceremony may take place before the training begins. It is essential to consult with your host in advance to understand the protocol and the time needed. This will allow you to adjust your agenda accordingly.

Introduction

10 Mins

1. Introduce trainers, training hosts and other guests as appropriate and welcome participants.
2. Introduce the training as follows:
   - *This training focuses on faecal sludge treatment plants including their components, types and design.*
   - *This training is specifically tailored for engineers and professionals working in municipalities and private sector working in the field of sanitation.*
   - *This training is participatory and includes a variety of group activities throughout the sessions.*
3. With the information, share the objectives of the training to participants.
4. Inform participants that the objectives are set to meet from the session covered.
5. Review agenda for the day with participants.
6. Explain the building/workshop layout, bathroom location, emergency exits, first aid, and daily schedule.
7. Facilitate an icebreaker or introduction activity to help participants get to know each other and feel comfortable. Suggested icebreaker is provided below.

Getting to know you by trading card

20 Mins

1. Inform participants that they will be engaging in a quick and fun activity to get to know each other better.
2. Ask each participant to pair up with the person sitting close to them.
3. Provide each participant with a marker and a meta-card.
4. Explain that they have 5 minutes to write down the following detais about themselves.
   - Their Name and its meaning
   - Their address
   - Their profession
   - Their experience in sanitation sector
   - A few fun facts about themselves
5. Once the time is up, ask participants to exchange their meta-cards with their partner.
6. Instruct each partner to spend a few minutes asking questions about the details on the card to learn more about the person who wrote it.
7. When everyone has had time to interact, bring the group back together. Each participant will then introduce their partner to the rest of the group, sharing key highlights about them.

This activity not only breaks the ice but also encourages participants to connect with each other from the beginning.

Learning Expectations

10 Mins

1. Inform participants that they are now going to collect the expectations from the training.
2. For this inform participants that each of them will get 2 meta-cards and they are to write their learning expectations, one in each meta-card.
3. Provide meta-cards to the participants and provide a minute to note their expectations.
4. Once participants have written their learning expectations, collect the meta-cards and read out representative expectations to the large group.Once the time is up, ask participants to exchange their meta-cards with their partner.
5. Inform participants that they will be discussing the expectations at the end of orientation.
6. Paste the meta-cards in the station under the learning expectation and if any of the expectations are not related then you may paste it under the parking lot.

Group Agreement

5 Mins

1. Explain that ground rules are agreements created by the group that will allow everyone to learn together.
2. For this, inform participants that you have drafted an agreement and present the newsprint paper with group agreement and read the points for all participants.

Pre Test

15 Mins

1. Inform participants that they are going for the pre-test. Inform participants that the test is for evaluation of the learning process, so participants do not have to worry about score and be honest with their experience and knowledge.
2. For this, provide the pre-test form or a link to the digital form of pre-test form to participants and inform that they will get 10 minutes time for the activity.
3. After the activity, review daily agenda with break and lunch times.
4. Ask the participants if they have any questions at this point.

Reflection on the Lesson

LESSON 2

Sanitation Practices in Global and Local Context

60 Minutes

Learning Outcomes

At the end of this session participants will be able to:

1. Discuss global and local urban sanitation scenarios.
2. Recognize the challenges and solutions in urban sanitation.
3. Identify specific sanitation context of Nepal.

Materials

- Markers
- Meta-cards
- Newsprint paper
- Masking Tapes
- PowerPoint Slides

Preparation

- Read and prepare lesson plan
- Write learning outcomes in newsprint paper
- Review the presentation slide and make changes as per requirement

Introduction

10 Mins

1. Ask participants what comes to mind when you think of sanitation?
2. Ask participants to share their personal or observed challenges in sanitation practices in their community. Collect 3-4 responses.
3. With slides 3 and 4, inform about the ways of managing the waste.

Sanitation Status

40 Mins

1. Present the slide showing global urbanization trends and its impact.
2. Use slides to show Regional and global coverage of sanitation services (2015-2022).
3. Introduce JMP ladder for sanitation and explain what “safely managed sanitation” entails.
4. Explain the five sanitation levels: safely managed, basic, limited, unimproved, and open defecation.
5. Activity: Divide participants into groups, assigning each a sanitation level to discuss real-world examples in their communities.
6. Debrief: Review the global status of safely managed sanitation (slide 11-13).
7. Continue with the slides, explain the concept of SFD with the scenario of overall Nepal then Kathmandu and Itahari.
8. Brief the history of sanitation in Nepal and share Nepal’s history and achievements in sanitation (slides 19-22).
9. Explain SDG 6.2 on ensuring access to equitable sanitation and hygiene and the relevant indicators (6.2.1 for safely managed sanitation services).
10. Discuss Nepal’s government policies regarding sanitation, including current goals and areas for improvement.
11. Introduce common sanitation practices in Nepal (slide 27), including on-site vs. off-site systems.

    Q&A: Ask participants to share prevalent systems in their localities.
12. Brief the history of sanitation in Nepal and share Nepal’s history and achievements in sanitation (slides 19-22).
13. With slide 37 explain about occupational health and safety of sanitation workers.
14. Explain the factors affecting the technology selection and financial and technical aspects of sanitation system.

Review

10 Mins

1. Ask participants if there is any questions.

Reflection on the Lesson

LESSON 3

FS and Its Characterization

90 Minutes

Learning Outcomes

At the end of this session participants will be able to:

1. Categorize the faecal sludge as per physical, chemical and biological parameter

Materials

- Markers
- Meta-cards
- Newsprint paper
- Pictures of faeces

Preparation

- Print the color picture of faeces or prepare in presentation
- Cue the presentation

Introduction

10 Mins

1. Inform participants they will be shown the picture of faeces and they have to observe the picture.
2. Inform them they will get 1 minute for this activity.
3. Present the pictures of faeces and ask the following questions:
   - What is the color of the faeces?
   - Do you think it is hard or soft?
   - What is texture of the faeces?(Solid, or semi-solid)
4. Collect responses from 2 to 3 participants on each question. Expected answer: faeces is yellow in color, hard faeces, non-diarrheal.
5. Summarize the responses and inform we will discuss more about the characteristic of faecel sludge in this session.

Faecal Sludge Characterization

60 Mins

1. Ask participant what do they understand about faecal sludge. Collect responses from 2 to 3 participants. Expected answer: urine, excreta, anal cleansing materials or water to flush collected in containment is faecal sludge.
2. Summarize the participant responses and provide the definition of faecal sludge by …. Faecal waste stored within onsite sanitation technologies is defined as faecal sludge.

Trainers' Note: Faecal waste from offsite sanitation technologies is called sewerage. The faecal waste from offsite sanitation technologies is mixed with the grey water (bathing and washing wastewater).

3. Linking to the activity in introduction (faeces characteristics), inform participants FS characterization is done in three categories i.e. Physical, Chemical and Biological.
4. Ask participants which parameters are included in each category. Collect response from participant starting from Physical, Chemical and Biological.
5. After the response from participant present the list of parameters. Expected answer: Physical (Temperature, Color, Odor, Solids) Chemical (pH, COD, BOD, Nutrients, Nitrogen, Phosphorus) and Biological (pathogen, virus, bacteria, protozoa, helminths).
6. Present slide 4 to 13 describing the physical, chemical and biological parameters of FS.

7. Along with that, present slide 14 on comparison between FS and sewage.
8. Also present the characteristics of FS across different regions (slide 15)
9. Present characteristics of faecal sludge from containment and desludging vehicles (slide 16 to 18).
10. Ask participants what are the factors which determine the characteristic of faeces, wastewater and faecal sludge.
11. Collect 2 to 3 responses from participants and summarize it with slide 20.
12. With slide 20 present the relationship between different factors affecting the FS characteristics.

Trainers' note: Explain the relationship of inflow, concentration and infiltration, storage duration and organic matter (BOD), ammonium-nitrate of dry vs flush toilet.

13. Discuss the quality parameters to be assessed for faecal sludge and significance of FS characterization for determining biological stabilization.

Review

10 Mins

1. Ask participants to discuss in pair about the FS characterization and their influencing factors. Collect responses from 2 to 3 participants.
2. Facilitator summarizes and present the key messages and end the session

Reflections on the Lesson

LESSON 4

Introduction to FSM

90 Minutes

Learning Outcomes

At the end of this session participants will be able to:

1. Explain the sanitation service chain.
2. Discuss different technologies related to faecal sludge management.

Materials

- Markers
- Meta-cards
- Newsprint paper

Preparation

- Prepare the presentation slides
- Cue the presentation

Introduction

10 Mins

1. Display the diagram of the sanitation service chain to participants.
2. Allow participants 1-2 minutes to review and reflect on the diagram. Encourage them to recall or relate it to their previous knowledge.
3. Ask “what do you understand or recognize in this picture?”
4. Collect responses from 2 to 3 participants.**Expected answer:** Participants may state that they are familiar with the pictures or partially understand it.
5. Summarize the responses and thank the participants for sharing.
6. Inform them the discussion will be carried out in detail in this session.

Faecal Sludge Management

60 Mins

1. Explain in detail all the five components of the sanitation service chain from user interface to containment, collection and transport, treatment and reuse/ disposal.
2. With slides 3 and 4 detail out about types of sanitation system, sewered and nonsewered sanitation system.
3. Ask participants about the available sanitation system in their areas.
4. Highlights the advantages and limitations of both sanitation systems.
5. Encourage the participants to share their preference on the types of sanitation system.
6. Explain different forms of wastewater generation. Inform the participants that these terminologies are not universal but are used for consistency in this workshop.
7. Then explain the terminologies used in faecal sludge management.
8. Explain the importance of faecal sludge management in terms of finance, technical, environmental and social aspects (slides 12 to 17).
9. Conclude the session with the importance of Faecal sludge management and its critical role in achieving sustainable sanitation.

Review

10 Mins

1. Ask participants about any queries regarding the session.
2. Facilitator summarizes and present the key messages and end the session

Reflection on the Lesson

LESSON 5

Technological Awareness on FSM

180 Minutes

Learning Outcomes

At the end of this session participants will be able to:

1. Detail out the 5 components of sanitation service chain.
2. Explain various treatment processes and technologies.

Materials

- Markers
- Newsprint paper

Preparation

- Prepare for power-point presentation, cue the presentation
- Print pictures of different containment and technologies
- Print name tag for different containment and technologies
- Print name tag for different offsite treatment technologies

Introduction

15 Mins

1. Inform participants that they will begin with a group activity before starting the session.
2. Divide the participants into 3 groups and assign them the names “Himalayan”, “Hilly” and “Terai”.
3. Provide each group with newsprint paper and colorful markers.
4. Instruct each group to draw a typical house that represents their assigned region of Nepal. For example, the Himalayan group should depict a house typical of the Himalayan region, while the other groups will do the same for their respective regions.
5. Allocate 10 minutes for the activity.
6. Once the time is up, each group displays their drawing on the wall at the front of the hall.
7. Ask participants to share their thoughts on why the drawings differ, taking 2-3 responses from the group.
8. Summarize the responses to highlight the key points.

Introduction to Faecal Sludge Management

60 Mins

1. Begin by presenting the first component of the Sanitation Service Chain (SSC) through a slide on hygienic latrines, engaging participants in a discussion as needed.
2. Inform participants that the second component of the sanitation service chain, containment will be discussed along with its types.
3. Announce that participants will now engage in another group activity, using the same groups formed during the introductory activity.
4. Explain that each group will receive a set of pictures depicting different types of containment, along with corresponding name tags. Their task will be to match each picture with its appropriate name tag. Inform them that they will have 5 minutes to complete the activity.

5. Distribute the pictures and name tags to each group and reiterate the instructions for the matching task.
6. Allocate 5 minutes for the groups to complete the activity.
7. Once the time is up, ask participants to review their work as the presenter displays the correct matched on the presentation slides.
8. Proceed to explain and discuss different types of containments (with brief on design considerations) with the participants. (slides 7-24)
9. Transition to the next topic by informing participants that they will now discuss various desludging methods.
10 Encourage participants to share their thoughts on desludging methods. Collect 2-3 responses.
11. With that, present information on desludging services along with transportation methods and discuss as appropriate. (slides 26-34)
12. Conclude by inviting questions from the participants regarding the types of containments, desludging and transportation to ensure clarity and understanding.

Trainer's Note: If the participants have any questions, allocate 5 minutes of time for discussion. If they don't have any questions, proceed to another slide.

Treatment Technologies

90 Mins

1. Inform participants that the next topic will focus on treatment technologies.
2. Present slides on treatment technologies, explaining their features and applications while engaging participants in discussion.
3. Highlight the objectives of treatment with slide 39.
4. Present the treatment process and technologies to the participants.
5. Now, inform participants that they will now participate in another group activity, continuing with the same groups from earlier activities.
6. Explain the activity: each group will receive a diagram outlining the treatment process. Additionally, they will be given name tags listing different treatment technologies. Their task is to correctly place each name tag under the corresponding process in the chart. Allocate 5 minutes for the activity.

Trainer's Note: If the participants have any questions, allocate 5 minutes of time for discussion. If they don't have any questions, proceed to another slide.

7. After the allocated time, ask each group to paste their group work on the wall in front of the hall.
8. Use slides to provide an overview of onsite and off-site treatment processes and associated technologies.
9. Inform participants that the focus of the session will now shift to a deep discussion of the various faecal sludge treatment technologies, starting with pre-treatment technologies.
10. Move to slide 44 and provide a detailed explanation of the bar screen. Start with an introduction to bar screen, its types, critical design considerations and its role in the FSTP during the initial treatment phase.
11. Similarly, provide a comprehensive explanation of the settling thickening tank. Cover its introduction, operational principles and importance in pre-treatment process.

12. Present the next slide to introduce the concept of solid liquid separation. Explain the significance in this process, highlighting its critical role in separating solids from liquid components.
13. Continue the session by discussing the sludge drying bed as the vital component of FSTP. Present an overview including its introduction, types, key design considerations and their advantages.
14. Inform participants that the next step in faecal sludge treatment process involves liquid treatment technologies. Provide detailed discussions on these technologies, explaining their working mechanism, key design considerations and practical applications in treating the liquid fraction of faecal sludge.
15. Highlight the importance of addressing solid particles concurrently with liquid treatment to ensure a comprehensive approach to FSM. Use slides to present an overview of various solid treatment technologies, explaining their applications and benefits in managing the solid components effectively.
10. Explain that the combination of technologies for different FS treatment processes creates a comprehensive treatment system or treatment plant. Use slides to illustrate this point.
11. Explain the challenges in selecting the appropriate sanitation technologies for FSTP.
12. Present various form of FSTP with different technologies for different conditions.
13. Introduce global efforts for innovative and transformative solutions to human excreta disposal. Mention initiatives like the “Reinvent the Toilet Challenge.”.
14. Present slides on innovative and transformative technologies, complementing the discussion with relevant videos to provide visual context and enhance understanding.

Review

10 Mins

1. Ask all the groups to revisit their group work for “off-site treatment process and technologies”.
2. Ask them to rearrange the name tags under different processes if required.
3. Allocate 2-3 minutes of time for this.
4. After the allocated time, ask all the participants to take their respective seats.

Reflection on the Lesson

LESSON 6

Design Parameter and Quantification of FS

90 Minutes

Learning Outcomes

At the end of this session participants will be able to:

1. Calculate the quantity of faecal sludge from different methods .

Materials

- Markers
- Newsprint paper

Preparation

- Prepare for power-point presentation, cue the presentation

Introduction

10 Mins

1. Initiate by revisiting the previous session. In our last session, we learned about faecal sludge and its characterization. Now we will take a closer look at the quantity of FS produced and the influencing factors.
2. Ask participants, can they share what they know or think about how much FS they produce?
3. Inform them the quantity varies significantly from one place to another. Food habits differ in different places which directly affect the generation of FS.

Faecal Sludge Quantification

40 Mins

1. Ask participant what do you think are the factors that influence the quantity of FS
2. Collect responses from 2 to 3 participants and note them down
3. Summarizing the response from participant present slides on FS quantification from slide 2 and 3.

Trainer's Note: Factors affecting FS are Location, Processed food, water usage, number of user, intrusion of groundwater, sludge accumulation rate.

4. Present the pictures of faeces and ask the following questions:
    - Population based method- variable sludge accumulation rate
    - Sludge Collection method – Not possible with manual emptying practices
    - Estimation based on Containment size, emptying frequency and number of containments – cannot be generalized
5. Explain the Population based method to estimates total sludge accumulated in the containments. For this method the data required is population/no. of users, average household size, type of containment, sludge accumulation rate (slide 5)
6. After briefing the information of the method, present an example for calculation of FS quantification using population-based method (slide 6 to 8).
7. Similar to the process, inform participants about the sludge collection method. Inform sludge collection method estimate total sludge collected by service provider in terms of number of trucks. The data required for this method are No. of vehicles, Capacity of vehicle (in m3), No. of trips. (slide 9)
8. Present an example of sludge collection method from slide 10.
9. Inform participants about the different steps for the calculation of FS generated using estimation-based method with slide 11 and 12.

Review

10 Mins

1. Allocate 5 minutes time for an open discussion, allowing participants to share their thoughts, ask questions, or provide feedback related to the content of the session.
2. Encourage participants to raise the question and contribute in the discussion. Add further insights or clarification from the trainer if necessary.
3. Conclude the session by summarizing the key takeaways and emphasizing the most important points covered.

Reflection on the Lesson

LESSON 7

Design of Faecal Sludge Treatment Technologies

270 Minutes

Learning Outcomes

At the end of this session participants will be able to:

1. Detail out the components of faecal sludge treatment plant.
2. Design various treatment technologies.

Materials

- Markers
- Newsprint paper
- Presentation slides
- Handsout on calculation samples
- Septic tank design manual
- Design graphs

Preparation

- Prepare for power-point presentation, cue the presentation
- Print pictures of different treatment technologies
- Print the necessary graphs for the design of various components.

Introduction

10 Mins

1. Show the picture of a house and ask participants to think for two minutes, "What things do you consider before buying a house?"
   - Possible answers: enough number of rooms as per family members, storeroom, open spaces, no. of toilets/ bathrooms, design of the living rooms, kitchens and garage.
2. Provide 2 minutes for participants to think about the picture of the house.
3. Ask 3 random participants what they consider before buying a house.
4. Link participants' responses to the significance of appropriate design of anything, whether it is a house or faecal sludge treatment plants to ensure sustainability and resource optimization.
5. Inform participants that we will be discussing various components of faecal sludge treatment plants in more detail.

Design

30 Mins

1. Before moving to the design, present slides explaining the importance of rational design approach in FSM.
2. Explain the critical parameters in FSM design including prerequisites, inflow characteristics, site conditions and technology selection.
3. Provide an in-depth on treatment objectives such as dewatering, stabilization, pathogen reduction and nutrient management.

Hands on Design

215 Mins

Inform Hands on Design Activity to participants that now they will be designing a nature-based FSTP using the information provided.

Design of Bar Screen Chamber

1. Begin the session by addressing: “As part of our training today, we will focus on designing the first critical step of a faecal sludge treatment plant—the pretreatment technology, specifically the bar screen chamber.
2. Engage the participants with an inquiry: “Can anyone share what they know about the bar screen chamber from our previous discussion on FSTP components?”
3. After the responses from the participants, inform them we will now proceed with the detailed design of the bar screen using the provided data.
4. The data and design steps will be presented through slides and will work through each step together.
5. Inform participants that they are free to raise any questions or doubts and they will be addressed on the spot.
6. Once everyone is confident in designing the bar screen, move on to designing the other components.

Design of an Unplanted Sludge Drying Bed

1. Next, will focus on designing the unplanted sludge drying bed, which is essential for dewatering and drying sludge efficiently. The data provided will be used and follow a step-by-step design approach together.

Design of Septic tank

1. Following that, the septic tank will be designed, a critical primary treatment unit for settling and sludge digestion, using the same structured process

Design of Anaerobic Baffle Reactor and Anaerobic Filter

1. Then will proceed to the anaerobic baffled reactor followed by anaerobic filter, a secondary treatment unit that enhances sludge stabilization through anaerobic digestion, ensuring participants fully understand its design principles

Design of Horizontal Fow Constructed Wetland

1. Finally, the horizontal flow constructed wetland will be designed, which provides tertiary treatment by removing nutrients and polishing the effluent.

? Review

10 Mins

1. For each component, data will be presented through slides and will practice the design steps collaboratively.
2. Questions or doubts will be addressed in real time to ensure clarity before moving to the next component.”
3. Further insights or clarification will be provided by the trainer if necessary.

Reflection on the Lesson

LESSON 8

Presentation of Design and Discussion

90 Minutes

Learning Outcomes

At the end of this session participants will be able to:

1. Present their design workout.
2. Clarify any issues that arise during the design of various components of FSTP.

Materials

- Markers
- Newsprint paper

Preparation

- Pepare for power-point presentation
- Case studies

Introduction

15 Mins

1. Initiate the session by highlighting the importance of proper design.
2. Share the challenges that have been faced due to poor design selection.
3. Set the stage by saying, the designs we create or review today should not be technically sound only but also contextually appropriate and sustainable. Let's approach this session with a mindset to learn, discuss, and innovate.

Presentation and Discussions

60 Mins

1. Inform participants to display and present their design sheet to a larger group.
2. Provide 10 minutes for each group.
3. Instruct participants to explain the key design considerations and parameters they assumed or used in their designs. The rationale behind the technology selection.
4. Encourage participants to share any challenges they encountered while designing specific components of the faecal sludge treatment plant.
5. Once all presentations are complete, facilitate an open discussion where participants and facilitators provide constructive feedback and share insights.

Review

15 Mins

1. Summarize the main takeaways from the presentations and discussions.
2. Highlight key lessons learned and encourage participants to refine their designs based on the feedback received.

Reflection on the Lesson

LESSON 9

Q and A session; Experience Sharing

90 Minutes

Learning Outcomes

At the end of this session participants will be able to:

1. Clarify any technical doubt related to the design of FSTP
2. Share personal experiences, insights and learning from real-world scenarios

Materials

- Markers
- Newsprint paper

Preparation

- Prepare the slides
- Real world examples

Introduction

15 Mins

1. Inform participants this is a dedicated session to address questions and hear the experiences related to design of FSTPs.
2. Emphasize them by saying your inputs and queries are vital, as every design challenge or innovative solution can contribute to building better FSTPs."

Q & A Experience Sharing

45 Mins

1. Open the floor for participants to ask their questions.
2. Allow participants and facilitators to provide responses.
3. Start with a simple open-ended question: what specific challenges do you have about designing FSTP?
4. Encourage participants to ask questions about real world scenarios.
5. If all the participants are clear on the topic, invite participants to share their experiences in FSTP design and implementation.
6. Focus on the theme such as challenges in site selection, technology selection, data collection and design parameters.
7. Encourage group discussion around the shared experiences.

Review

30 Mins

1. Recap the most significant questions, answers and experiences shared.
2. Encourage participants to apply the insights gained to their ongoing or future FSTP projects.

Reflection on the Lesson

LESSON 10

Training Evaluation and Training Closing

100 Minutes

Learning Outcomes

At the end of this session participants will be able to:

1. Evaluate whether learning expectations were met.
2. Analyze the training and provide feedback on the training.

Materials

- Expectations from the opening session
- Certificates
- Post-test forms
- Evaluation forms
- Camera for group photo

Preparation

- Print and prepare certificates
- Prepare the learning expectations from the opening session
- Print the post-test forms and evaluation forms
- Select one to two representatives from similar organizations to deliver the closing remarks. Include one representative from a private firm, another from an NGO, and one from a government office or as availability.

A formal closing ceremony may be part of the training's conclusion. Consult with your host in advance to understand the protocol and determine the time needed, allowing you to adjust your agenda as necessary.

Review of The Training

50 Mins

1. Prepare five stations, each labelled with a specific topic. Use a clearly visible cardboard to display the topic at each station.
2. Divide participants into groups, ensuring each group consists of four members (or adjust based on participant numbers).
3. Each group will visit one station at a time.
4. At each station, participants will collaboratively outline details related to the assigned topic based on their knowledge and understanding. These details can include definitions, drawings, design parameters, or the effectiveness of components.
5. Groups will have 5 minutes at each station to complete their input.
6. After 5 minutes, groups rotate to the next station.
7. At each new station, the group adds new and original details to the topic, avoiding repetition of points made by the previous group.
8. Repeat this process until all groups have visited all five stations.
9. Once all groups have completed the rotation, each group will present their collective work from all stations to the entire class.
10. Each group will get 5 minutes to present their work.

Revisiting Expectations

10 Mins

1. Announce to participants that the session is concluding and they will now reflect on how well the training has met their initial expectations.
2. Inform participants that the focus will be on reviewing the expectations they shared at the beginning of the training.
3. Bring the sheet listing all the collected expectations to the front of the hall.
4. Go over each expectation, revisiting what was collected at the start of the training to assess how well these expectations have been addressed during the session.

Post Test and Evaluation

15 Mins

1. Inform participants that the next activity involves evaluating the training program.
2. Inform them that they will complete two forms: a post-test form to assess their learning and a training evaluation form to provide feedback on the training.
3. Clarify that the purpose of the evaluation is twofold: to measure individual learning and to evaluate the overall effectiveness of the training.
4. For the evaluation, participants will get a printed form.
5. Participants will get 10 minutes for the activity.
6. Provide the post-test forms to participants and ask them to fill.
7. Once finished, distribute the training evaluation forms for them to complete.
8. After all participants have submitted both the forms, proceed to the certificate distribution ceremony.

Certificate Distribution

15 Mins

1. Inform participants that they are now going for the certificate distribution.
2. Begin with a brief opening remark to acknowledge participants' effort and highlight key achievements during the training.
3. Emphasize the importance of certificates as recognition of their learning and participation.
4. Invite a guest /host to hand out the certificates for added significance.
5. Call participants one by one in an alphabetical order to receive the certificates.
6. Announce each participant's name clearly and allow for a handshake or a brief interaction with the presenter as they receive their certificate.
7. Encourage applause after each participant's name to create an engaging and celebratory atmosphere.

Closing and Group Photo

10 Mins

1. Ask a representatives from the participants to deliver the closing remarks.
2. Request the guest to deliver the closing remarks.
3. Conclude the ceremony with a thank-you note, recognizing the participants, trainers, and organizers.
4. After closing, ask participants to join for a group photo

Reflection on the Lesson

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