

# Online Training Programme on **Co-treatment of Faecal Sludge in Sewage Treatment Plant**

**STOP TRAINING OF TRAINERS  
NOVEMBER 2<sup>nd</sup> – NOVEMBER 10<sup>th</sup>, 2020**



National Institute of Urban Affairs



Sanitation Capacity  
Building Platform



ECOSAN  
SERVICES  
FOUNDATION



ONLINE TRAINING PROGRAMME ON

# Co-treatment of Faecal Sludge in Sewage Treatment Plant

TRAINING OF TRAINERS  
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## **TITLE**

**Online Training Programme on Co-treatment of Faecal Sludge in Sewage Treatment Plant**

## **PUBLISHER**

National Institute of Urban Affairs, Delhi

## **RESEARCH PROJECT**

SANITATION CAPACITY BUILDING PLATFORM

## **CONTENT**

The report summarizes the online training programme conducted under Sanitation Capacity Building Platform during the COVID 19 pandemic. The report elaborates on the online training given to the officials from ULBs and state government organizations, faculties of nodal training institutes, TSU/PMU's and experts from private consulting firms in India on Co-treatment of faecal sludge in STP. This certificate course would have helped to understand all aspects & importance of Co-treatment of septage & sewage across the treatment & service value chain.

## **GRAPHIC DESIGN**

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Year of Publishing 2020

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# Abbreviations

<b>ABR</b>	Anaerobic Baffled Reactor
<b>AF</b>	Anaerobic Filter
<b>BIS</b>	Bureau of Indian Standards
<b>CEPT</b>	Centre for Environmental Planning & Technology
<b>CPHEEO</b>	Central Public Health and Environmental Engineering Organisation
<b>CSP</b>	City Sanitation Plan
<b>CW</b>	Constructed Wetlands
<b>DEWATS</b>	Decentralized Wastewater Treatment Systems
<b>DPR</b>	Detailed Project Report
<b>DTS</b>	Decentralised Treatment System
<b>ESF</b>	Ecosan Services Foundation
<b>FS</b>	Faecal Sludge
<b>FSSM</b>	Faecal Sludge and Septage Management
<b>FSTP</b>	Faecal Sludge Treatment Plant
<b>GoI</b>	Government of India
<b>IHHL</b>	Individual Households Latrine
<b>IIHS</b>	Indian Institute of Human Settlements
<b>IWSM</b>	Integrated Wastewater and Septage Management
<b>MLD</b>	Million Litre per Day
<b>NaWaTech</b>	Natural Water Systems and treatment Technologies
<b>NIUA</b>	National Institute of Urban Affairs
<b>NGT</b>	National Green Tribunal
<b>O&amp;M</b>	Operation & Maintenance
<b>OWSSB</b>	Odisha Water Supply & Sewerage Board
<b>PBMC</b>	Port Blair Municipal Corporation
<b>PCB</b>	Pollution Control Board
<b>PMC</b>	Pune Municipal Corporation
<b>SCBP</b>	Sanitation Capacity Building Program
<b>SeTP</b>	Septage Treatment Plant
<b>SOP</b>	Standard Operating Procedure
<b>STP</b>	Sewage Treatment Plant
<b>SWM</b>	Solid Waste Management
<b>ULB</b>	Urban Local Body
<b>UDDT</b>	Diversion Dehydration Toilet



# 1. Introduction

Over the past few years on-site sanitation has been widely promoted as a solution which can be quickly implemented to address sanitation issues, and it is gaining traction. As such, treatment of the contents emptied from on-site containments has become a pressing issue. While dedicated treatment facilities for this purpose have been advocated, co-treating these wastes in sewage treatment facilities is a promising option, which many countries have implemented or are exploring. This option maximizes the utilization of city infrastructure. In cases where the existing sewage treatment facilities are underutilized, co-treatment presents a ready solution for managing fecal sludge and septage.

In spite of co-treatment being a well-known practice in many countries, it remains clouded in uncertainty, especially regarding the technical advisability, and potential risks of co-treating faecal sludge or septage in sewage treatment plants. Planners and decision-makers are often very apprehensive in considering co-treatment. As a result, the opportunity to better utilize available infrastructure for co-treatment of sludge is often being missed.

## Course Objective

To build the capacities of the participants so that they can understand, analyze and apply the learnings in the real-life scenario for technical and financial planning, execution & financial management of co-treatment of septage and sewage at a city level with some case studies in india.

An intensive 8-day course with total duration of 12 hours was designed for online delivery. In order to engage the participants and ensure that capacity is built to the level of practicing co-treatment or conducting similar training, the course was developed using a case methodology and had a mix of presentations, case studies, exercises, information videos and quizzes. The online session contributed to 9 hours of duration whereas the remaining 3 hours were dedicated to the quiz and exercise which the participants had to attempt offline. A separate session was arranged to conduct further discussions with participants to clarify their doubts and queries. A final online quiz was conducted during the last day of the session, where in the overall learning impact assessment was done.

In order to successfully complete the course with certification, the participants had to attend all the sessions, attempt all the 7 session quizzes, complete the exercise and attempt the final online quiz.

# 2. Agenda

Following is the day wise agenda of the training. A detailed minute to minute agenda is available in the annexure.

**Table 1: Agenda of the Training of practitioners**

Day	Session	Topic	Contents	Duration [min]
Monday, 2 November 2020	1	Approaches for Faecal Sludge & Septage Treatment	Stages of FSSM	90
			Approaches for treatment	
			Objective of treatment	
			Treatment mechanisms	
			Stages of treatment	
			Standards for treatment	
Tuesday, 3 November 2020	2A	Characterization of Liquid Waste: Faecal Sludge, Septage & Sewage	Parameters for characterization	90
			Characteristics of sewage	
			Types of sludge & its characteristics	
			Exercise: Concentration & load; Peak flow rate & Loading rate	
	2B	Sewage Treatment Plant & Co-Treatment	Objectives of Treatment	
			Treatment mechanisms	
			Treatment chain- Multi barrier approach	
			Addition of sludge for Co-treatment	
			Impact of unscientific Co-treatment of sludge	
			Exercise: Forming treatment chain at Sewage Treatment Plant	
Wednesday, 4 November 2020	3	Planning of Co-treatment of Sludge & Sewage	Identifying Co-treatment opportunities	90
			Precautions for adding sludge in sewerage system	
			Stages of planning	
			Checklist for collection of data	
			Administrative controls for conducting Co-treatment of septage with sewage	
			Exercise: Pre-feasibility check for Co-treatment of septage with sewage	
			Case Study: Kargi STP, Dehradun, Uttarakhand	

Day	Session	Topic	Contents	Duration [min]
Thursday, 5 November 2020	4	Septage Receiving Station	Importance of Septage Receiving Station	90
			Components of Septage Receiving Station	
			Types of Septage Receiving Station	
			Solid Liquid Separation	
			Standard Operating Procedure at Receiving Station	
Friday, 6 November 2020	5	Co-Treatment in Liquid Stream at STP	Treatment units in Liquid Stream;	90
			Design Criteria	
			Precautions & checks for Co-treatment	
			Mitigating the impact of Co-treatment through O&M	
			Exercise: Check for primary & secondary treatment units for Activated Sludge Process for Co-treatment	
Saturday, 7 November 2020	6	Co-Treatment in Sludge Stream at STP	Treatment units in Sludge Stream	90
			Design Criteria	
			Precautions & checks for Co-treatment	
			Mitigating the impact of Co-treatment through O&M	
			Exercise: Check for thickening, digestion treatment units for Activated Sludge Process for Co-treatment	
Monday, 9 November 2020	7	Disinfection of Sludge	Treatment Objectives	90
			Co composting	
			Thermal Drying	
			Thermal treatment of Biosolids	
			Case Study: Puri, OWSSB	
Tuesday, 10 November 2020	8	Final Assessment	Final Assessment & Exercise Discussion	90

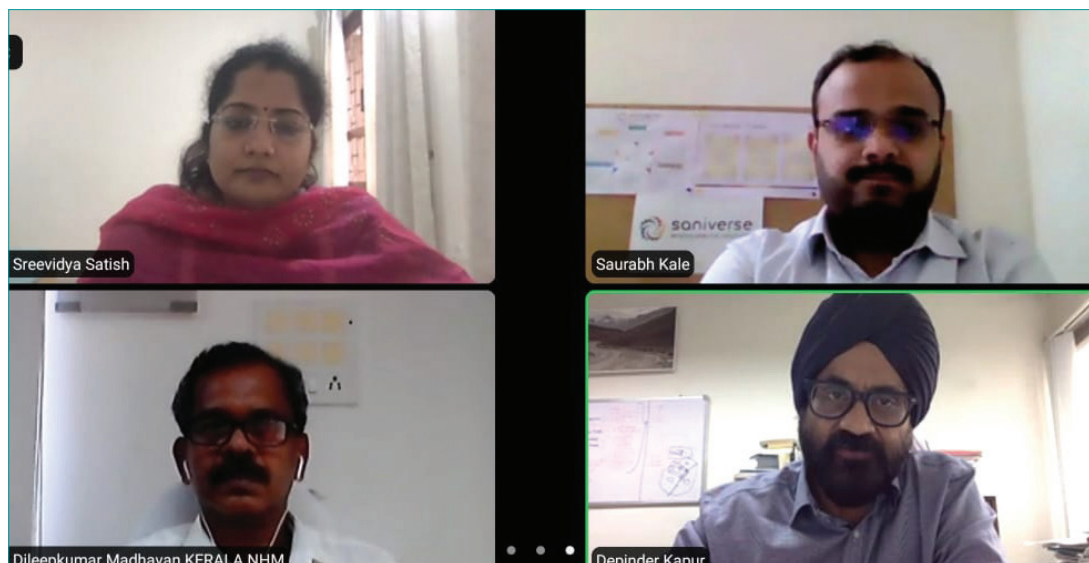
# 3. Sessions

## 3.1 Day 1, November 2nd, 2020

The training program commenced with a brief introduction of the advanced online training program on Co-Treatment of Faecal Sludge & Septage by the moderator, Mrs Sreevidya Satish. The participants were briefed about the reference material provided, exercises to be attempted, concept note & overall online training decorum to be maintained during the course of these 8 days. The objectives of the training program, course outline, final assessment, certificate distribution regulations, course structure, training tools, platforms for training were explained by the moderator in the introduction session.

Mr. Depinder Kapur, Team Leader, SCBP, NIUA welcomed all the participants to this online training program and shared his overall views on the importance of this co-treatment module and how this subject needs to be tackled by our country in the coming days. He also introduced the SCBP team and the ESF team by introducing the lead trainers and facilitators, followed by setting of ground rules for all the participants and explaining the mandatory criteria for the successful completion of the course.

Figure 1: Snapshot from the introductory session of the program



### 3.1.1 Session 1: Approaches for Faecal Sludge & Septage Treatment

After the introduction session, Mr. Saurabh Kale, Sr. Resource Person, ESF, Pune presented this first session. Session began with the objectives of the session being explained by the lead trainer. Following contents were discussed from the slide-deck:

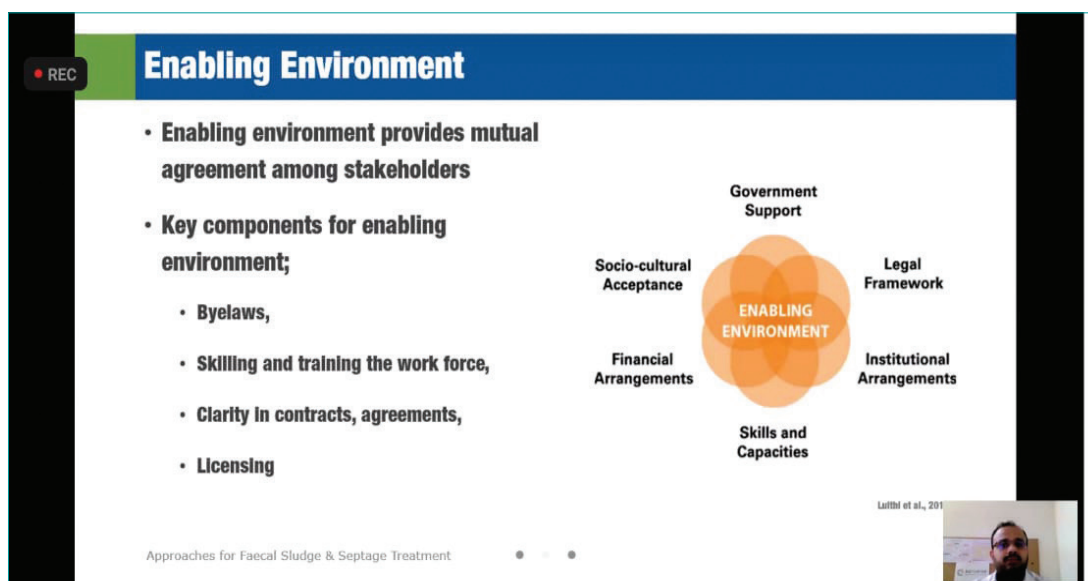
- Planning of FSSM.
- Quantification & characterization of sludge.
- Enabling environment.
- Approaches for FSSM.
- Treatment standards.
- Treatment objectives- Dewatering, Pathogen removal, Nutrient recovery, Stabilization.
- Treatment mechanism & stages- Solid liquid separation, Stabilization, Dewatering/Drying, Pathogen reduction, Potential end products.
- Treatment chain.

- Rationale for Co-treatment at STP- Hydraulic loading, Organic loading, Holistic treatment.
- Co-treatment at Municipal solid waste plants.

Following were the key takeaways from this session:

- Co-treatment at STP has a very high benefit to cost ratio.
- Co-treatment of faecal sludge & septage at STP provides holistic solution to managing sludge.

Figure 2: Snapshot from the session on approaches on faecal sludge & septage management



Following questions were raised during the session:

- Has CPCB released any discharge standards for biosolids?
- Is Co-treatment possible in the form of standalone treatment?

After the session ended, Mr. Akshay Agarwal, Program Officer, NIUA explained the Classmarker platform & showcased the overall working to all the participants. A quiz relating to the 1st session was shared with all the participants as a homework.

### 3.2 Day 2, November 3rd, 2020

The moderator welcomed all the participants for the 2nd day of the online training & she encouraged all the participants to attempt all the quizzes regularly. The lead trainer gave a brief recap about last session. All the participants were advised & encouraged to put forward any of their questions/queries in the chat box of the Zoom platform during the sessions.

#### 3.2.1 Session 2A: Characterization of Liquid Waste: Faecal Sludge, Septage & Sewage

This second day session started with the presentation on Quantification of faecal sludge and septage by Mr. Dhawal Patil, Sr. Resource Person, ESF. The following contents were covered in this part of the session:

- Characteristics of liquid waste- Physical characteristics, Chemical characteristics (Organic & Inorganic), Biological characteristics.
- Parameters of liquid waste.
- Types of sludge- Faecal sludge, Septage, Sewage sludge.
- Operational factors.

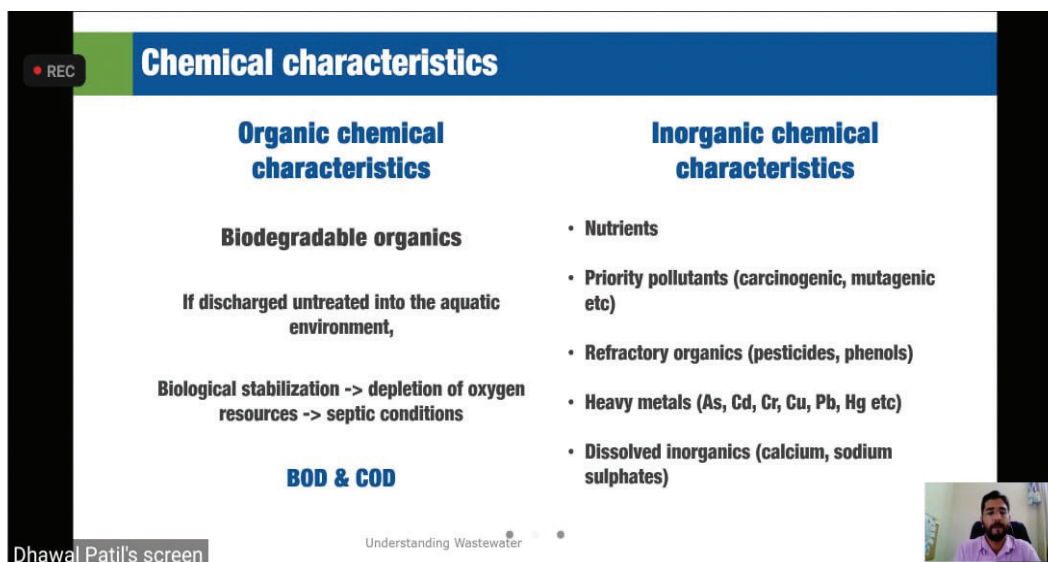
Following were the key takeaways from the session:

- Operational factors affect the characteristics of faecal sludge & septage.
- Faecal sludge & septage although similar in characteristics, is much stronger than sewage.

Following were the questions that were asked by participants followed by their answers:

- Q: Septage accumulation rate whether it is 230 L/cap/day or per annum.
- Ans: Septage accumulation rate is 230 L/cap/annum. Septage refers to sludge accumulated in septic tank and not liquid portion.
- Q: Peaking factor is defined as maximum/average quality received. What is the significance of peaking factors of <1 say 0.8 ?
- Ans: If Peaking factor is low then there will be issue when maximum quantity of FSS received at treatment plant and there will be less designed capacity of the FSTP.

Figure 3: Snapshot of the session from characterization of liquid waste



### 3.2.2 Session 2B: Sewage Treatment Plant & Co-treatment

Steps taken during the process of planning of FSTP at Port Blair were explained by Mr. Dhawal Patil, Sr. Resource Person, ESF representing sanitation service chain of the city to explain sanitation scenario in the city. The following contents were explained in this part of the session:

- Objectives of treatment
- Treatment processes- Physical, Biological, Chemical & Photolytic
- Design parameters
- Treatment stages- Primary, Secondary & Tertiary
- Primary treatment- Screens, Grit chamber, Clarifier
- Secondary treatment- Aerobic, Anoxic, Anaerobic, Combined & Lagoon processes; Non mechanised (DEWATS, Waste stabilization pond, Soil bio technology; Mechanised (Activated sludge process, Sequential batch reactor, Moving bed biofilm reactor, Membrane bio reactor
- Tertiary treatment- Chlorination, UV disinfection
- Addition of sludge for Co-treatment

Following were the key takeaways from this session:

- Wastewater treatment technologies consist of different stages or components whose design needs to be understand while designing the system.
- Wastewater treatment system design needs to be studied before deciding the points of addition of sludge while co-treatment approach.

Following questions were asked during the session followed with their answers:

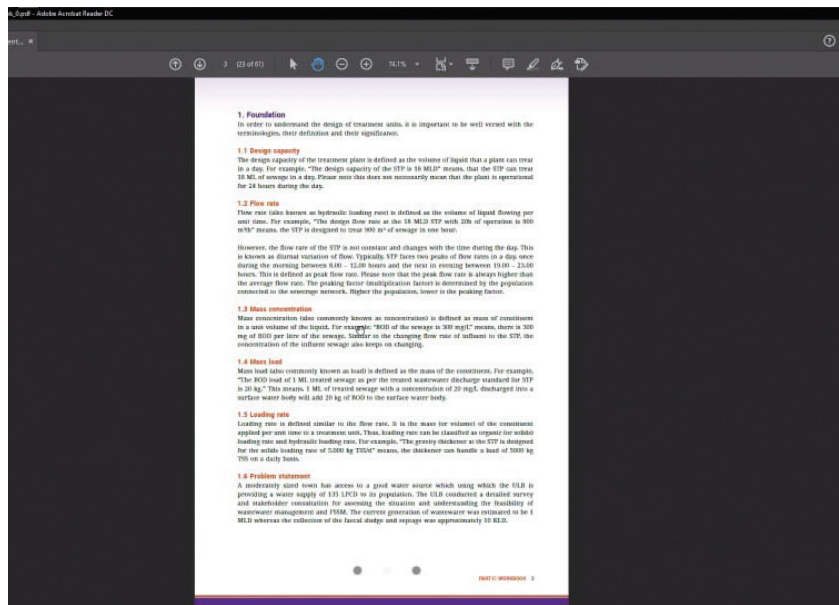
- Q: Give a clarification for tertiary treatment for the use of membranes to make it more potable?
- Ans: Yes, After the disinfection process in tertiary treatment advanced treatment mechanisms like MF, UF & NF considering the reuse aspects

### 3.2.3 Exercise: Foundation & Sewage Treatment Plant

The exercise on Co-treatment foundation was explained. The exercise comprised of calculating the peak flow rate & loading rate and forming the treatment chain at STP.

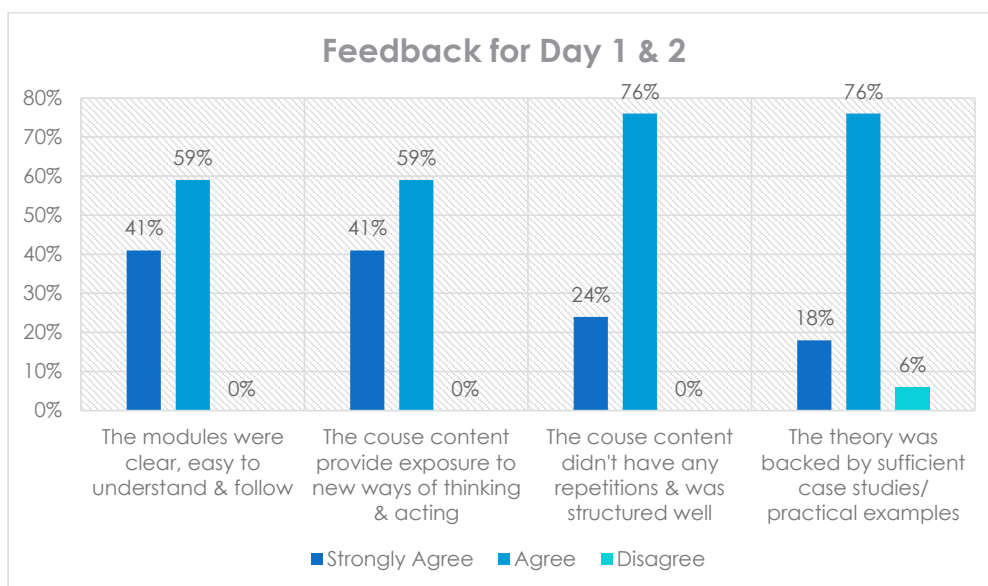
The moderator announced about the submission time of both the exercises & reminded all the participants about the timely completion of all the quizzes. The lead trainer also suggested the participants to go through the section 2 of the workbook regarding the STP.

Figure 4: Snapshot of the session explaining the foundation & formation at STP



An online poll was conducted for these 2 days training program at the end of the session. Almost all the participants very much agreed with the overall training exposure for the 2 days.

Figure 5: Graph representing the feedback for Day 1 & 2





### 3.3 Day 3, November 4th, 2020

The moderator began day 3 by welcoming all the participants & gave an overview about the training structure for the day.

#### 3.3.1 Session 3: Planning of Co-treatment of Sludge & Sewage

In this session of day 3, the objective of the session was to introduce planning aspects of co-treatment of sludge & sewage. Mr. Saurabh Kale, Sr. Resource person, ESF presented with following contents:

- Planning of Co-treatment- Identifying opportunities, Sewerage systems, Sewage treatment plant, Checklist for data collection, Scaling up of Co-treatment.
- Addition of sludge in sewerage system- Working of gravity sewers, Impact of sludge addition.
- Administrative controls- Before commissioning: byelaws, paperwork, sludge characteristics; After commissioning: SOP, Impact monitoring.

Following were the key takeaways from this session:

- Administrative controls are as important as engineering controls in case of Co-treatment.
- While performing Co-treatment, monitoring & checks need to be performed at various stages.

Following were some questions asked during the session followed by their answers:

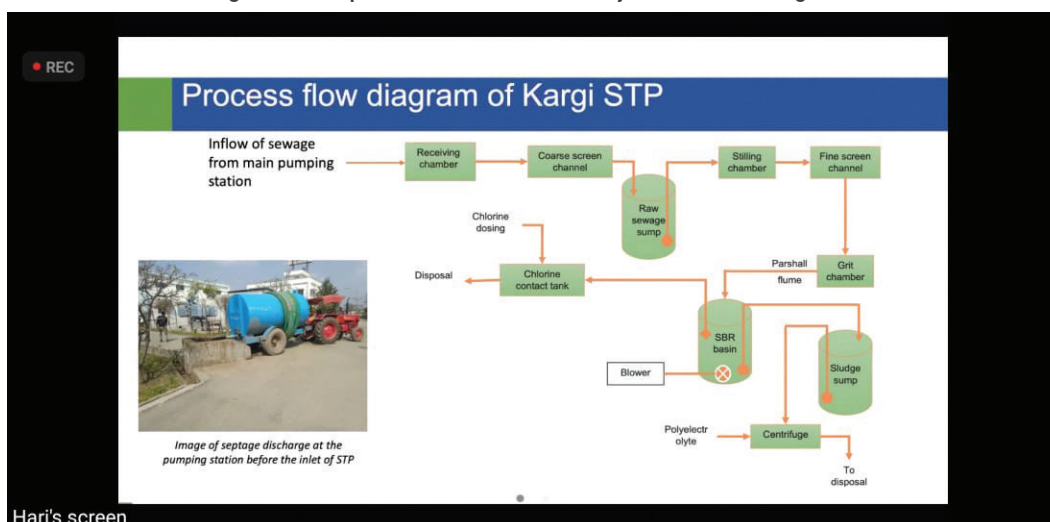
- Q: Any examples of pumping stations where septage is introduced in sewer systems?  
• Ans: Direct addition of septage in sewage pumping stations is practiced in Tamil Nadu.
- Q: What is the reason for the under-utilization of Kargi STP?  
• Ans: There seems to be a delay in getting the planned no. of sewerage connections for STP due to various reasons.

#### 3.3.2 Case Study: Kargi STP, Dehradun

Mr. Shantanu Kumar Padhi, Senior Programme Officer, NIUA was the guest speaker for this case study. He gave a brief introduction about the current work being done in the Uttarakhand state in terms of Co-treatment. Following contents were discussed in the case study:

- Background of Co-treatment at Kargi STP.
- Process flow diagram of Kargi STP (Up to 40 emptier come for desludging).
- Planning & designing for Co-treatment (Data checklist similar to IIHS was adopted).
- Rationale for Co-treatment at Kargi STP (Observations during the O&M of the STP).
- Septage characteristics in Dehradun.
- Additional components for Co-treatment at Kargi STP.
- Proposed sites for the construction of receiving station, homogenization tanks & sludge drying beds.

Figure 6: Snapshot from the case study session on Kargi STP



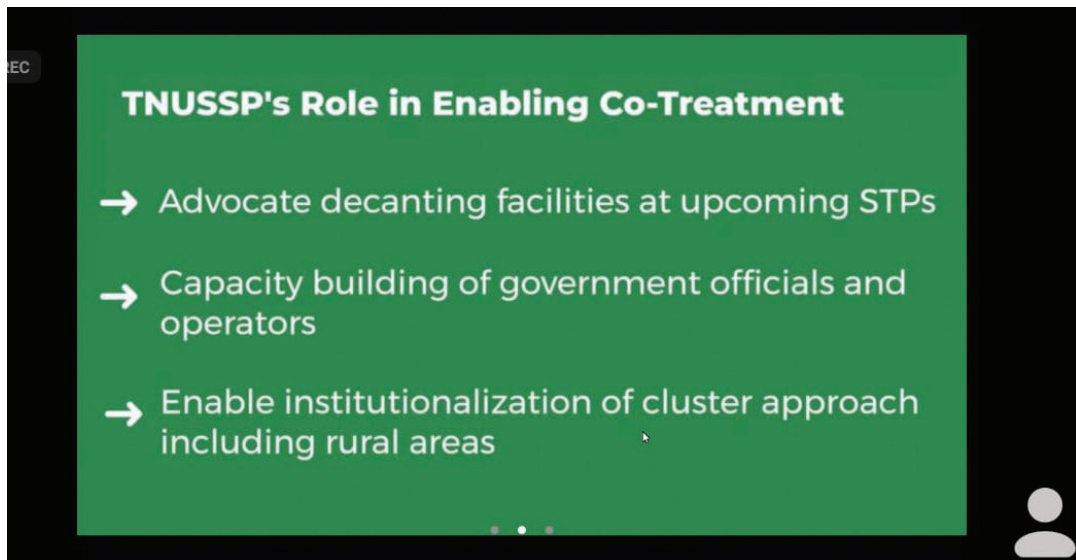
Hari's screen



### 3.3.3 Informational video- Co-treatment in Tamil Nadu overview and its potential for overall scope in India

After the case study an interesting video about how the Co-treatment management in Tamil Nadu is being done was showcased. The video described about the overall process and local conditions pertaining to STP and Co-treatment and how the TNUSSP has enabled co-treatment in Tamil Nadu state.

Figure 7: Snapshot from the video played on co-treatment in Tamil Nadu



### 3.3.4 Exercise: Pre-feasibility assessment

The exercise section of design criteria, parameters, pre-feasibility assessment study to be done for the Co-treatment at the STP's were explained by the lead trainer. He advised all the participants to be careful about the units while doing the calculations. Participants were asked to draw inferences from the exercise to be attempted by them. The moderator advised all the participants again for regular quiz completions.

Figure 8: Snapshot of the lead trainer explaining the pre-feasibility part of the exercise

**3. Pre-feasibility Assessment**

**3.1 Problem statement**

In order to curb the indiscriminate disposal of sewage into the surface water bodies, the TLD wishes to utilize the current STP for co-treatment. You are appointed as a consultant by the Water Supply and Sewerage Board (WSSB) to carry out a rapid assessment of the STP for checking the feasibility of co-treatment of faecal sludge and sewage at the STP. A meeting is convened by the WSSB where you have to present the following data:

- Current utilization of the volumetric capacity of the STP.
- Current utilization of the loading capacity with respect to BOD, COD and TSS.
- Volume of sewage available for co-treatment.

Composite sampling was carried out in to assess the characteristics of the influent sewage. Similarly in case of sewage, multiple samples were taken and sent for analysis to the lab. The tables below provide the results of the lab analysis.

**Table 8: Influent sewage characteristics at the sewage treatment plant**

Parameters	Influent concentration
BOD	182.00 mg/L
COD	365.00 mg/L
TSS	122.00 mg/L

**Table 9: Sewage characteristics collected in the city**

Parameters	Concentration
BOD	7000.00 mg/L
COD	20000.00 mg/L
TSS	5000.00 mg/L

### 3.4 Day 4, November 5th, 2020

Day 4 began with general information regarding the technical part of the training & the participants were asked to follow & ask their queries on the WhatsApp chat for further doubts. The moderator welcomed all the participants & gave an overview about what all would be covered in today's presentation.

#### 3.4.1 Session 4: Septage Receiving Station

Mr. Saurabh Kale, Sr. Resource person, ESF presented this session. He discussed the following contents:

- Receiving station- Objectives, Design, Components
- Dumping station- Layout, Inlet, Screens
- Grit removal- Parabolic grit channels, Integrated pre-treatment module
- Odour control unit- Activated charcoal filter
- Receiving station options
- Solid liquid separation- Natural systems, Mechanised systems
- Standard operating procedure at receiving station.

Following were the key takeaways from this session:

- Aim of having a receiving station is to safely transfer the septage to the treatment facility.
- Solid-liquid separation is an important objective and it helps to optimize the treatment system.

#### 3.4.2 Informational video: Screens

Mr. Dhawal Patil, Sr. Resource person, ESF gave a voiceover while explaining the video and the entire process of the manual screens in receiving station. Pre-fabricated manual screens & mechanized screens were explained in the videos by the lead trainer. He gave a voiceover discussing the camlock arrangement, cylindrical screen & various arrangements of mechanized screens for the cleaning.

#### 3.4.3 Informational video: Integrated septage receiving station & integrated mechanized septage receiving station

A video of the integrated septage receiving station & integrated mechanized receiving station was explained by the lead trainer. He explained the design & implementation and other factors considered for these types of receiving station. While the video was being played on the screen, the lead trainer gave his voice-over for explaining the video.

Figure 9: Snapshot of the video on integrated septage receiving station explained by the lead trainer



Following questions were asked during this session followed by their answers:

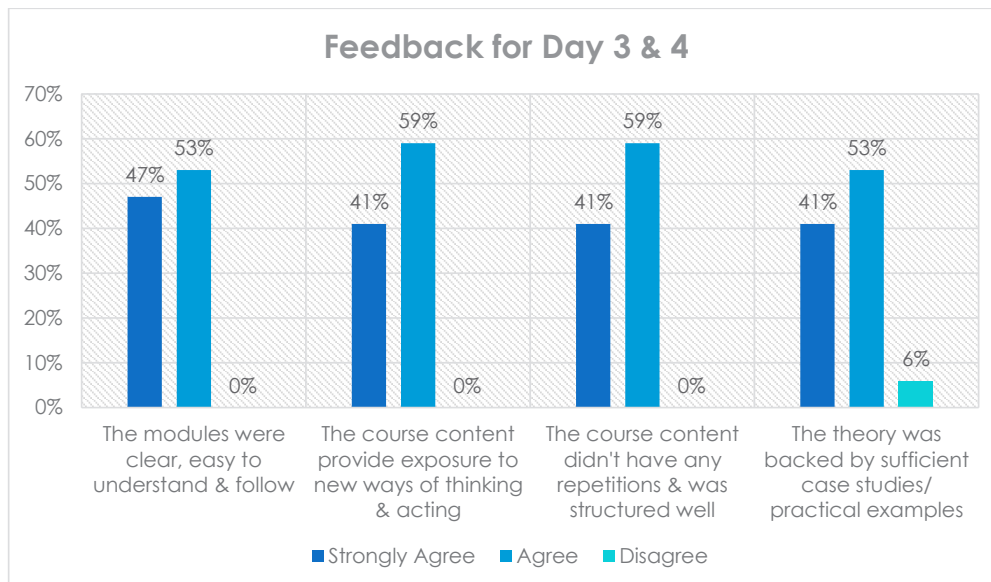
- Q: In-case of unforeseen circumstances if the septage of the truck needs to be stored temporarily, is it advisable to consider a holding tank at the inlet?
  - Ans: Yes, it's recommended to have a storage tank to store. It's important in case of a mechanised treatment plant if there is any breakdown.
- Q: Is there any specific material used for the pre-fabricated bar screen for handling septage?
  - Ans: Mild steel bars are usually preferred. Oil paint or tar-based paints are used to prevent rusting.

Figure 10: Snapshot of the Q&A session by the lead trainers & moderator



An online poll was conducted for the 3rd & 4th day training program at the end of the session. Almost all the participants strongly agreed with the overall training exposure for these 2 days. Comparing with the first 2 days of the trainings, more no. of participants voted for strongly agree.

Figure 11: Graph representing the feedback for Day 3 & 4



### 3.5 Day 5, November 6th, 2020

The moderator welcomed all the participants for the day 5 session. She informed the participants about the importance of today's session pertaining to co-treatment & laid the overview about the do's & don'ts to all.

#### 3.5.1 Session 5: Co-treatment in Liquid Stream at STP

Mr. Dhawal Patil, Sr. Resource Person, ESF initiated the session by discussing the contents of the session & it's objectives. The lead trainer told the participants to focus on the units to understand the design criteria of each of the components. Following contents were discussed in this session:

- Treatment units- Design criteria
- Primary treatment- Sedimentation, Design values, STP's in India
- Secondary treatment- Activated sludge process, components of ASP, Aeration system, Design criteria, Design values- Secondary clarifier
- Tertiary treatment- Chlorination, Design values
- Feasibility checks- Addition of sludge, Primary clarifier, Activated sludge process, Chlorination
- Mitigation measures- Primary clarifier, Activated sludge process, Secondary clarifier, Chlorination.

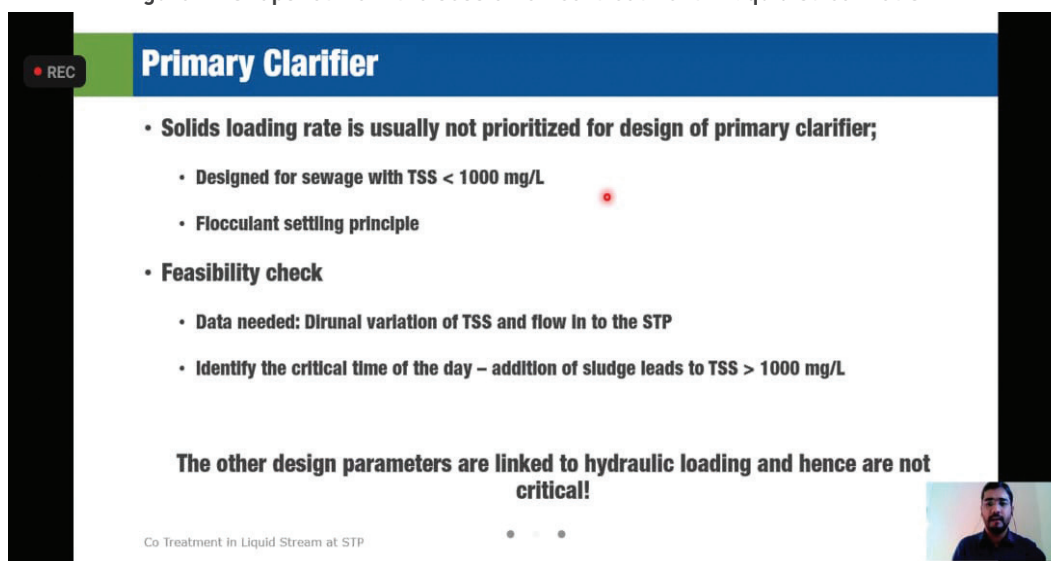
Following were the key takeaways from this session:

- Addition of faecal sludge & septage to liquid treatment stream of STP will impact the complete treatment chain of the STP.
- Proper feasibility checks & analysis helps to predict the risk of Co-treatment.

Following were some of the questions raised during the session:

- What would be the BOD & COD ratio in the supernatant in the septage after being settled?
- If an under-utilized STP has been chosen for co-treatment, then should the solids removing unit be included in septage receiving units or should it utilize the primary clarifier mechanism existing in the STP?

Figure 12: Snapshot from the session on co-treatment in liquid stream at STP



The screenshot shows a presentation slide with a blue header and a white body. The header contains the title 'Primary Clarifier' and a 'REC' icon. The body contains a bulleted list of points and a concluding statement. A small video inset of a man is visible in the bottom right corner.

**Primary Clarifier**

- **Solids loading rate is usually not prioritized for design of primary clarifier;**
  - Designed for sewage with TSS < 1000 mg/L
  - Flocculant settling principle
- **Feasibility check**
  - Data needed: Diurnal variation of TSS and flow in to the STP
  - Identify the critical time of the day – addition of sludge leads to TSS > 1000 mg/L

**The other design parameters are linked to hydraulic loading and hence are not critical!**

Co Treatment in Liquid Stream at STP

#### 3.5.2 Exercise: Detailed assessment part 1

The lead trainer gave an overview about the exercise sections to be followed from section 4 related to parameters on addition after solid-liquid separation and their feasibility checks, etc. The lead trainer advised all the participants to look out for the units while solving the equations.

Figure 13: Snapshot from the part C exercise workbook on detailed assessment study

**4.3 Addition after solid-liquid separation**  
 In this section, detailed assessment of all the treatment units will be done upon addition of supernatant and thickened sludge from settling thickening tank into the sewage stream and gravity thickener respectively.

**4.3.1 Primary clarifier**  
 Using the information from section 4.2.6 and 4.2.7 calculate total solids loading rate and hydraulic loading rate to the primary clarifier after addition of supernatant to the sewage stream.

Solids loading rate  $\left[\frac{kg}{h}\right]$   

$$= \text{Solids loading rate of sewage} \left[\frac{kg}{h}\right] + \left\{ \text{Feasible truck loads} \left[\frac{no.}{h}\right] \times \text{Supernatant load} \left[\frac{kg}{h}\right] \right\}$$

Solids loading rate = kg/h

Hydraulic loading rate  $\left[\frac{cum}{h}\right]$   

$$= \text{Hydraulic loading rate of sewage} \left[\frac{cum}{h}\right] + \left\{ \text{Feasible truck loads} \left[\frac{no.}{h}\right] \times \text{Supernatant volume} [cum] \right\}$$

Hydraulic loading rate = m<sup>3</sup>/h

This hydraulic loading rate is assumed to be constant for the subsequent liquid treatment unit.

**FEASIBILITY CHECK!**

The hydraulic loading should be lower than designed flow rate. This usually holds true provided, there is no mistake in the calculations before.

Calculate TSS concentration.

Solids loading rate  $\left[\frac{kg}{h}\right]$

### 3.6 Day 6, November 7th, 2020

The moderator welcomed all the participants & gave a brief overview about the topics for today's session.

#### 3.6.1 Session 6: Co-treatment in Sludge Stream at STP

Mr. Dhawal Patil, Sr. Resource Person, ESF undertook this session by continuing where he had left off for the previous day's training session about co-treatment in liquid stream of STP.

Following contents were discussed in the session:

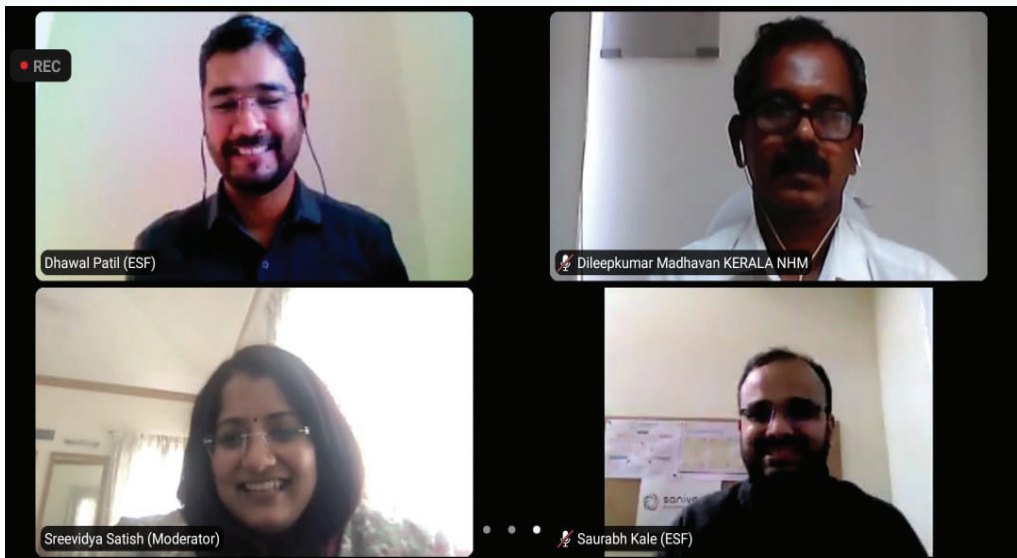
- Treatment units- Design criteria
- Gravity thickener
- Anaerobic digester- Requisites for digestion, Design parameters
- Mechanized dewatering- Considerations, Sizing of equipment
- Feasibility checks- Addition of septage, Gravity thickening unit, Anaerobic digester, Mechanized dewatering
- Mitigating the impact- Gravity thickening unit, Anaerobic digester, Mechanized dewatering.

Following were some of the key takeaways from the session:

- Solids & organic loading rates are major constraints while adding faecal sludge & septage in the sludge treatment stream.
- Hydraulic loading rate can become major constraint while adding faecal sludge & septage in liquid treatment stream.



Figure 14: Snapshot of the Q&A session by the lead trainers & moderator

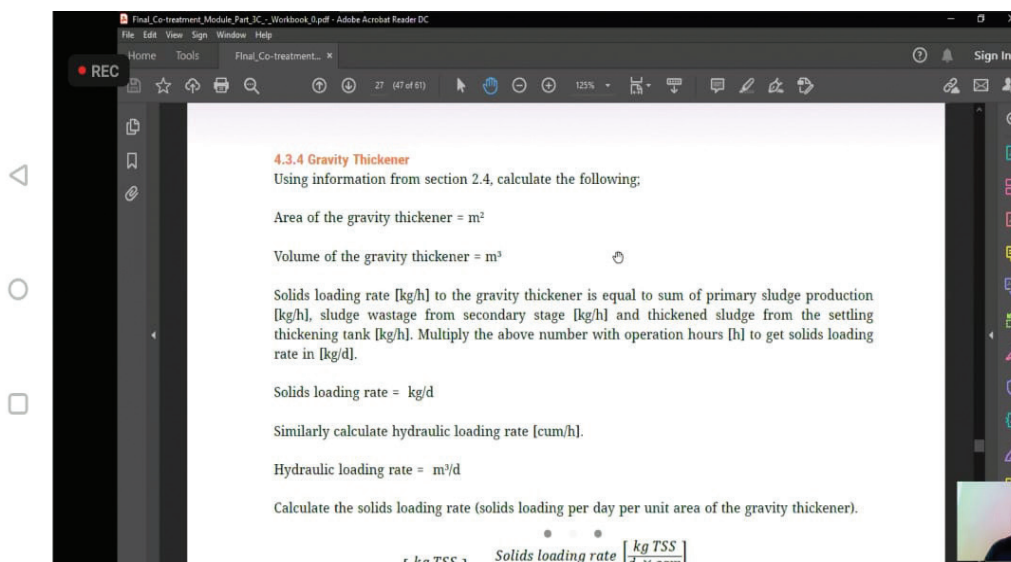


### 3.6.2 Exercise: Detailed assessment part 2

The lead trainer resumed his explanation regarding the exercise section 4.4 from workbook C. He gave an overview for the parameters on addition in sewage sludge and their feasibility checks from the exercise workbook. The lead trainer suggested the participants to try and attempt all the sections from the exercise which would help them in exploring more about the design parameters regarding Co-treatment. The main objective behind solving such exercises is to make the participants understand the various details while preparing any DPR.

The moderator also requested all the participants to come forward to ask any questions if they encountered at any point of time. All the quizzes were in a way indirect. So instead of rote learning from the literature provided, the participants were made to think logically & move forward with such type of questions which would help them to apply the knowledge correctly.

Figure 15: Snapshot from the exercise section 4 being explained by the lead trainer



### 3.7 Day 7, November 9th, 2020

The moderator welcomed all the participants for last day's training session. She instructed all the participants regarding the final session, everyday quiz & assignment exercises. While the other lead trainer was open to answer all the queries & told the participants to put forth the same in the chat box.

#### 3.7.1 Session 7: Disinfection of Sludge

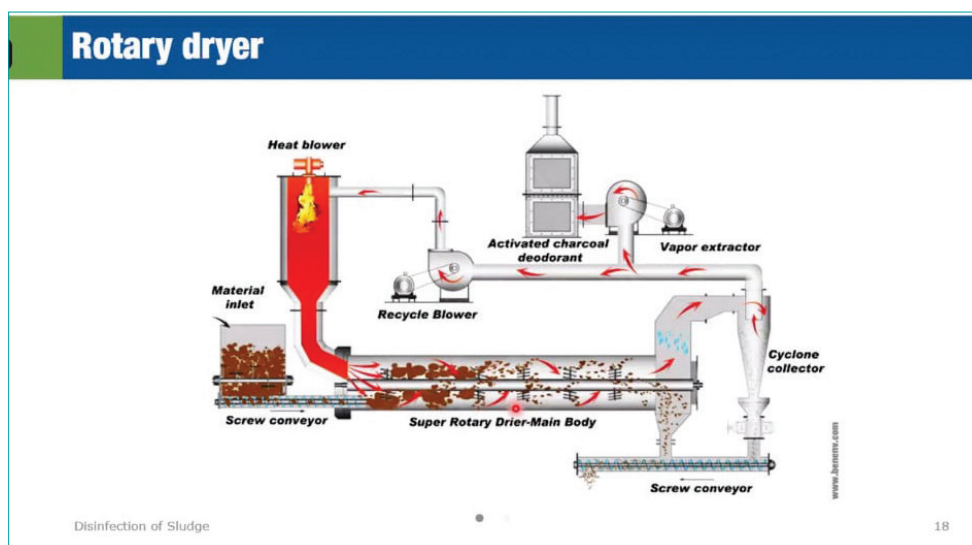
Mr. Saurabh Kale, Sr. Resource Person, ESF presented the final session of the online training program. He gave a brief idea about the overall structure of the same. Following contents were covered in the session:

- Treatment objectives
- Co composting
- Solar drying house- System description, Performance range, Design criteria, Operational & design considerations
- Thermal drying- System description, Performance range, Operational & design considerations, Design criteria, Rotary dryer, Belt dryer, Paddle dryer, Fluidised bed dryer
- Thermal treatment of biosolids- Incineration, Types of incinerators, Pyrolysis, Dry pyrolysis, Biochar, Hydro thermal carbonization.

Following were some of the key takeaways from the session:

- Thermal drying is more controllable as compared to solar drying, however it is more expensive for implementation and O&M.
- The sludge needs to be dried to increase the solids content to more than 60% for incineration. Higher the solid content, better it is for combustion.

Figure 16: Snapshot from the session on disinfection of sludge



#### 3.7.2 Case Study: Co-treatment of faecal sludge & septage at Puri STP, Odisha

Mr Prasanta Kumar Mohapatra, Project Director, State level septage cell-OWSSB was the guest speaker for this case study session. The moderator welcomed the guest speaker to address the participants. He explained the overall faecal sludge management in Odisha state at a glance. Following contents were covered by him:

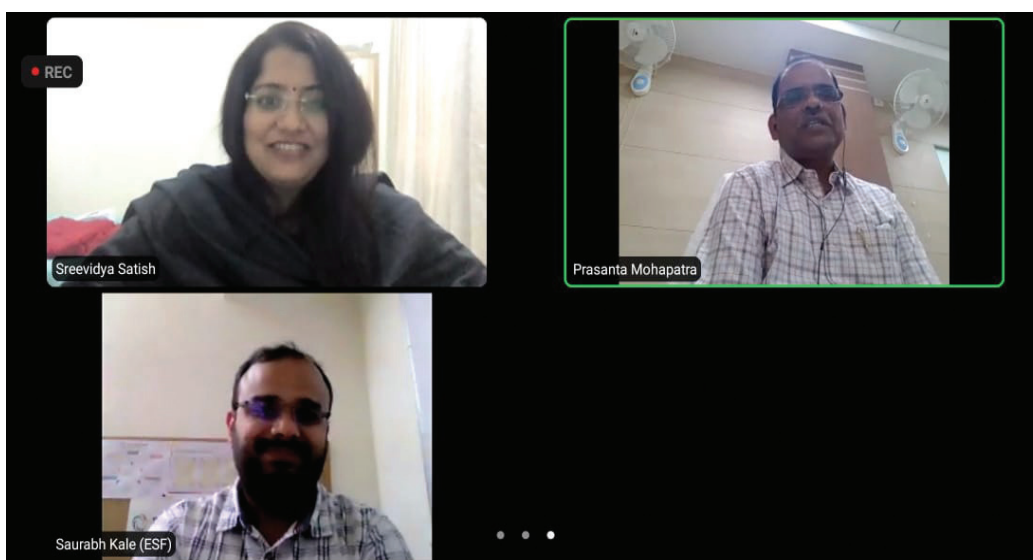
- FS treatment processes adopted in Odisha state
- Solids separation + DEWATS
- Solids separation + STP
- Co-treatment at Puri STP- Treatment components
- STP + FSTP Water quality parameters

The moderator thanked the guest speaker for his valuable insights in sharing the amazing work being done in Orissa state for FSSM & asked the participant to raise their questions if they had any.

Figure 17: Snapshot from the case study session on Puri FSTP



Figure 18: Snapshot during the interaction between the guest speaker & moderator



### 3.7.3 Informational video: Solar drying system & sludge drying system

The working of a solar drying system from Helaintis Suez & sludge drying system from Andritz were explained by the lead trainer through a voice-over.

The moderator requested all the participants to attempt all the quizzes & exercise as it was mandatory for their certificates. All were asked to share their genuine & constructive feedback for improving the co-treatment module as this was the first time that this module was being tested.

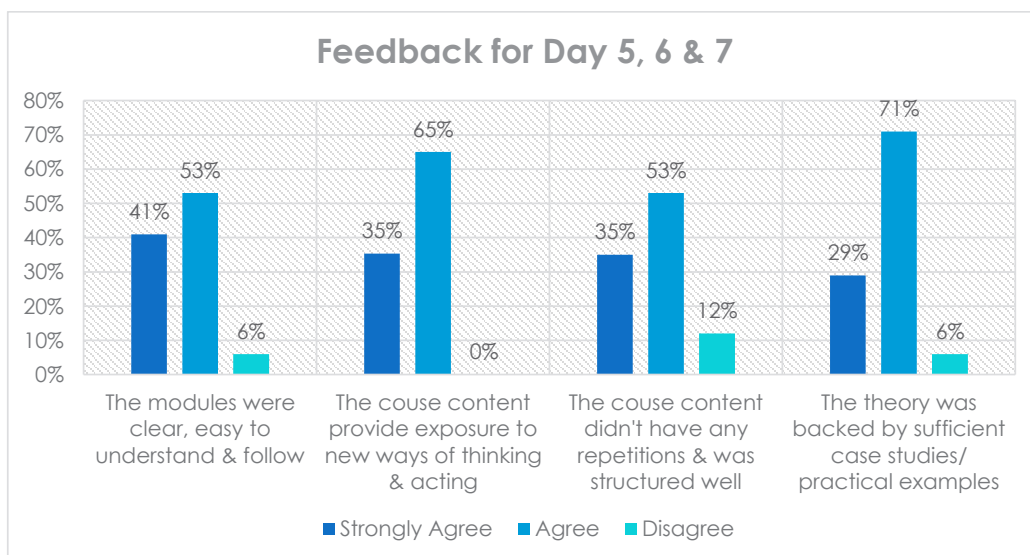


Figure 19: Snapshot from the video explaining the solar drying system by the lead trainer



An online poll was conducted again for the 5th, 6th & 7th day training program feedback at the end of the session. Almost all the participants strongly agreed with the overall training exposure for these 3 days too.

Figure 20: Table representing the feedback for day 5,6 & 7



## 8. Day 8, November 10th, 2020

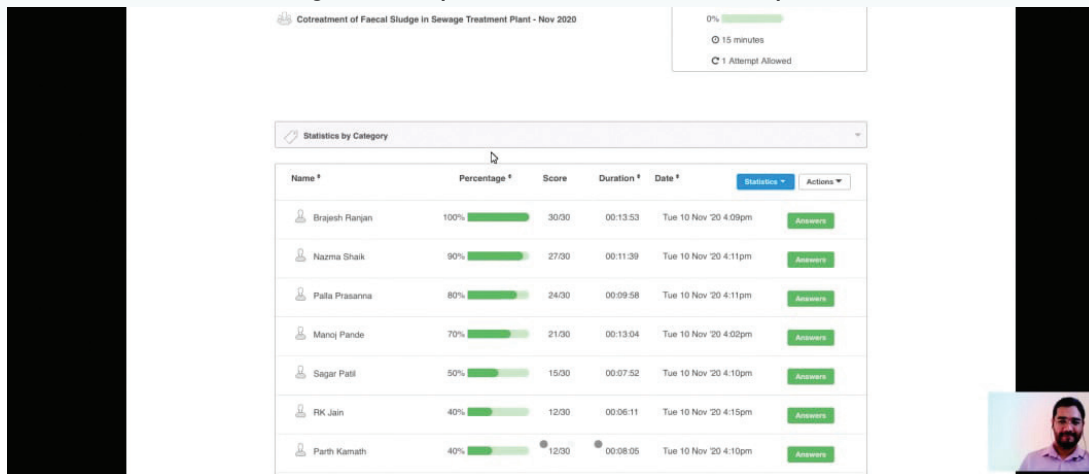
Until the closing session began the participants were asked to resolve their doubts if they had any with the lead trainers. The moderator welcomed the participants for the final session. She discussed about the following aspects in the online training- Course overview, Participants, Online live quiz & exercise status, Feedback, Q & A session, Final assessment, Course certificate.

For the 2nd exercise-assignment submission the deadline was extended for 5 more days for completing & attempting it. Few participants shared their live feedback during the closing session. Their testimonials could be seen below in the feedback section of the report. Mr. Brajesh Ranjan was the top scorer in the live quiz session.

### 3.8.1 Closing Session

After the Q&A session, live quiz covering the topics for the whole training was conducted through Class marker platform.

Figure 21: Snapshot of the results of the live quiz



After the online quiz, a live feedback was taken from some of the participants during the session. They were requested to share their whole experience & learnings from this training.

Figure 22: Snapshot of the participants sharing their live feedback



After the feedback, the certificate issuance criteria & it's process for the completion of training program was explained again by the moderator to all the participants. The moderator invited Mr. Depinder Kapur, Team Leader, SCBP-NIUA & Ms. Jyoti Dash, Sr. Programme Manager, NIUA for a vote of thanks to end this training program.

Figure 23: Snapshot of Mr. Depinder Kapur addressing all the participants



Figure 24: Snapshot of Ms. Jyoti Dash offering her vote of thanks



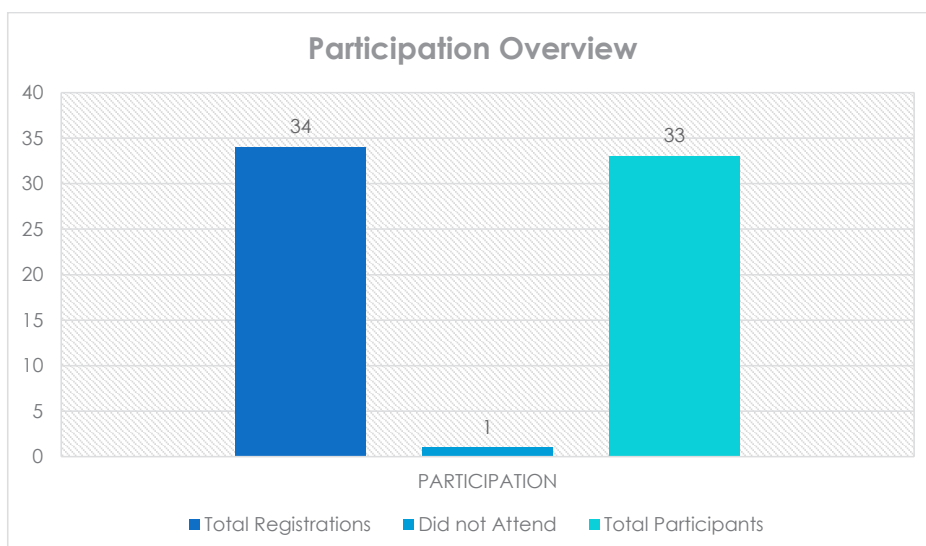
# 4. Summary & Feedback of the Training

The summarized data of participation & the relevant feedback always helps to get an overview about how well the training program was conducted and what all improvements can be further implemented in designing the course. Considering the summary & feedback carried out for the overall training, following inferences were drawn.

## 4.1 Summary

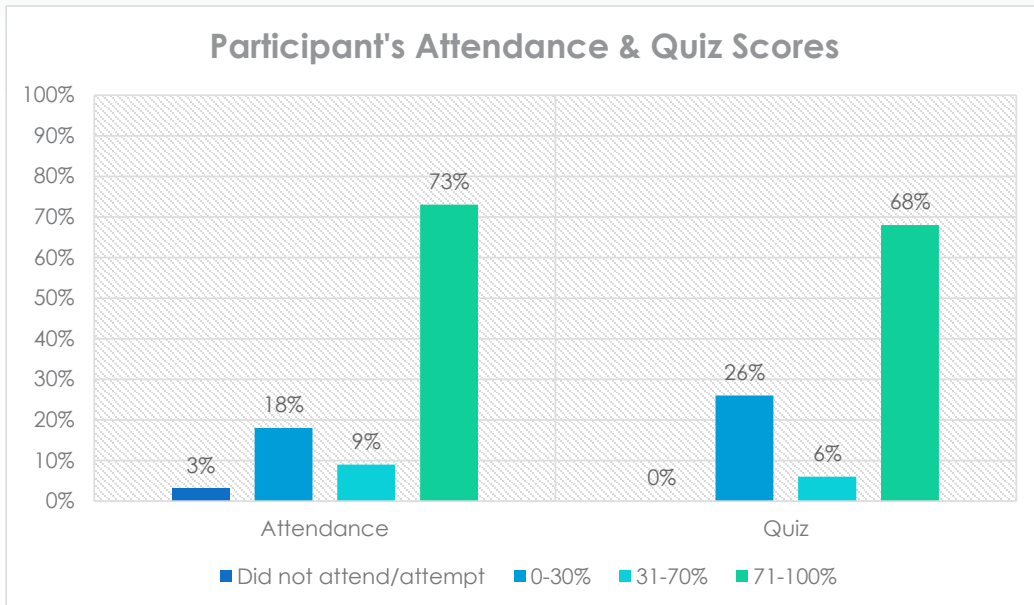
The graph below shows the overall participation during the training. Out of the 34 participants who had registered for the training, 33 participants attended the entire training program. Only 1 participant from UK Jal Sansthan did not attend the training.

Figure 25: Graph representing the participation overview



The graph below describes the total participation of the participants over the period of 8 days and the scores range for the regular session quizzes. On an average, 69% of the participants have attempted the session quizzes and have scored an average of 59% marks. 47% of the participants attempted the online live quiz in the last session. This quiz is difficult since, the questions are based on all the sessions and are indirect questions wherein the participants have to apply the knowledge and concept gained during the training. The average score of the participants was 57%. 38% of the participants who attempted the quiz scored higher than 57%.

Figure 26: Graph showcasing participant's attendance and quiz scores



The graph below shows the data showcasing the overview of participants who had completed the exercise assignments & the entire course for certificate. 61% of the participants attempted the first part of the exercise and scored an average of 66% marks. The second part of the exercise consisted of detailed assessment of the STP for co-treatment and was perceived as complex by the participants. None the less, 48% of the participants attempted the second part of the exercise and scored an average of 41% marks.

#### 4.1.2 Training Feedback

The graph below represents the learning outcomes of the participants where they have rated about their learnings from this training program. The ratings are out of 10. It has overserved that the all participants have liked the course content which is related to their current work profiles and the course has improved their understanding about the Co-treatment. 62% of the participants have given average rating of greater than 9.

Figure 27: Graph representing the total exercise submitted & the certificate completion status

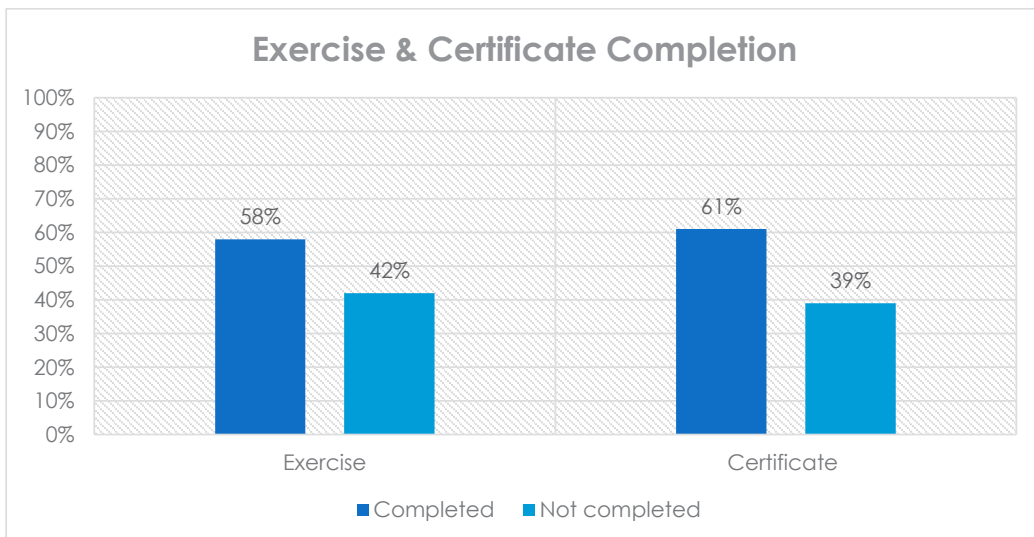
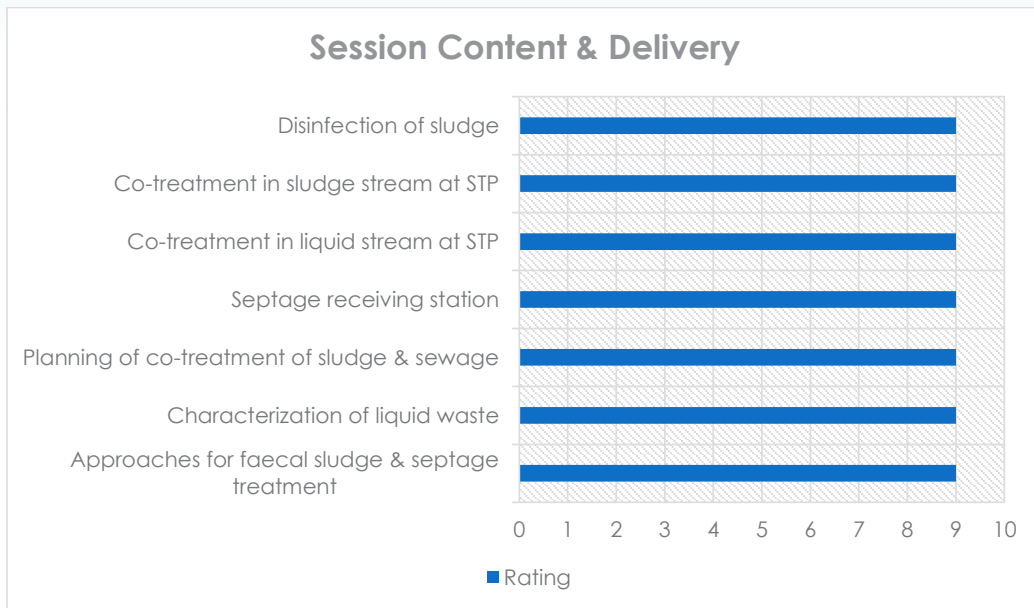
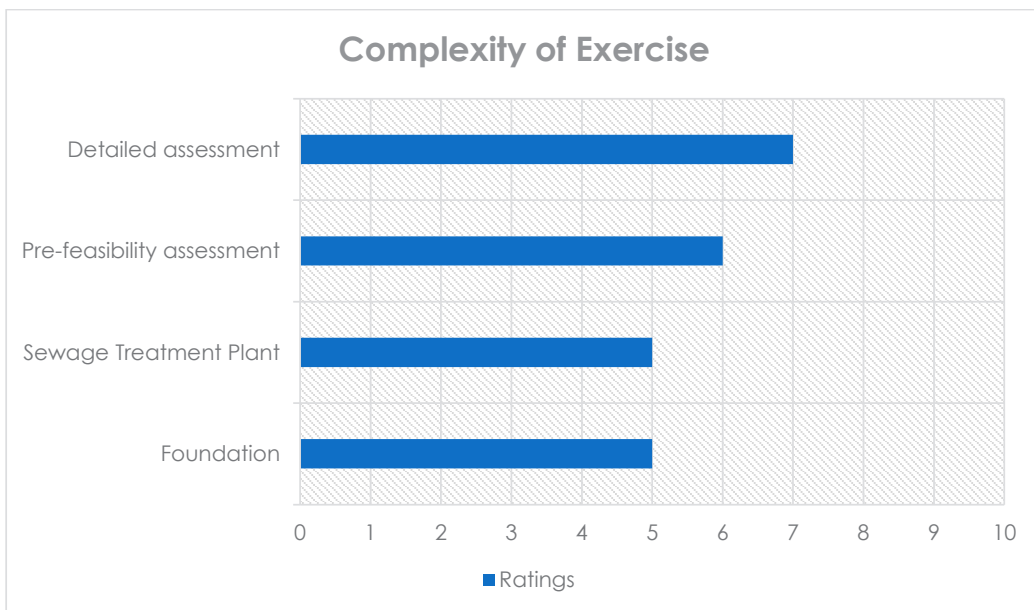


Figure 28: Graph representing the ratings of the session content and delivery



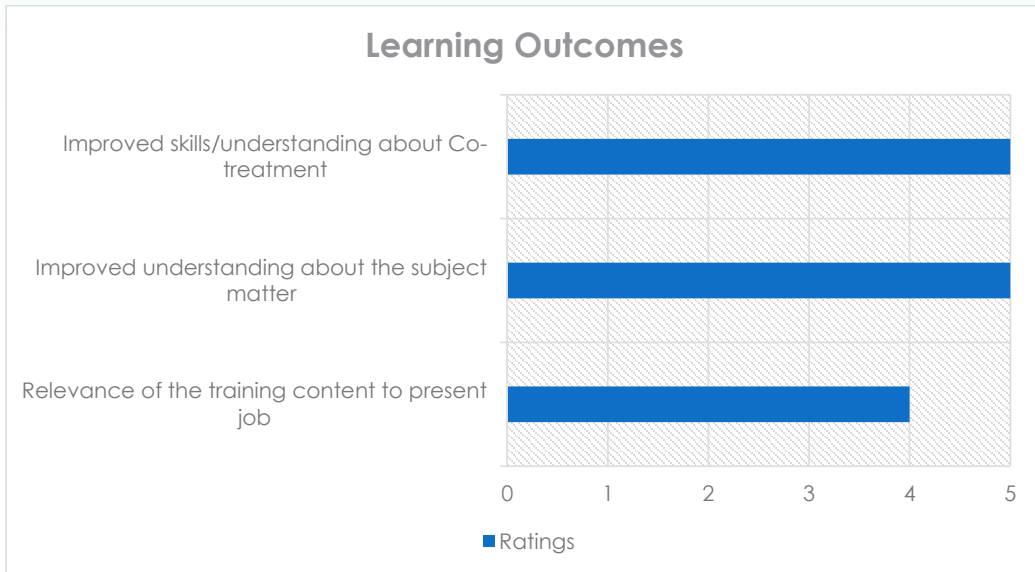
The graph below shows the complexity level of each of the exercises that the participants experienced during the course. The ratings are out of 10. Except the last exercise on detailed assessment, the rest of the exercises were moderately difficult. The participants with prior experience in designing and implementation of STPs found the detailed exercise moderately complex.

Figure 29: Graph representing the ratings for complexity of the exercise



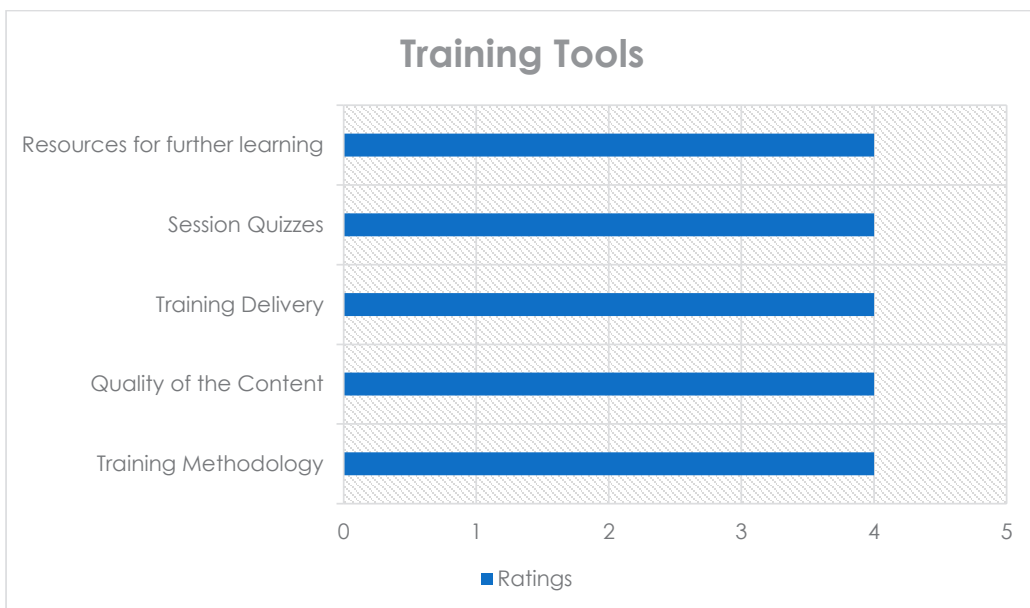
The graph below displays the overall ratings for the learning outcomes from the participants. The total ratings are out of 5. 54% of the participants rated 5 for the first outcome of relevance of the training & 62% of the participants rated 5 for the other two outcomes of improved understanding and skills about co-treatment which clearly showcases about the knowledge & skills gained during this training by the participants.

Figure 30: Graph representing the ratings of the learning outcomes



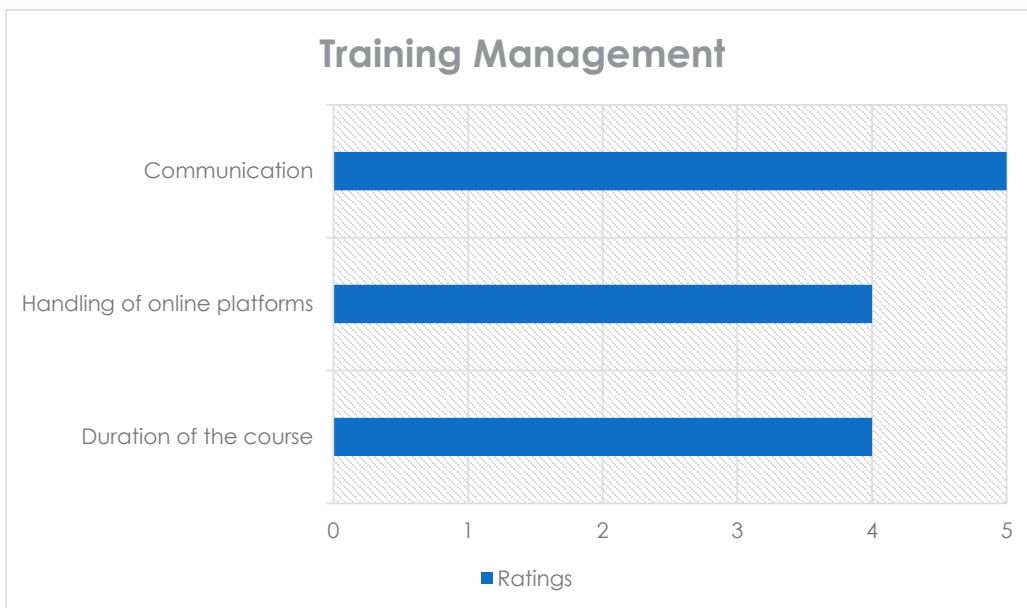
The graph below represents the overall ratings for the Training tools of the lead trainers & how helpful it was for their capacity building. The total ratings are out of 5. 94% of the participants have given an average rating of 4+ out of 5.

Figure 31: Graph representing the ratings of the training tools



The graph below represents the overall ratings for the training management by the organizers. The total ratings are out of 5. The 85% of participants rated 4+ for duration.

Figure 32 Graph representing the ratings for training management



### 4.1.3 Testimonials by the participants

The table below presents some of the valuable comments that have been shared from the participants in their feedback forms & live feedback during the closing session.

Table 2: Testimonials from participants

SR. NO	NAME OF THE PARTICIPANT	ORGANIZATION	Testimonial
1	Mr Pranshu Kumar	IPE Global	Sessions were very good and easily understandable. The modules provided were brief & informative. Regarding exercises, I suggest that at-least a solved example should have been provided for a reference so it would be easy for us to solve the exercise.
2	Mr B Vijay Kumar Reddy	MCRHRD, Hyderabad	The training content was very good. It was very helpful in understanding about Co-treatment. I would suggest this program be attended or should be reached to most of the ULB's.
3	Ms Palla Prasanna	NIUM, Hyderabad	All the sessions were very informative and very nicely explained by both the lead trainers. Looking at the potential for Co-treatment in a country like ours, I would suggest this program for all the ULB's to attend & adopt in their respective cities.



SR. NO	NAME OF THE PARTICIPANT	ORGANIZATION	Testimonial
4	Mr. Manoj Pandey	ATI, Nainital, Uttarakhand	The exercise format should be as following-1. Give sample exercises to the participants, the answers should be discussed next day. 2. The sessions must refer to the sections of the exercise. 3. A final plant design should be given at the end which the participants must do at the end of the programme. The answers field should be specifically shown in the exercise rather than hiding it. We must try that as most people are able to do the exercise.
5	Mr. Manu Tyagi	EY	The modules of the program are very well conceptualized & designed. Both the lead trainers were very helpful in solving any kind of queries that the participants had during this whole program.
6	Mr. R K Jain	Uttarakhand Pey Jal Nigam	All the exercise sections were good but if you had given the exercise in a more consolidated form everyday then it would be much more helpful while solving. Otherwise the overall experience of the program was very good.

# 5. Learning Impact Assessment

The training program was actively participated by 33 participants from different eminent organisations. As per the overall course statistics, it can be interpreted that the course was successfully completed by 59% (20 out of 34) of the participants over the period of 8 days. The basis of completion of the training course was determined by: (a) attendance for the sessions, (b) evaluating the participants attempt to 8 session quizzes, (c) attempting the exercise-assignments and (d) scores of the final quiz (which was conducted live during the closing session).

In this online course 18% (6 out of 34) of the participants were females. It can be noted that only 34% (2 out of the 6) female participants completed the course successfully whereas 64% (18 out of 28) male participants completed the course. It was also noted that most of the participants had not given a sincere attempt to the exercises on co-treatment or had difficulties in the pre-feasibility & detailed assessment sections due to its longevity. The participant's engagement with the resource persons while discussions for asking relevant questions was also moderate.

The learning impact of the training program was assessed depending upon same criteria listed above. Approximately 38% of the participants who attempted the final quiz, scored more than group average score.

It was observed that all the participants who had attempted all the quizzes and the completed the exercises scored pretty well, thus reinforcing the fact that participants who showed interest and dedication towards the training program benefited significantly in terms of improving their knowledge and understanding about Co-Treatment of Faecal Sludge and Septage in STP.

# 6. Learning and Way Forward

In face to face training programs, the participants are motivated to attend the training and learn. In this case, the participants are away from the day to day work and hence, it is relatively easy to capture their attention and maintain their interest for the trainers. The trainer as well as trainees are connected in person and hence, the learning is accelerated and ensured. Following are the learning from the online training conducted:

## 6.1 Agenda and schedule

- The agenda should be tailored for the target audience. A training program having focussed topic for appropriately targeted audience has more impact.
- The schedule of the session needs to be carefully planned. If the sessions are to be conducted during weekdays, the time slot should be either start of the working hours or the end of the working hours. This allows the participants to manage their time well with the daily work.
- The orientation training having 5-6 session in case of face to face training should be condensed into 3-4 sessions (60 – 90 in each) and conducted over a duration of 2-3 days.
- The advanced trainings which are usually conducted for up to 3 days in face to face format should be ideally split into 10 -12 session (60-90min each). The duration of such courses can be based on the type of the target audience. In case of working professionals in private organizations the course can be conducted in 10-12 days. However, in case of government officials belonging to parastatal agencies and ULBs, the same course should be conducted over a longer period.

## 6.2 Content

- The content of the sessions needs to be adopted for the online delivery of the sessions. It is recommended to use more pictorial and illustrations to state the point. The flow of the topics plays an important role to retain the attention. The session should begin with easy to grasp concepts leading into more detailed and important points. Each session should focus on not more than 5 points.
- The duration of the session can be up to 90 min, provided the session is a good mix of PowerPoint presentation, audio visual aids such as information videos, case studies, quizzes, exercises etc.

## 6.3 Exercise

- All the activities and exercise conducted in face to face training cannot be conducted in online training program. The exercises should be split in such a way that they go along with the session.
- Simple and basic exercises can be conducted online during the session, however, for more elaborate exercises, it is recommended that they be attempted offline by the participants. For this, the trainers need to ensure that participants understand the concepts needed for solving the exercise during the online session.

## 6.4 Resources

- For an online training program, it is recommended that there is a moderator. The moderator's job is to put together different elements of the session together and to introduce to the participants. The moderator also plays an important role in case there is a technical glitch at the resource person's end.
- For each session of the training program, it is recommended to have at least 2 resource persons. While one resource person is engaged in delivering the session, the other resource person can answer the queries, which the participants are posting in the chat box. Clarifying the queries of the participants when they are raised is important to maintain their interest in the session. The questions, which are not related to the topic of discussions, are noted by the moderator and discussed with the lead trainer after the presentation is done.

## 6.5 Assessment

- Assessment in the form of quizzes is important. Ideally short quizzes (up to 10 questions) with multiple choice questions should be conducted on each session. The formation of the questions is dependent on the level of the blooms' taxonomy. There should be a time duration for each quiz. For multiple choice questions, 1 to 1.5 min per question (depending upon the difficulty level) is better.
- In case of orientation training program, the aim is to introduce the participants to the concept and make them aware about certain approaches. For such training the questions should be direct. This allows the organizers to check, the participants have grasped and retained the key message from the session.
- In case of advanced courses, the aim is to enable the participants not only to grasp and retain but to apply the concepts for solving a problem. Hence, in this case, indirect questions should be used in the quiz. This requires the participant to retrieve the information from the memory, analyse the question at hand, apply the concept and solve the question.
- It is recommended that the session quizzes be conducted offline in order to save time during the online session.
- The final quiz consisting of all the questions on all the topics covered in the online training program can be conducted online. In this case, the time duration given should be not more than 1 min per question. This ensures that the difficulty level is not increased when compared to usual session quiz.

## 6.6 Platform

- The platforms used for conducting the online sessions, quiz and feedback play an important role to determine the user experience of the participants. A good user experience ensures and maintains interest of the participants in the various elements of the training program.
- Microsoft Teams was tested during the first training. The platform is user friendly and was easy for the participants to adapt. However, the participants were frequently facing issues with the audio and video quality which was also mentioned in the feedback.
- Another popular platform where this course was conducted was on Zoom. It does not consume higher bandwidth and also gives an option to switch off the audio video of the participants by the host. Thus, improving the audio video quality of the online sessions. It also has features such as breakout rooms, white board, dedicated Q&A box, chat box for participants. It's the most preferable online tool for conducting trainings like these.
- Classmarker proved to be a very resourceful platform for conducting quizzes. The summary of the quizzes was provided on the dashboard and could also be exported in various formats for further use.
- For online polling, Mentimeter is a good platform. The representation of the polling is through an interactive illustration which is nice for the participants and the organizer to see.
- For feedbacks, there are multiple platforms, however, Google Forms are the most convenient platform. Feedbacks can be used not only to improve further training but also to allow the participants to self-assess their individual learnings from the training program.

## 6.7 Learning Management System

A Learning Management System (LMS) or a portal can be developed which will eliminate the need of using different tools and platforms. The LMS can integrate the following tools:


- Training calendar with brief about each training consisting of Introduction to the course, resource persons, profile of the organizers etc.
- Registration portal with online payment gateway.
- A repository of the resources pertaining to all the trainings (accessible only after registration to the training).
- Integrated online training platform to live delivery of the sessions.
- Question and answer section dedicated for participants to post queries during the training.
- Exercise can be also converted into an online format where in the participants have tools such as calculator ready on the screen for use.
- To reduce the number of queries, hints can be provided at certain stages of the exercise which will help the participants to smoothly carry out the exercise.
- Forums on discussing the topics and sharing of knowledge during and after the training.
- Quiz platform for the participants to attempt the quizzes.
- Feedback portal for the training.

The LMS not only improves the user experience for the participants during the training but also eases the efforts of the organizer to put together various lists containing information of the participants and the results from various platform. Such a platform can be also be made mobile friendly, so that participants can use the forum and other tools easily.

# Annexure 1

## List of Resource Persons

Table 3: List of Resource Persons

SR NO.	NAME OF THE RESOURCE PERSON	ORGANIZATION	ROLE	Profile Photo
1.	Ms Sreevidya Satish	Ecosan Services Foundation	Moderator	
2.	Mr Dhawal Patil	Ecosan Services Foundation	Lead Trainer	
3.	Mr Saurabh Kale	Ecosan Services Foundation	Lead Trainer	
4.	Mr. Shantanu Padhi	National Institute of Urban Affairs	Guest Speaker	
5.	Mr. Prasanta Kumar Mohapatra	Orissa Water Supply & Sewerage Board	Guest Speaker	

# Annexure 2

## List of Participants

The following table presents the details of the officials, staff with whom we have discussed about the Co-Treatment of Faecal Sludge & Septage at STP.

(\* represents the participants who have successfully completed this certificate course)

Table 4: List of the participants

No.	Organisation Name	Participant Name	Designation
1	Uttarakhand Pey Jal Nigam	K K Rastogi	General Manager, Haridwar
2 *		R K Jain	Project Manager, Haridwar
3		Meenakshi Mittal	Assistant Engineer, Haridwar
4		A K Kataria	Executive Engineer, Haldwani
5		Bharti Rawat	Assistant Engineer, Mussoorie
6		Sudhir Kumar	Executive Engineer, Haldwani
7 *		Er. Diksha Nautiyal	Assistant Engineer
8	UK Jal Sansthan	Abdul Rashid	Asistant Engineer
9		Ajay Kumar	EE Ganga Haridwar
10	SUDA, Jharkhand	Brajesh Ranjan	Sanitation Expert
11		Anjali Tigga	
12	ATI Kolkata	Mr Kaushik Ghosh	
13 *	ATI Nainital	Mr Manoj Pande	
14	EY	Atharva Setu	Consultant
15 *		Manu Tyagi	Senior consultant
16 *	CDD Society	Sagar Patil	Project Engineer
17	Tide technocrats Private Limited, Bengaluru	Raj kiran CA	Manager - Engineering
18 *	IPE Global	Nitish Kumar	WASH Consultant, IPE Global
19 *		Pranshu Kumar	Civil Engineer, IPE Global
20 *	NIUM, Hyderabad	Palla Lakshmi Prasanna	Knowledge Manager
21 *		Shaik Nazma Sultana	Knowledge Manager
22 *	CED, Hyderabad	Dileep kumar M	Program Director & Senior Environmental Engineer
23		Reghukumar	Senior Design Engineer
24		Dr. Radhakrishna PV	
25 *		Mr Sri Jayaram	
26 *	MCRHRD, Hyderabad	B.Vijaykumar Reddy	
27 *		Rambabu	
28 *		Prasanna Kumar	
29 *	ESF, Pune	Abhishek Sakpal	Project Associate
30 *	CEPT, Ahmedabad	Yash Barve	
31 *	NIUA_SCBP	Doab Singh	Programme Officer
32 *		Ashwin B	Programme Officer
33 *		Shantanu Padhi	Sr Programme Officer
34 *		Parth V Kamath	Programme Officer

# Annexure 3

## Minute by Minute Agenda

Table 5: Minute by minute agenda

Date	Session	Topic	Contents	Resource Person	Duration [min]
2 November 2020		Introduction	Introduction to the training module, Getting acquainted with the training platform, Setting up the ground rules	Ms. Sreevidya Satish	15
	S1	Approaches for Faecal Sludge and Septage Management	Stages of FSSM, Approaches for treatment, Treatment mechanisms, Rationale for co-treatment	Mr. Saurabh Kale	50
		Question and answer		Mr. Dhawal Patil & Mr. Saurabh Kale	10
	Q1	Quiz (Multiple choice questions)		Ms. Sreevidya Satish	5
	F1	Feedback for Day 1 session & Introduction to Classmarker platform		Mr. Akshay Agarwal	10
3 November 2020	S 2A	Characterization of liquid waste: Faecal sludge, Septage & Sewage	Parameters for characterization, Characteristics of sludge, sewage & septage	Mr. Dhawal Patil	30
	S 2B	Sewage Treatment Plant & Co-treatment	Objectives of treatment, Treatment chain- multi barrier approach, Addition of sludge for co-treatment, Impact of unscientific co-treatment of sludge	Mr. Dhawal Patil	30
		Question and answer		Mr. Saurabh Kale & Mr. Dhawal Patil	10
	Q2	Quiz (Multiple choice questions) & feedback poll for day 2		Ms. Sreevidya Satish	10
	E1	Introduction to the exercise	Peak flow rate & Loading rate, Forming treatment chain at the Sewage treatment plant	Mr. Dhawal Patil	10



Date	Session	Topic	Contents	Resource Person	Duration [min]
4 November 2020	S3	Planning of Co-treatment of Sludge & Sewage	Stages of planning, Identifying opportunities for co-treatment, Administrative controls conducting co-treatment	Mr. Saurabh Kale	30
	C1	Case Study: Kargi STP, Dehradun	Background of Co-treatment at Kargi STP, Process flow diagram of Kargi STP, Planning & designing for Co-treatment, Rationale for Co-treatment at Kargi STP, Septage characteristics in Dehradun	Mr. Shantanu Padhi	30
		Question and answer		Mr. Saurabh Kale, Mr. Dhawal Patil & Mr. Shantanu Padhi	10
	Q3	Quiz (Multiple choice questions)		Ms. Sreevidya Satish	5
	E2	Exercise	Pre-feasibility check for co-treatment of septage with sewage	Mr. Dhawal Patil	15
5 November 2020	S4	Septage Receiving Station	Importance of septage receiving station, Components & Types of septage receiving station, SOP at receiving station	Mr. Saurabh Kale	40
		Question and answer		Mr. Dhawal Patil & Mr. Saurabh Kale	10
		Informational videos	Screens, Septage receiving station, Integrated & Mechanized Septage Receiving Station	Mr. Dhawal Patil	30
	Q4	Quiz (Multiple choice questions)		Ms. Sreevidya Satish	10

Date	Session	Topic	Contents	Resource Person	Duration [min]
6 November 2020	S5	Co-treatment in Liquid stream at STP	Treatment units in liquid stream, Design criteria, Precautions & checks for co-treatment, Mitigating the impact of co-treatment through O&M	Mr. Dhawal Patil	60
		Question and answer		Mr. Saurabh Kale & Mr. Dhawal Patil	10
	E3	Exercise	Check for primary & secondary treatment units for activated sludge process for co-treatment	Mr. Dhawal Patil	15
	Q5	Quiz (Multiple choice questions)		Ms. Sreevidya Satish	5
7 November 2020	S6	Co-treatment in Sludge stream at STP	Treatment units in sludge stream, Design criteria, Precautions & checks for co-treatment, Mitigating the impact of co-treatment through O&M	Mr. Dhawal Patil	60
		Question and answer		Mr. Dhawal Patil & Mr. Saurabh Kale	10
	Q6	Quiz (Multiple choice questions)		Ms. Sreevidya Satish	5
	E4	Exercise	Check for thickening, digestion treatment units for activated sludge process for co-treatment	Mr. Dhawal Patil	15

Date	Session	Topic	Contents	Resource Person	Duration [min]
9 November 2020	S7	Disinfection of sludge	Treatment objectives, Co composting, Solar drying house, Thermal drying, Thermal treatment of biosolids	Mr. Saurabh Kale	40
		Question and answer		Mr. Dhawal Patil & Mr. Saurabh Kale	10
	Q7	Quiz (Multiple choice questions)		Ms. Sreevidya Satish	5
		Informational videos	Solar drying system, Sludge drying system	Mr. Dhawal Patil	15
	C2	Case Study: Co-treatment at Puri STP, Orissa	FS treatment processes adopted in Orissa state, Solids separation + DEWATS, Solids separation + STP, Co-treatment at Puri STP- Treatment components, STP + FSTP Water quality parameters	Mr. Prasanta Kumar Mohapatra	30
10 November 2020	Completion of the assignment questions for all the exercises. The completion of the solutions to the exercise are mandatory for completion of the course.				











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