National Institute of Urban Affairs

Sanitation Capacity Building Platform

SYMBIOSIS INTERNATIONAL (DEEMED UNIVERSITY)

ecosan SERVICES FOUNDATION

Faculty Capacity Development Program On Integrated Wastewater and Septage Management (IWSM)

18TH –20TH MAY, 2022

Pune, Maharashtra

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CONTENT

This report summarises the training program on Integrated Wastewater and Septage Management (IWSM) conducted under the Faculty Capacity Development Program (FCDP) of National Institute of Urban Affairs in partnership with Symbiosis International University, Pune. The report brings together the learnings from the three days intensive training program conducted for faculties of different institutes, researchers and academicians with an aim to build their capacity and encourage them for integrating the concept of IWSM and non-sewered sanitation into the curriculum.

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Contents

1. Introduction

Water, an essential source of life, needs attention of every human being on this earth due to its excessive use and exploitation of natural resources, which affects environmental sustainability.

Young minds in the sanitation sector can become “Agents of Change” in the near future to conserve our natural resources, adopt various solutions to manage waste, and create awareness in society to save water and environmental pollution. To understand the basics of wastewater and septage generation and its management, young engineers and practitioners need more in-depth knowledge. The advanced expertise in the sector will keep the young people aware. It might drive their minds toward innovations in the sanitation sector, provided they are groomed through proper training and capacity building about the sanitation sector.

Integrated Wastewater and Septage Management (IWSM) comprises of various aspects of water, wastewater, faecal sludge & septage, its understanding, planning, technology selections, execution, stakeholder involvement and financial aspects for planning and implementation of safe and sustainable sanitation through the service chain. Students, practitioners and experts in the sector can join hands together to change the current scenario of IWSM in the country through adaptation of novel approach, innovative sustainable ideas, and understanding the urgent need to adopt a decentralised approach of sanitation to maintain the sustainability of sanitation services. Understanding the importance of proper planning and selecting technologies for safe management of waste needs more focus keeping in mind the rapid urbanisation and increase in demand of safe sanitation infrastructure. To understand and inculcate the in-depth knowledge about the sector, to join hands with various government and private organisation to achieve objectives of various missions like SBM 2.0, AMRUT2.0, smart cities mission etc academic institutes in India need to change their approach from theory to more on adopting the solution to solve the actual practical problems like Wastewater, Septage and Solid waste management into their regular curriculum or shall design and introduce an elective certificate course for students in the field of civil or environmental engineering, architecture, town or urban planning etc. Most of the cities and towns in India face issues in planning and managing sanitation infrastructures that are commonly not planned properly according to the future population projection and unprecedented increase in rapid urbanisation. This problem can be solved through a collaborative approach of engaging students, academic faculties, researchers, practitioners, and professional experts. Local administrative bodies from cities can engage academic institutes to carry out surveys to collect data for preparation of City Sanitation Action Plans, Detailed Project Reports and can engage students to carry out awareness activities through various government missions and programs. This engagement in various missions will help students to understand the actual on ground problems and trigger their minds to come with new solutions and innovations in the sector and will help various ULBs to get accurate data and to achieve the goals by 2030.

National Institute of Urban Affairs (NIUA), India’s leading think tank on urban planning and development aims to address urban sanitation challenges through capacity development of stakeholders in urban sanitation. However, it has been observed that current academic discourse focuses on conventional sewerage systems as solutions to city-wide safe sanitation, but has seen limited progress in India. Hence, this faculty capacity development program was developed with a aim to reach out to universities, institutes and academies for bringing a paradigm shift in understanding of sanitation management which are also aligned with national missions and programmes and to understand all aspects of Integrated Wastewater and Septage Management across the service value chain and further planning to adopt such courses into the current curriculum to make students aware of the importance of wastewater and septage management to achieve SDG 6 by 2030 and also to introduce faculty to various tools and tailor-made courses which can be adopted by academic institutes.

Program Objective

To build the capacities of faculties from civil and environmental engineering, planning and management department of different academic institutes on Integrated Wastewater and Septage Management (IWSM) and to educate universities to lead and adopt non sewered sanitation as a subject into their curriculum through various modalities and mediums

A 3-day face to face training with a total duration of 18 hours was designed. To engage the participants and ensure that capacity building of academic institutes in Integrated Wastewater and Septage Management (IWSM) shall be built at the level where they can develop the courses in the regular curriculum for the students of various departments; civil, planning, environment etc. This training is built to make academic institutes understand the urgent need of Wastewater and Septage management to achieve SDG 6. To achieve the targets, the youth of India will play an important role from the planning stage to awareness creation and to change the scenario of waste management in India through new ideas and innovation in the sector.

A separate session was organized to introduce the board game developed by NIUA under SCBP platform to understand the current sanitation situation of coastal city and plan the sanitation infrastructure according to the current need and geography of the city. Such board games allow participants to play with the planning and management approach and to build the sanitation infrastructure which is financially and socially sustainable.. To complete the course with certification, the participants had to attend all the sessions, complete the exercise and participate in the group exercise.

Agenda

Following is the day wise agenda of the FCDP. A detailed session wise agenda is available in the annexure.

Table 1: Agenda of the Training

Date	Session	Topic	Contents	Duration
Wednesday 18th May 2022	1	Missions and Programs	Growing recognition of FSSM Swachh Bharat Mission 1.0 Urban Swachh Bharat Mission 2.0 Urban Jal Jeevan Mission Policies and guidelines	45 Min.
	2	Planning Approach	City Wide Inclusive Sanitation Centralized and Decentralized Approach Sanitation Systems Approach SBM 2.0: Used water management	60 Min.
	3	Board Game – IWSM for coastal reason	Understanding planning and implementation of sanitation systems of any city or town through board game.	90 Min.
Thursday 19th May 2022	4	Faecal Sludge and Septage Management	Introduction of FSSM Need of FSSM Components of FSSM Planning for FSSM FSSM in Tamil Nadu	60 Min.
	5	Stakeholder Engagement	Identification of stakeholders Characterization of stakeholders Stakeholder engagement strategy IEC and BCC campaign	60 Min.
	6.	Group Exercise – Stakeholder Identification and mapping	Stakeholder identification and mapping in any given project Prioritization matrix for given projects	60 Min.
	7	Project Management	DPR components and review Financial Modeling Type of tenders Project monitoring and standards	60 Min.
	Site Visit to College of Engineering, Pune		Natural Wastewater treatment with anaerobic and aerobic process within the campus of CoEP hostel.	120 Min.
Friday 20th May 2022	8	Case study – Kolhapur Institute of Technology	Learning of conducting certificate courses and programs for academic institutes Integration of courses through various means in the regular curriculum.	60 Min.
	9	Pedagogy in Education and Learning	How to develop targeted course and content Tools for delivering the content effectively	60 Min.
	10	Group Exercise and presentation	Institutionalization of Non sewered sanitation in curriculum through various projects and tools for students.	60 Min.

3. Sessions

3.1 Day 1, May 18th, 2022

Welcome address and Introduction

The faculty capacity development program had commenced with the welcome address by Dr. Jyoti Chandiramani, Director, Symbiosis School of Economics and Dean, Faculty of Humanities and Social Sciences. Dr. Jyoti having a background of economics and working in teaching and research broadly under urban development for last 35 years, addressed participants with the introduction and vision of Symbiosis International University, mentioning the objective of the university to let student understand and solve the problem related to urban development, economy, climate change etc. She also set an ambitious goal of adopting such courses in the regular curriculum of symbiosis.

Dr. Mahreen Matto, Program Manager, NIUA gave the formal introduction of the Sanitation Capacity Building Platform (SCBP). She elaborated on the objectives of the platform and the different types of training and faculty development program conducted through the platform.

Mr. Dhawal Patil, Lead Trainer, then introduced Ecosan Services Foundation (ESF) and the MoU signed between ESF and SIT under the service-learning program of SIT. The session began with ice breaker activity to introduce participants to a unique way of knowing each other. After that, he introduced the course outline, structure and objectives of the training program on Integrated Wastewater and Septage Management (IWSM) under the Sanitation Capacity Building Platform (SCBP).

Figure 1: Snapshot of the Introduction session

Session 2: Mission and Programs

The first session was delivered by Mr Saurabh Kale, Sr Resource Person and Lead Trainer, ESF to enlighten the participants regarding national schemes and policies launched by the government to provide funding at various levels of the sanitation chain. The session started with Mr Saurabh Kale briefing the participants regarding how FSSM is fast gaining traction in India and the immense opportunity this change brings with it. Further in this session, Mr Saurabh Kale introduced the policies successively, mission objectives, budget allocation, mission objectives, and a key focus of every mission. National missions, programmes and schemes covered under this session were:

- Journey of FSSM in India
- Swachh Bharat Mission- Urban (SBM-U) 2.0
- Jal Jeevan Mission- Urban
- Smart Cities Mission
- The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) mission
- 15th Finance Commission
- Manual Scavenging Act 2013
- National Faecal Sludge and Septage Management (FSSM) Policy.

Summary: Fund allocation for various treatment processes, proper management of the fund and adequate planning for setting up the distribution system were some key discussion points in the session. Water plus protocol and certification was discussed in detail.

Figure 2: Snapshot of the day one first session

Session 3: Planning Approach

Mr Dhawal Patil, Sr Resource Person and Lead Trainer, ESF carried forward the training by introducing the participants to various approaches for IWSM planning. This session was designed to deliver the concept and principles of CWIS in planning the sanitation system. It also explained CWWIS and DPR concepts under SBM(U) 2.0 to the participants. The session was conducted to introduce different levels of liquid waste management for changing urban settings, different aspects of centralized and decentralized liquid waste management and planning of liquid waste management. A detailed knowledge of following topics was delivered through this session:

- CWIS principles of planning
- Components of CWWIS
- Level of liquid waste management
- Sanitation system and its types
- DPR preparation

The following aspects were discussed in the session:

- Levels of Wastewater Management
  - » Urban, peri-urban, rurban and rural habitats and settings along with their characteristics and probable sanitation systems.

- Centralized Wastewater Management
  - » Characteristics, requirements, components of systems, limitations and economic aspects.

- Decentralized Wastewater Management
  - » Characteristics, components of systems, features, constraints and economic aspects.

- Other Aspects of Liquid Waste Management
  - » Financial sustainability, idle volumes and time, house service connections, recovery of costs and reuse aspects.

Summary

Liquid waste management is crucial for maintaining environmental health. Different levels of management fit appropriately in different urban and rural scenarios. Planning of the sanitation systems needs to take into consideration affordability and long-term sustainability of infrastructure. Centralized and decentralized management compliments and provides maximum sanitation coverage.

The following aspects were discussed during the session:

- Definition, objective and types of Sanitation system – Wet and dry systems
- Wet Sanitation Systems, Functional Group – User Interface, Conveyance/containment unit, treatment / disposal
- Types of user interface – types of toilets.
- Containment units with its types in detail.
- Collection and transport system with its type and technologies can be used on ground as per ground condition and area friendly.
- The conveyance system with its types in details like gravity sewers, simplified sewer and solid free sewer.
- Operational Factors – Toilet usage, storage, climate, infiltration and exfiltration, equipment used.

Summary

Sanitation systems are used to protect environmental health. The type of sanitation system used employed depends upon the affordability and availability of water. According to SBM(U) 2.0 guidelines, CWWIS focuses mainly on wastewater management and FSSM. The CWIS approach emphasises on whole sanitation service chain for the safe management of human waste. Detailed discussion was held on the centralised and decentralised aspects of sanitation. Detailed Project report under SBM(U) 2.0 includes data collection, survey, treatment options, designs and financial aspects.

In India, a hybrid sanitation system is mostly followed. A solid free sewer is an appropriate collection and conveyance system for sullage and regular emptying of septic tank is necessary for maintaining solid free sewer. Non-sewered sanitation system diagram (value chain) with functional group and input product was explained for a single pit, twin pit, Ecosan toilet, Biogas toilet. Sewered sanitation system diagram with functional group and input product was described in detail for the septic tank. Septic tanks can be considered as a part of non-sewered and sewered sanitation system depending upon adopted approach for the service delivery in town. Sewered sanitation system approach was also explained in detail. Backward planning plays an important role in building proper city sanitation plans.

The following queries were discussed in the session:

- Are there any guidelines for designing decentralized collection and conveyance systems other than the CPHEEO?
  - Answer - CPHEEO Manual does not provide much design guidelines for decentralized wastewater collection and conveyance systems. However, there are international publications providing design guidelines.

- What is Urine Diversion Dehydration Toilet (UDDT)? How does it function? Will it be possible to adopt UDDT in the urban area as well?
  - Answer – UDDT is a type of toilet (user interface) that is a dry type of toilet suitable in rural or water scare areas with less accessibility of safe sanitation management and farming land nearby. The three whole pan helps separate urine, faeces, and anal cleansing water, which are further stored and processed and then used on farm lands as a source of nutrients for plants.

- Does the CPHEEO manual have standards for the reuse of treated wastewater for agriculture?
  - Answer – In Environment (Protection) Act, 1986, there is a mention of the standards for discharge of treated wastewater in inland surface water, public sewers, land for irrigation and marine coastal areas, which was then revised in 2017 with the stringent common discharge norms for disposal or reuse of treated wastewater.

- Does partially separate sewers are part of combined sewers or separate sewers?
  - Answer – Partially separate sewers are a type of separate sewers that combines the attributes of both separate and combined sewers.

- Which sewer system is most prevalent in India?
  - Answer - Gravity sewers are most prevalent in India. However, there are cases where simplified sewers have been implemented in slums and unorganised settlements.

Mr Dhawal Patil introduced participants with a few good examples and case studies of proper planning and management of wastewater treatment facilities at the city level.

Case Study: Bhandewadi Sewage Treatment Plant, Nagpur

Mr Dhawal Patil explained a case study of the wastewater treatment plant in Bhandewadi, Nagpur city, with the reuse of end products approach. This STP has a fully automated system with a treatment capacity of 130 MLD. The MAHAGENCO's 1,980 MW capacity Koradi Thermal Power Station has a contract with STP Operator and Nagpur Municipal Corporation to reuse the treated water for industrial applications.

Case Study: College of Engineering, Pune

The case study of NaWaTech – Natural Water Treatment Technologies for coping with urban water shortages includes information on sites where natural treatment technologies were implemented to make the reuse of treated water feasible. The first case was located at the College of Engineering, Pune. Here three treatment systems cater to black water, grey water and sewage separately.

Figure 3: Snapshot of the day one second session

Session 4: Board game – Integrated Wastewater and Septage Management

In this session, a board game was introduced to participants to understand better and visualise different scenarios of any city or town. Mr Dhawal Patil explained the scenario of the coastal city and took participants on the game's conception journey until its final outcome. He initiated the dialogue about the settings in the city and the existing water and sanitation infrastructure situations. This type of board game helps navigate the discussion towards planning, implementing, and managing various sanitation infrastructures in the city.

All the participants were very excited to know about the game in detail. They showed interest in obtaining these games for their students and faculty members to include in their curriculum activities. They understood that such games would make students understand the on-ground water and sanitation challenges and how to take decisions to solve the problems.

Figure 4: Snapshot of the session introducing board game

3.2 Day 2, May 19th, 2022

Mr Dhawal Patil began the session by giving recap of previous day to the participants.

Session 5: Understanding Faecal Sludge and Septage Management

Mr Dhawal Patil was the lead trainer for the session. The main aim of the session was to make participants understand the importance of FSSM as an integral part of the sanitation system in India, the basics of faecal sludge and septage quantification and the type of desludging and the approaches for faecal sludge and septage management.

The following aspects were covered in the session:

- Needs & Challenges in FSSM-
  - Status of Sanitation in Urban India
  - Sanitation Systems around us
  - Need of FSSM
  - Sanitation Services Chain
  - Current Challenges in FSSM

- Planning of FSSM-
  - Quantification of FSS
  - Desludging- Demand & Scheduled desludging

- Approaches of FSSM-
  - Treatment Standards
  - Sanitation tools

- Case study of Tamil Nadu - FSSM

Summary

FSSM must preserve environmental health as the dependency on onsite containment units is high in India. Currently, a city faces multiple challenges in operationalizing FSSM ranging from forming appropriate byelaws and enforcing them to accessing and managing funds. Methods and challenges of quantification of faecal sludge and septage vary depending on the goals. Pros and cons of demand and scheduled desludging were discussed. Approaches for faecal sludge and septage management. Dietary habits and economic status can change the characteristics of sewage, faecal sludge, or septage.

Session 6: Stakeholder Management

Ms. Radhika Boargaonkar was the trainer for this session. The session's objective was to understand the process of identification and characterisation of stakeholders and to learn about stakeholder engagement and the different tools involved in it.

The following aspects were covered in the session:

- Stakeholder Analysis-
  - Identification of stakeholders
  - Characterisation of stakeholders
  - Influence and interest

- Stakeholders' engagement-
  - Participation levels
  - Involvement tools
  - Milestones and cross-cutting tasks
  - Distributing and formalising roles and responsibilities.

The trainer also asked participants to do the activity of stakeholder analysis and prioritisation matrix for their projects in their respective colleges.

Summary

Stakeholder analysis is a vital tool for understanding the social and institutional context of a project. Identification and characterisation of stakeholders provide early and essential information about who will be affected by and influence the project. Stakeholders' engagement plays a vital role in the sustainability of the project. It develops the stakeholders' skills, trust, and confidence needed to run the system.

Figure 4: Snapshot of the day two second session

Session 7: Project Management

Mr. Saurabh Kale conducted the project management session. In this session, participants were expected to understand the components of the Detailed Project Report and critical points that need to be reviewed while preparing the DPR, along with financial modelling of the project and different project delivery methods.

The following contents were covered in the session:

- DPR Review
- Components of DPR
- Things to review
- Financial Modelling
- Life Cycle Cost
- Equivalent Annual Cost
- Project Delivery Methods
- EPC
- PPP

Summary

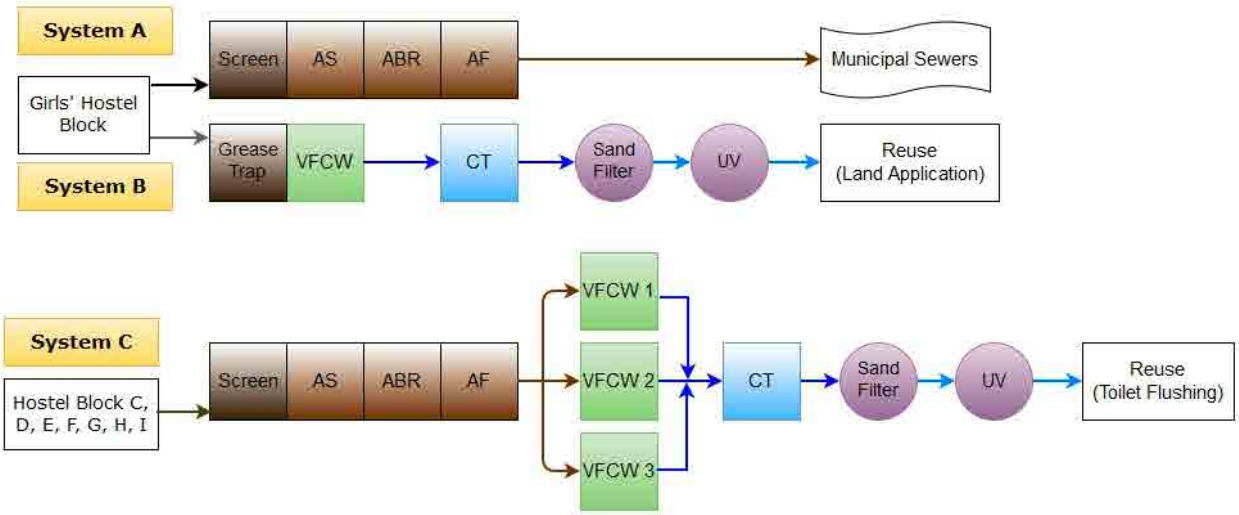
The stages in DPR preparation were discussed in the session, including technical, non-technical, financial, environmental, etc. Financial modelling is explained, which is important to check the sustainability of the project. For PPP projects, financial modelling is necessary for the fair allocation of risk in the project. The project delivery method helps bind the key stakeholders of the project together.

Exposure Visit – College of Engineering, Pune

In the last session on the second day, participants visited the Sewage Cure (Decentralized Treatment System and Constructed Wetland) Plant situated at the College of Engineering Pune. Mr Dhawal Patil explained the project background, the system's treatment process, treatment units, and Operation and Maintenance (O&M) activities step by step to the participants.

This plant is located in the centre of the city area called Shivajinagar. The hostel campus of the College of Engineering Pune has a total residence capacity of 2000 students. They have new and old hostel blocks, and in the new hostel block, segregation of black and grey water has been installed, while in old hostel blocks segregation system is not installed.

Figure 6: Decentralized Wastewater Treatment Plant, CoEP



It is a decentralised treatment system and the treated water is reused in toilet flushing and gardening activity on the hostel campus. This technology is natural treatment technology with minimal operational cost. Requirement of electricity, skilled labours is very minimum. Participants got an opportunity to communicate about the functioning of the plant directly with the campus management. After understanding each and all processes and units, participants discussed the cost of the operation and other O&M activities of this plant. They raised many queries about the suitability of the plant at the urban scenario and its feasibility for the institutional level. Some participants showed interest in reflecting on this kind of system at their training institute campus.

Figure 7: Exposure visit to Decentralised Treatment System and Constructed Wetland plant, CoEP



3.3 Day 3, May 20th, 2022

Day 3 started with the recap of the previous day and learnings from the exposure visit. Mr Dhawal Patil requested participants to share their feedback on exposure visit, stakeholder engagement activity and takeaways from the previous day's sessions. Participants shared their views, feedback and takeaways regarding the two days of knowledge on IWSM.

Figure 8: Participants Feedback on exposure visit and takeaway sharing


Session 8: Case study – KIT's College of Engineering, Kolhapur

The session on day three was planned to focus on how institutes can adopt the courses of waste management in their regular curriculum. Dr Akshay Thorvat, Associate Professor and Head of Department of Civil and Environmental Engineering, KIT's College of Engineering (Autonomous), Kolhapur took participants how KIT came across such faculty capacity development program and training of trainers workshop organized by NIUA under SCBP in 2018. After attending these courses, KIT started its Certificate courses on Global and National Perspective of Sustainable Sanitation Approaches and Technology Interventions, which was funded under SCBP by NIUA. He also mentioned the methodology they used to design the course by adopting different components, such as expert lectures, site exposure visits, case studies, lab demonstrations, group work, etc.

KIT designed the course for majorly four themes which are as below:

- Rural and urban sanitation
- Solid waste treatment and management
- Decentralized water and wastewater treatment
- Faecal sludge and septage management

KIT also organized a faculty development program under AICTE on Green Technology and Sustainability Engineering and mobilized various experts in water and sanitation for FDP and certificate courses. After attending the certificate courses, students participated in many academic conclave and conferences with the best possible takeaways from the courses and won awards for presenting the best posters and projects. Students' expectations from such courses are generally to get in-depth knowledge about the practices, technology, and advancements taking place in the real world with effective communication through case studies, presentations, activities, etc.

Dr Thorvat also mentioned the integration of such courses in the regular curriculum that need the vision and mission of any institutes to adopt such courses. The vision and goals of institutes need to increase their spectrum from more theory to some part of practical challenges from on-ground and adopt the course content accordingly. Keeping in mind the process and expectations of students KIT also introduced to the B.Tech. (Hons.) degree in Civil and Environmental Engineering with a Specialization in Green Technology and Sustainability Engineering, the impact of which is students' inclination has increased toward environmental sustainability.

Figure 9:A case study by Dr. Thorvat

Session 9: Pedagogy in Education and Learning

Dr Kanchan Khare was the expert speaker for this session. She has 36 years of experience in the field of Water Resources and curriculum development. This session content was planned to make participants understand how a revolution in education is important in terms of solving real-life problems by adopting various tools in pedagogy for a better understanding of students. She mentioned that the beginning of industry revolution 4 will take the world to another level of development in various sectors, but implementing that in real life will need proper understanding of problems and which will take place through adopting smart way of communication and tools in regular pedagogy. Pedagogy plays a very important role in education and better learning experience to develop the knowledge and personality of young minds. As industrial revolution 4.0 begins, it will need the support of education 4.0 to drive the journey hand in hand for effective implementation and impact of these revolutions. Pedagogy needs content full of knowledge and adaptive methodology for better learning. She also mentioned that “Education 4.0” is an approach to learning that aligns with the fourth industrial revolution and about transforming the future of education using advanced technology and automation. Creativity is a foundation of Education 4.0 and will be achieved adopting the principals and skills that Education 4.0 demands. It emphasizes the need to prepare students to take on challenges head-on. Dr Khare asked all the participants to adopt the significant trends of education 4.0 in their regular curriculum through practical means and resources. Major trends in education 4.0 are mentioned below:

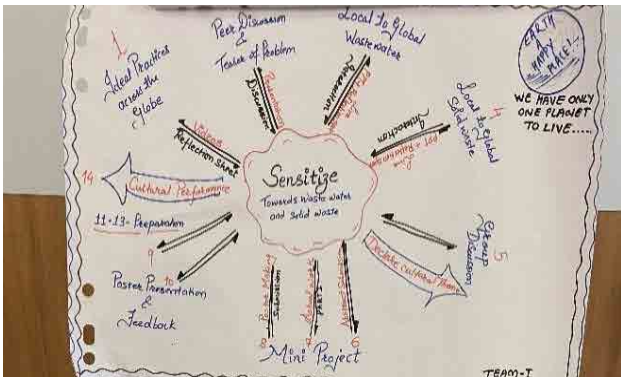
- More personalized learning
- More remote learning opportunities
- The plethora of education tools
- Data at the finger tips
- Easy and accurate assessment
- Project-based learning

Figure 10: Pedagogy in education and learning by Dr. khare

Group exercise

Mr Dhawal Patil conducted an exercise with all the participants by dividing them into a group of 5 to 6 and making 5 groups. Each group has been given the task to develop a strategy for developing a plan on the institutionalization of non sewered sanitation in the curriculum through various projects and tools for students and model this training program into their institutes. He also asked them to make a project implementation plan using flip charts and colour markers and prepare a presentation speech to present the project they sketched on their flip charts. All the five groups have done phenomenal work in making a project plan for conducting such a program in their curriculum through different means and modes of education tools. Best group work and presentation were guided by the NIUA and ESF team and were judged by their respective teams and jury. The best group was awarded a prize.

Figure 11: Group exercise and letter writing by participants



Before concluding the session and the training program, Mr Patil asked participants to write a letter to themselves about their future plans to take the learnings forward from the training. The letter will reach participants after six to eight months of gap to understand how they took and encapsulate the takeaways of the training in their regular practice.

4. Feedback

Providing feedback towards the training sessions and content delivery during and after the training program was voluntary. All participants shared their feedbacks through google forms shared with them.

Considering the feedback carried out for content, level of content, and overall training, following inferences were drawn.

4.1 Online Feedback

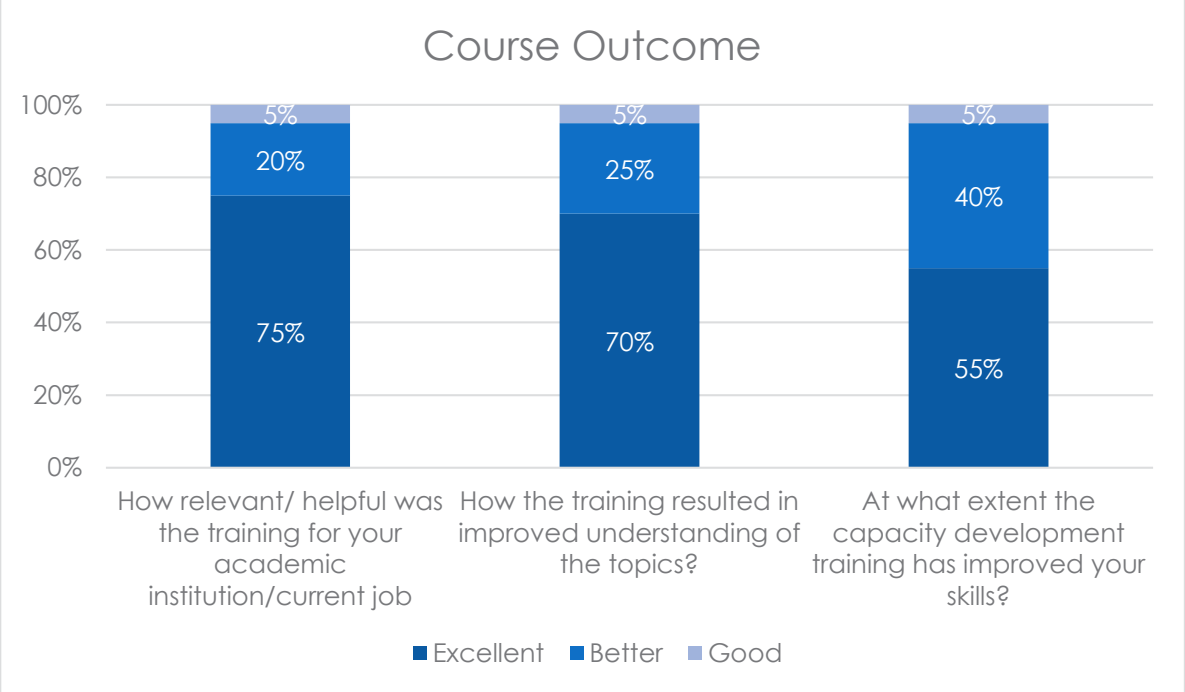
Training learnings and outcomes

The figure below represents the understanding and learning of topics in the module.

The graph below in the figure represents participants feedback on learning outcomes of the training program like the relevance of the training content to the present job, improved understanding of the subject matter, and improved skills/understanding of IWSM.

75% of participants found training excellent and helpful for the institution and their current job, 70% of the participants had excellent understanding of the topics whereas 55% of the participants had excellent capacity development and improved their training skills.

Figure 12: Feedback on learning through modules

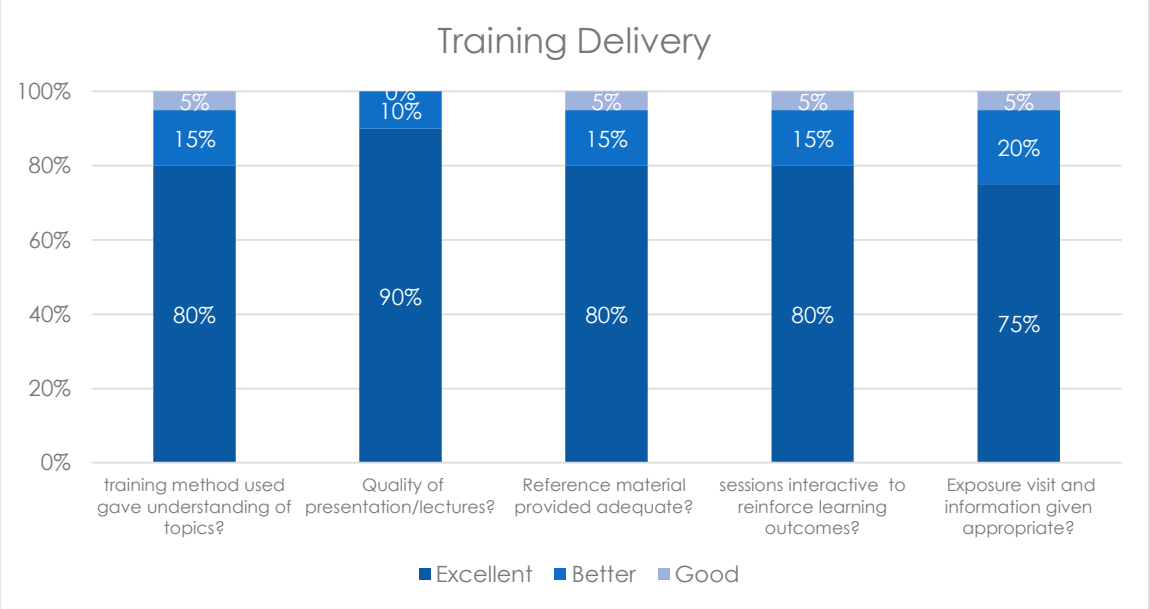


Training content, methods, exposure visits and exercises conducted

The figure below represents the evaluation of the feedback given by participants on training content, methods, exposure visits and exercise conducted during the program.

80% of the participants rated excellent for the session conducted in the training program, the content of the program and especially the game introduced to them. Apart from the content of the slide decks, participants also showed an appreciation towards the case studies discussed during the session that were shared based on the practical implementation of the concepts in India. This helped the participants to find common ground for potential re-application or for realizing appropriate solutions for their projects.

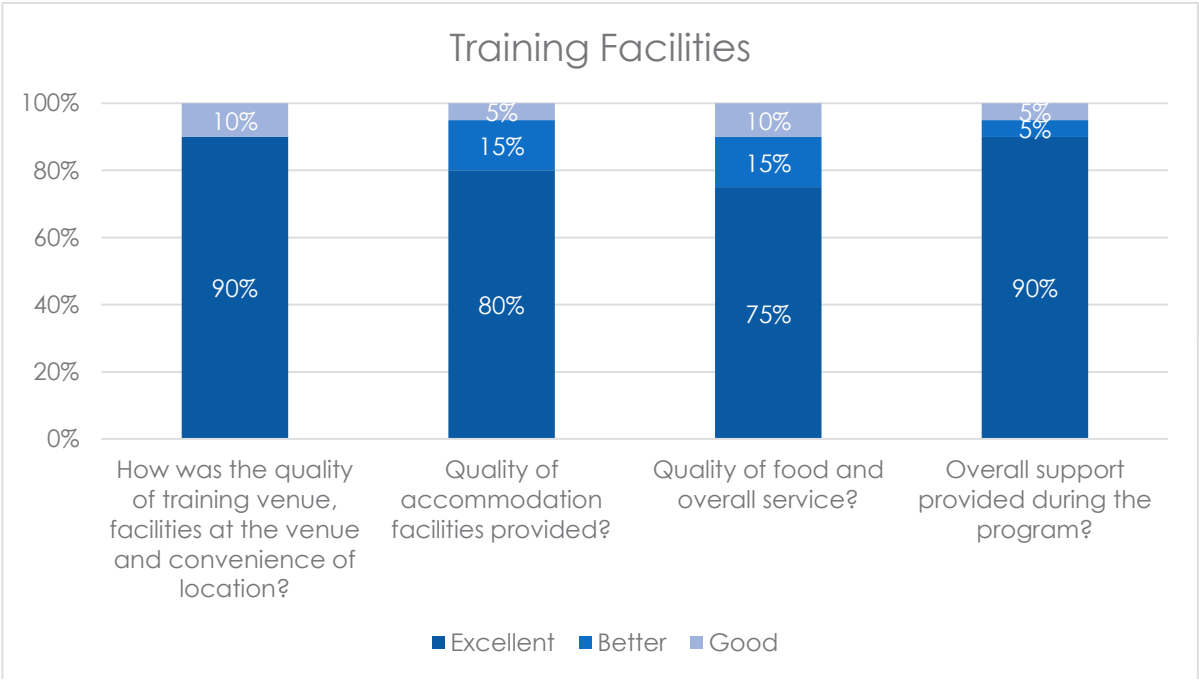
Figure 13: Feedback of training content and delivery



Training Facilities and Program Management

The figure below represents the feedback given by participants on training facilities and program management. The graph below represents feedback on training management, such as course duration, communication from participants, discussion and facilities provided for training.

Figure 14: Feedback on training facilities and management



Offline Feedback

Participants providing feedback towards each session, exercise, learning outcomes, training tools and management after the completion of training through google forms. Few of the participants also gave their offline feedback about training program. Almost all participants gave their feedback for each part of the training and learning.

Figure 15: Offline feedback from participants

The training course ended with a feedback and experience sharing of few participants.

Table 2: Testimonials/feedbacks from participants

Sr. No	Name of the participant	Organization	Testimonial
1.	Bharat Ingavale	College of Engineering, Kolhapur	I am glad and thankful to symbiosis, NIUA and ESF for organising such programs again and again. The course adopted by KIT was thought after the KIT team attended the similar course through NIUA. The exposure visit was helpful for participants to understand the on-ground reality of sanitation infrastructure Looking forward for many more such trainings.
2.	Dr. Chhaya Lande	Symbiosis Institute of Technology, Pune	I am from a mathematics background, wastewater and sanitation is new to me but the way trainers have conducted the training any layman can understand the concept easily. The site visit added to my knowledge how wastewater can be treated within the premises. Thank you for organising this training program which cleared my concept of waste management and problem related to it.
3.	Sagar Kolekar	Symbiosis Institute of Technology, Pune	The sewage standards for reuse and disposal were not known to me but trainers had given brief about all Indian and abroad standards which was vey useful. The board game was very interesting and gave the vision to make something of that sort with students.
4.	Sagar Gawande	Institute of Chemical Technology, Mumbai	My objective for attending the training program was to get in depth knowledge about the IWSM concept and it's on ground challenges which I got during entire 3 days of training. Trainers were giving examples from there on ground experiences was very helpful. Exposure visit was excellent to understand the concept of wastewater management within the premises.
5.	Priya Sharma	BITS Pilani KK Birla Goa Campus	I am having microbiology background but as I have interest in waste management, I wanted to get knowledge about the IWSM concept so I decided to attend the training and I am glad that I attended as I am going back with clarity of thoughts on IWSM concept and challenges.

Annexure 1: List of Resource Persons

Table 3: List of Resource Persons

Sr no.	Name of the resource person	Organization	Role	Profile Photo
1.	Mr Dhawal Patil	Ecosan Services Foundation	Lead Trainer	
2.	Mr Saurabh Kale	Ecosan Services Foundation	Lead Trainer	
3.	Ms. Radhika Boargaonkar	Ecosan Services Foundation	Trainer	
4.	Dr. Akshay Thorvat	KIT's College of Engineering, Kolhapur	Guest Speaker	
5.	Dr. Kanchan Khare	Symbiosis Institute of Technology, Pune	Guest Speaker	

Annexure 2: List of Participants

The following table presents the details of the participants who attended the Integrated Wastewater and Septage Management training under Faculty Capacity Development Program (FCDP).

Table 4: List of Participants

Sr. No.	Participant Name	Designation	Institution Name	Email Id
1	Dr. Kanchan Khare	Professor & Head	Symbiosis Institute of Technology, Pune	kanchan.khare@sitpune.edu.in
2	Dr. Dipika Jaspal	Professor		dipikaj@sitpune.edu.in
3	Sagar Kolekar	Assistant Professor		sagar.kolekar@sitpune.edu.in
4	Dr. Chhaya Lande	Assistant professor		chhaya.lande@sitpune.edu.in
5	Mugdha Kshirsagar	Assistant professor		mugdhak@sitpune.edu.in
6	Dr. Sayali Apte	Assistant Professor		sayali.apte@sitpune.edu.in
7	Vaishnavi Dabir	Assistant Professor		vaishnavi.dabir@sitpune.edu.in
8	Amar jain	Teaching Associate		amar.jain@sitpune.edu.in
9	Pranav Sankapal	Research scholar		pranav.sankapal.jrf@sitpune.edu.in
10	Manali Date	Research scholar		manali.date.phd2021@sitpune.edu.in
11	Prajakta Magdum	Research scholar		prajakta.magdum.phd2021@sitpune.edu.in
12	Radhika Boargaonkar	Research scholar		radhika.boargaonkar.phd2021@sitpune.edu.in
13	Dr. Ravi Sharma	Assistant Professor	Symbiosis Institute of International Business, Pune	ravi.sharma@siib.ac.in
14	Navendu Chaudhary	Associate professor	Symbiosis Institute of Geoinformatics, Pune	navendu.sig.ac.in
15	Dr. Binaya Kumar Pattnaik	Assistant Professor		binaya@sig.ac.in
16	Sagar Gawande	Research Scholar	Institute of Chemical Technology, Mumbai	gawande.sagar@gmail.com
17	Sameer Gujar	Adjunct Faculty	Symbiosis Centre for Management and Human Resource Development, Pune	sameer_gujar@scmhrd.edu
18	Dr. Kedar Bhagwat	HOD and faculty		kedar_bhagwat@scmhrd.edu
19	Priya Sharma	Research Associate	BITS Pilani KK Birla Goa Campus	priya9116.sharma@gmail.com
20	Dr. Manoj Mansing Yadav	Assistant Professor	College of Engineering, Kolhapur	yadavmanoj2212@gmail.com
21	Bharat Ingavale	Assistant Professor		ingavale.bharat@kitcoek.in
22	Dr. Akshay Thorvat	Dean, Associate Professor and Head		thorvat.akshay@kitcoek.in
23	Dr. Yogesh Pisolkar	Assistant Professor	Symbiosis Centre for Management, Pune	yogesh.pisolkar@scmspune.ac.in

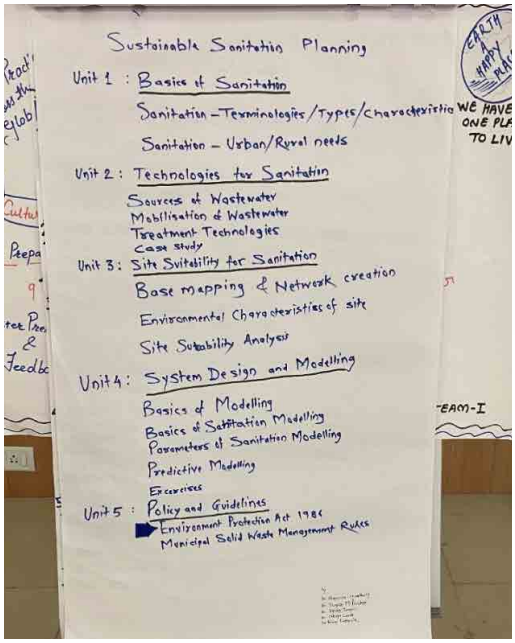
Annexure 3: Session Agenda

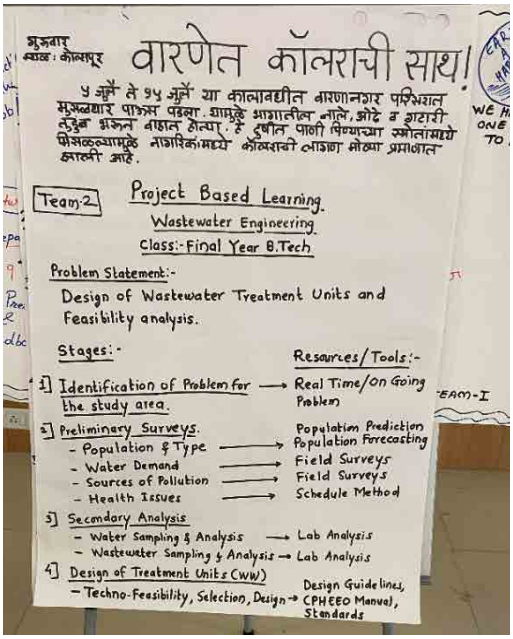
Detailed session-wise agenda followed in the programme.

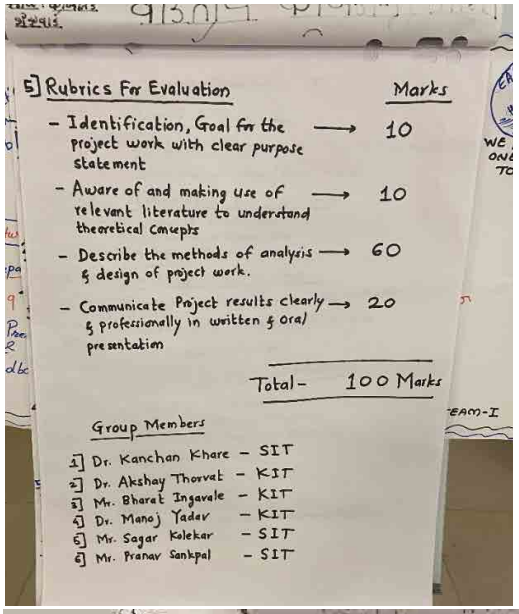
Date	Session	Topic	Content	Resource Person	Duration	Duration
Wednesday 18th May 2022	Welcome Address, Registration and Introduction			Dr. Jyoti Chandiramani, SSE, Dr Mahreen Matto, NIUA, Mr. Dhawal Patil, ESF	30 min.	30 min.
	1	Missions and Programs	Growing recognition of FSSM	Mr. Saurabh Kale	10 Min.	45 Min
			Swachh Bharat Mission 1.0 Urban		10 Min.	
			Swachh Bharat Mission 2.0 Urban		5 Min.	
			Jal Jeevan Mission		5 Min.	
			Policies and guidelines		10 Min.	
			Q&A and Discussion		5 Min.	
	2	Planning Approach	City Wide Inclusive Sanitation	Mr. Dhawal Patil	15 Min.	60 Min.
			Centralized and Decentralized Approach		15 Min.	
			Sanitation Systems Approach		15 Min.	
			SBM 2.0: Used water management		10 Min.	
			Q&A and Discussion		5 Min.	
	3	Board Game – IWSM for coastal reason	Understanding planning and implementation of sanitation systems of any city or town through board game.	Mr. Dhawal Patil	90 Min	90 Min

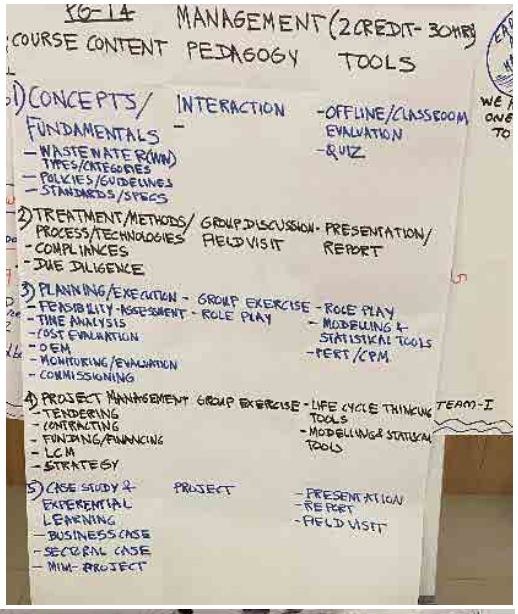
Thursday 19th May 2022	4	Faecal Sludge and Septage Management	Introduction of FSSM	Mr. Dhawal Patil	15 Min.	60 Min.
			Need of FSSM		15 Min.	
			Components of FSSM		10 Min.	
			Planning for FSSM		10 Min.	
			FSSM in Tamil Nadu		5 Min.	
			Q&A and Discussion		5 Min.	
	5	Stakeholder Engagement	Identification of stakeholders	Ms. Radhika Boargaonkar	10 Min.	60 Min.
			Characterisation of stakeholders		15 Min.	
			Stakeholder engagement strategy		15 Min.	
			IEC and BCC campaign		15 Min.	
			Q&A and Discussion		5 Min.	
	6	Group Exercise – Stakeholder Identification and mapping	Stakeholder identification and mapping in any given project	Mr. Dhawal Patil	30 min.	60 Min.
			Prioritization matrix for given projects		30 min.	
	7	Project Management	DPR components and review	Mr. Saurabh Kale	10 Min.	60 Min.
			Financial Modeling		15 Min.	
			Type of tenders		15 Min.	
			Project monitoring and standards		15 Min.	
			Q&A and Discussion		5 Min.	
	Site Visit to College of Engineering, Pune		Natural Wastewater treatment with anaerobic and aerobic process within the campus of CoEP hostel.	Mr. Dhawal Patil, Mr. Saurabh Kale, Ms. Radhika Boargaonkar	120 Min.	120 Min.
Friday 20th May 2022	Recap of Day 2 & Feedback			Mr. Dhawal Patil	15 Min.	15 Min.
	8	Case study – Kolhapur Institute of Technology	Learning of conducting certificate courses and programs for academic institutes	Dr. Akshay Thorvat	45 Min.	60 Min.
			Integration of courses through various means in the regular curriculum.		15 Min.	
	9	Pedagogy in Education and Learning	How to develop targeted course and content	Dr. Kanchan Khare	35 Min.	60 Min.
			Tools for delivering the content effectively		25 Min.	
	10	Group Exercise and presentation	Institutionalization of Non sewered sanitation in curriculum through various projects and tools for students.	Mr. Dhawal Patil, Mr. Saurabh Kale, Ms. Radhika Boargaonkar	60 Min.	60 Min.
	Closing Remarks and Certificate Distribution			Dr. Kanchan Khare, SIT Pune & Dr Mahreen Matto, NIUA	30 min.	30 min.

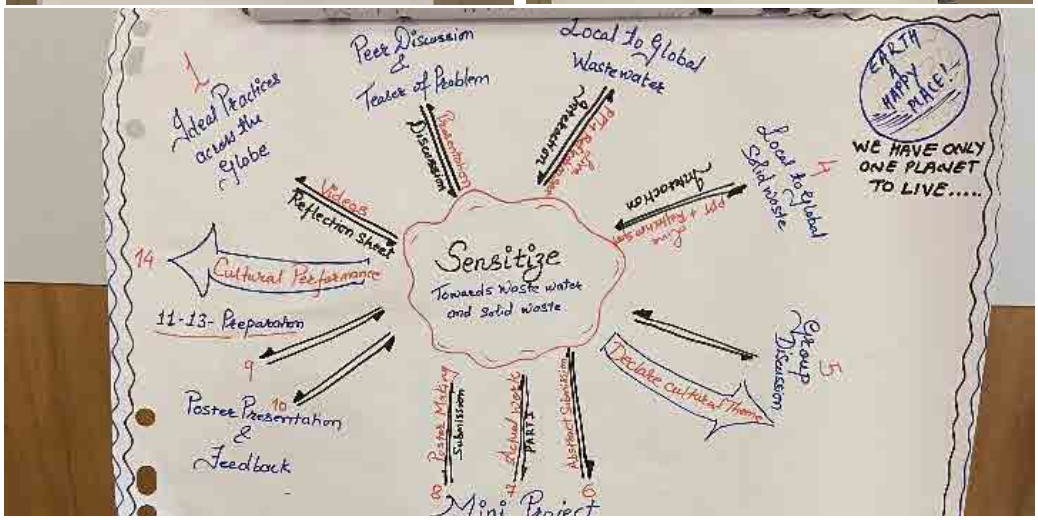
Annexure 4: Exercise on Curriculum Plan











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NIUA is a premier national institute for research, capacity building and dissemination of knowledge in the urban sector, including sanitation. Established in 1976, it is the apex research body for the Ministry of Housing and Urban Affairs (MoHUA), Government of India. NIUA is also the strategic partner of the MoHUA in capacity building for providing single window services to the MoHUA/states/ULBs.

About SCBP

The Sanitation Capacity Building Platform (SCBP) is an initiative of the National Institute of Urban Affairs (NIUA) to address urban sanitation challenges in India. SCBP, supported by Bill & Melinda Gates Foundation (BMGF) is an organic and growing collaboration of credible national and international organisations, universities, training centres, resource centres, non-governmental organisations, academia, consultants and experts. SCBP supports national urban sanitation missions, states and ULBs, by developing and sourcing the best capacity building, policy guidance, technological, institutional, financial and behaviour change advise for FSSM. SCBP provides a unique opportunity for:

- Sharing and cross learning among the partner organisations, to pool in their knowledge resources on all aspects of urban sanitation capacity building;
- Developing training modules, learning and advocacy material including key messages and content, assessment reports and collating knowledge products on FSSM. Through its website (scbp.niua.org), SCBP is striving to create a resource centre on learning and advocacy materials, relevant government reports, policy documents and case studies;
- Dissemination of FSSM research, advocacy and outreach to State governments and ULBs.

Its strength is its ability to bring together partners to contribute towards developing state sanitation policy, training of trainers and training content development, technical and social assessments, training programme delivery, research and documentation.

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