



Sanitation Capacity Building Program

TRAINING ON

INTEGRATED WASTEWATER AND SEPTAGE MANAGEMENT

TRAINING OF TRAINERS REPORT

Nov 9TH – Nov 11TH, 2017



1st Floor, 24 Prashant Nagar,
721/1 Navi Sadashiv Peth,
Pune – 411030, Maharashtra, India

+91 20640 00736 | +91 20245 30061

www.ecosanservices.org

The training of trainers report is prepared to facilitate the coordination with Ecosan Service Foundation and National Institute of Urban Affairs. The report elaborates on the training given to the officials of Amrut Training Institutes on Integrated wastewater and septage management and details of the sites visited at Pune regarding the integrated wastewater and septage management practices.

Prepared by;

Ecosan Services Foundation
1st Floor, 24 Prashant Nagar,
721/1 Navi Sadashiv Peth,
Pune – 411030, Maharashtra, India

For

National Institute of Urban Affairs

1st & 2nd floor,
Urban Habitat Centre,
Lodhi Road, New Delhi – 110003, India

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Abbreviations

| | |
|-------|--|
| AMRUT | Atal Mission for Rejuvenation and Urban Transformation |
| CSTF | City Sanitation Task Force |
| DPR | Detailed Project Report |
| ESF | Ecosan Services Foundation |
| FSSM | Faecal Sludge and Septage Management |
| Gol | Government of India |
| LAP | Local Action Plan |
| NIUA | National Institute of Urban Affairs |
| RAS | Rapid Assessment Survey |
| SCBP | Sanitation Capacity Building Program |
| STP | Sewage Treatment Plant |
| ULB | Urban Local Body |
| IWSM | Integrated Wastewater and Septage Management |

1 Introduction

The water and sanitation sector in India needs reforms if national and global benchmarks for service delivery are to be met with success. The current plight of the sanitation sector and the huge gaps faced by roughly 800 million Indians in accessing sanitation provisions. This highlights the need for not just institutional remodelling of the sector, but also for a novel approach, innovative ideas and urgent decentralization if the sanitation services are to reach the last common denominator. However, decentralization of treatment system (anaerobic process), leads to generation of faecal sludge. These systems need to be desludged at a regular interval to maintain their performance.

Faecal sludge management (FSSM) refers to the removal, treatment, and disposal of faecal sludge from holding tanks (septic or networked through sewerage pipes). Faecal sludge is different from overall sewerage and in that it contains mostly human bodily waste rather than the waste that drains from kitchens, etc.

The Government of India's (GoI) goal is for all cities to have networked sewerage connections, which would send faecal sludge to a central location for treatment and disposal. Presently, 95% of urban local bodies (ULBs) do not have this infrastructure. This means that septic tanks or pits have to be emptied and moved to a location that will process the faecal sludge. In higher end apartment complexes and business centres, there are on-site FSSM solutions; however, it remains a challenge even here where space and options for dumping the treated waste are limited. On the other hand, in poor settlements (slums), latrines are often built so the waste just empties directly outside it. This practice not only has the potential to contaminate the water sources and pollute the environment within the slum, but also the whole surrounding area.

There is little regulatory power to monitor whether faecal sludge is processed according to environmental and health standards. Most cities in India lack the capacity to regulate treatment and dumping of waste. There is also a lack of approved sewage treatment plants (STPs) in the country to safely and effectively treat faecal sludge, if it is actually collected and able to be sent there. Twenty-Seven Indian cities have only primary treatment facilities and 49 have primary and secondary treatment facilities. Due to the lack of functioning STPs and adequate enforcement of regulations, untreated faecal sludge is disposed indiscriminately into water bodies,

drains, landfills, and vacant lands. In Bhubaneswar, Orissa for example, untreated faecal sludge is often dumped directly into the sea. As with the on-site FSSM options, city wide STPs often still have the problem of responsibly dealing with the treated sludge.

Given these issues of collection, treatment, and disposal, it is exciting that innovators are starting to look to this waste as a resource rather than burden. While there is value of innovation at each level of the sanitation chain, mostly due to the human resource and health potential in infrastructure building and collecting waste, there is additional value add in turning the faecal sludge matter into an environmentally beneficial and profitable resource.

NIUA has been supporting the AMRUT Training Institutes in developing capacity building with respect of Integrated Wastewater and Septage. As one of the activity, the Training of Trainers will be organized which can give an opportunity to the designated AMRUT training institutes officials to understand the training modules of integrated wastewater and septage management and which will help them to develop their own modules for AMRUT Urban Local Bodies. The objectives of this activity were to provide training to the officials about the integrated wastewater and septage management at city level and to produce case studies which can be potentially be used to AMRUT cities.

2 List of Participants and Staff

The following table presents the details of the officials, staff with whom we have discussed about the details of the Integrated Wastewater and Septage Management.

TABLE 1: LIST OF PARTICIPANTS AND STAFF

| Sr No. | Name | Designation | Organization / Company | Mobile | Email |
|--------|----------------------------|---------------------|--------------------------------|---------------------------|---|
| 1 | Amita Pathria | Research Associate | AIIILSG, Mumbai | 9653814485 | amita.pathria91@gmail.com |
| 2 | Anand Gupta Chakinala | Associate Professor | Manipal University, Jaipur | 7073580885 | anandgupta.chakinala@jaipur.manipal.edu |
| 3 | Ananya Ghosh | Project Consultant | EY | 8197911193 | ananya.ghosh@in.ey.com |
| 4 | Anjuli Mishra | Joint Director | RCUES, Lucknow | 9415752044 | anjuli.rcueslko@gmail.com |
| 5 | Anuja Padma Gopalakrishnan | Expert (LWM) | KILA, Suchitwa Mission, Kerala | 9645410089 | anujapg@hotmail.com |
| 6 | Apoorva Gangrade | Urban Planner | IPE Global | 9479589006 | apoorvagngrd48@gmail.com |
| 7 | Arvind Kumar | GIS Analyst | ISPER, Panchkula | 9041939237 | isperonline@gmail.com |
| 8 | Awadhesh Kumar Singh | Assistant Director | RCUES, Lucknow | 9936711100 | awadhesh.rcues@gmail.com |
| 9 | C Ram Babu | Urban Planner | MCRHRD, Hyderabad | 8341079393 | ram060207@gmail.com |
| 10 | Chandra Naik | Faculty | ATI, Mysore | 7349379478, 9110606389 | chandranayaksiud@gmail.com |
| 11 | Deepa Nair | Director | MCRHRD, Hyderabad | 9391049802 | valathai@gmail.com |
| 12 | Gaurav Sancheti | Associate Professor | Manipal University, Jaipur | 9694727780 | gaurav.sancheti@jaipur.manipal.edu |

| | | | | | |
|----|-----------------------------|----------------------------|-------------------------------|---------------------------|---------------------------------|
| 13 | Hari Prakash Haihyvanshi | Project Associate | AIIILSG, Lucknow | 9453033321 | hariph45@gmail.com |
| 14 | Jaswant Singh | Sr. Vice President | ISPER, Panchkula | 9888550609 | isperonline@gmail.com |
| 15 | Pravin Lawande | Project Consultant | EY | 9867977337 | pravin.lawande@in.ey.com |
| 16 | Ruchi Singla | Urban Planner | IPE Global | 8847425614, 9582070335 | rsingla@ipeglobal.com |
| 17 | Sagar Gupta | Assistant Professor | Manipal University, Jaipur | 7837888980 | sagar.gupta@jaipur.manipal.edu |
| 18 | Satyam Narayan | Assistant Urban Planner | IPE Global | 7427033303 | snarayan@ipeglobal.com |
| 19 | Shweta Nagarkar | Research Associate | AIIILSG, Mumbai | 8080830401 | shwetanagarkar13@gmail.com |
| 20 | Siddhant Vivek Agrawal | Project Associate | AIIILSG, Jaipur | 9928029319 | siddhant.agrawal@live.in |
| 21 | Ankita Gupta | Project Coordinator | NIUA | 8527628667 | agupta@niua.org |
| 22 | Jyoti Dash | Project Coordinator | NIUA | 9718288014 | jdash@niua.org |
| 23 | Dhawal Patil | Sr. Resource Person | ESF | 9403682008 | dhawal.patil@ecosanservices.org |
| 24 | Saurabh Kale | Sr. Resource Person | ESF | 9665590631 | saurabh.kale@ecosanservices.org |

3 Agenda of the Training of Trainers

The following table represents the details of the scheduled discussion sessions, site visits

TABLE 2: AGENDA OF THE TRAINING OF TRAINERS

| Time | Day 1: November 09th, 2017 |
|----------------------|--|
| 9.30 am-10.00 am | Registration |
| 10.00 am-10.45 am | Welcome Introduction, setting ground rules! Understanding expectations, aims and objectives. |
| 10.45 am-11.00 am | <i>Coffee Break</i> |
| 11.00 am –12.00 noon | Water and Sanitation |
| 12.00 noon – 1.00 pm | Sustainable Sanitation and Water Management I |
| | Group Work: Define boundaries, identify components of water and sanitation |
| 1.00 pm - 2.00 pm | <i>Lunch</i> |
| 2.00 pm- 3.15 pm | Site Visit: Sewage Cure (College of Engineering, Pune) |
| 3.15 pm- 4.00 pm | Site Visit: Organic waste management plant (Peshwe Park) |
| 4.00 pm- 5.00 pm | Site Visit: Soil Scape Filter (Indradhanushya Environment Citizenship Centre) |

| Time | Day 2: November 10th, 2017 |
|------------------------|--|
| 09.00 am- 09.45 am | Non-Technical Aspects |
| 9.45 am- 10.15 am | Group Work: Stakeholders Analysis |
| 10.15 am- 10.45 am | Sustainable Sanitation and Water Management II |
| 10.45 am- 11.30 am | Group Work: Identification of sanitation components of your system/city and nutrient cycle |
| 11.30 noon- 12.00 noon | Coffee Break |
| 12.00 noon- 1.00 pm | Designing of Sanitation Systems |
| 1.00 pm- 2.00 pm | Lunch |
| 2.00 pm – 3.15 pm | Planning for environmental sanitation |
| 3.15 pm- 3.30 pm | Coffee Break |
| 3.30 pm- 4.30 pm | Sanitation Systems and Technologies, I |
| | Group Work: Sanitation Systems |

| Time | Day 3: November 11th, 2017 |
|--------------------|---|
| 10.00 am-10.45 am | Sanitation Systems and Technologies II |
| 10.45 am-11.00 pm | Coffee Break |
| 11.00 am- 12.15 pm | Wastewater Treatment Technologies |
| 12.15 pm- 1.00 pm | Group Work: Conceptualising Wastewater Treatment Systems |
| 1.00 pm- 2.00 pm | Lunch |
| 2.00 pm- 3.00 pm | Group Presentations |
| 3.00 pm- 3.15 pm | Coffee Break |
| 3.15 pm- 3.45 pm | Evaluation: Action Learning-Letter to Myself, Participants Feedback |
| 3.45 pm- 4.15 pm | Closing Session and Distribution of Certificates |

4 Sessions

Day 1, November 9th, 2017

The day was started with the initial introduction and objectives of the training program under Sanitation Capacity Building Program. Initially, Ms. Jyoti Dash introduced the participants about the Sanitation Capacity Building Program and its objective. After initial introduction of the SCBP, the introduction round session was hosted by Mr. Saurabh Kale, Sr. Resource Person. In the introduction round, every participant introduced themselves and briefed about their expectation from the training program. After introduction round, Mr. Saurabh Kale briefed about the overall agenda of the training of trainers, information of the training material in the kit and ground rules set for the training.



Presentation Session

Presentation 1: Water and Sanitation

After the introduction session, Mr. Dayanand Panse, Sr. Resource Person and Director, ESF presented the first module water and sanitation. Mr. Panse initiated the session with the brief worldwide scenario of water and sanitation and the goals set under 6th section in Sustainable Development Goals (SDGs). The key objective of this

presentation was to provide brief about environmental health, water supply and environmental sanitation. It also focused on the current challenges in urban region with respect of water management and sanitation. The session covered the following components:

- Environmental health
- Water supply and environmental sanitation
- Resource and waste streams
- Urban challenges



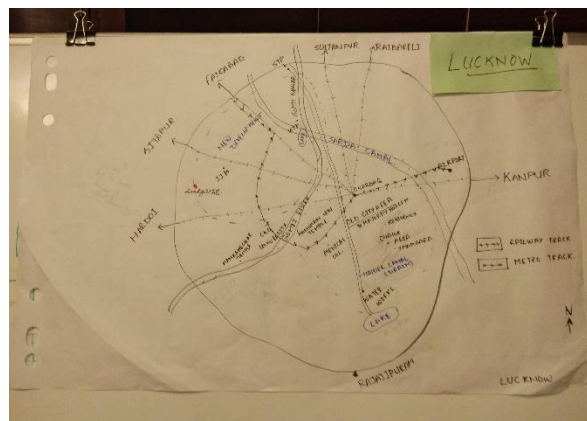
Presentation 2: Sustainable Sanitation and Water Management I

The second session was started with the presentation on Sustainable Sanitation and Water Management. The key objective of this presentation was to provide an overview of concept of sustainable sanitation and its management. It also focused on the ecological sanitation and closing the loop. The session was facilitated by Mr. Saurabh Kale, Sr. Resource Person covering the following components:

- Waste Products – black water, grey water, excreta, faecal sludge, domestic wastewater and stormwater
- Parameters for characterizing the wastewater – solids, organic constituents, nutrients, pathogens and other parameters
- Understand your system



After this session, participants worked on the group exercise on understand your system. In this activity, Mr. Saurabh Kale, instructed the participants about methodology of the exercise and distributed the participants in five different groups a) Hyderabad b) Lucknow c) Bhubaneswar d) Bhopal e) Jaipur. In this activity, participants defined the boundaries of the respective city, identified the natural and build infrastructure of the system and identified the components of water and sanitation. All participants, actively participated in the group activity and raised many queries about the system. This group work gave participants a comprehensive understanding of the local water and sanitation cycle by identifying the components (source, transport, use, etc.) and the existing links between them. In the discussion with the participants, each component is discussed with the participants and scenario of the cities were discussed with groups.



Exposure Visit

Site Visit: Organic Waste Management Plant, Peshwe Park, Pune

In the post lunch session of first day, we have visited the study site Organic Waste Management Plant at Peshwe Park which is of total 5TPD capacity. The plant Engineer

explained the treatment process, treatment units, Operation and Maintenance (O&M) activities.

It is located near Saras baug at Swargate area. The organic waste generated in the nearby hotels and restaurants is collected in the collection truck. Then it is transported to the same plant. Treatment units are such as follows,

1. Inlet dumping station
2. Segregation (manual)
3. Electronic Shredder
4. Primary Digester
5. Secondary Digester
6. Scrubber
7. Gas collection balloons
8. Electricity Generator set

Segregation process is carried out manually at this plant. After digestion the generated gas is passed through scrubber to dissolve harmful gasses like CO₂ and H₂S. Total 15 number of staff involved in the whole operation of the plant. The electricity generated from this plant is used for around 40 number of street lights which are there on nearby street.



The participants discussed about the functioning of the plant. After understanding each and every processes and units, participants asked many queries and doubts about the functioning and feasibility of the plant.

Participants also visited one of the plant nearby where used and empty coconut shells from central market area are shredded and the strands by-product is reused for making ropes by the private agencies.

Site Visit: Indradhanushya Citizenship Centre, Pune

In the next session, we have visited the Indradhanushya citizenship centre where the Soil Scape filter treatment system is installed. The total capacity of the plant is about 50 KLD. Mr. Sagar Patil explained the treatment process, treatment units, Operation and Maintenance (O&M) activities step by step to the participants.



The plant is located on the bank of Ambil nalha. The stormwater (mixed sewage) from this *nalha* is collected in the intake well through gravity and then treated with the help of Soil Scape Filter treatment system. It's a decentralised treatment system and the treated water is reused in gardening activity in this garden and another nearby garden. This technology is natural wastewater treatment technology with minimal operational cost.

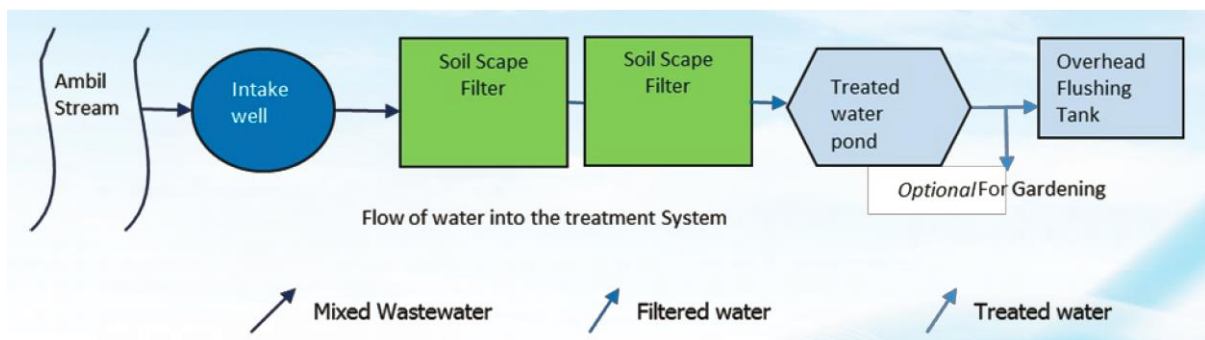


FIGURE 1: FLOWCHART OF SOIL SCAPE FILTER

The participants discussed about the functioning and feasibility of the plant. They found this system suitable with the perspective of pilot treatment system at institutional level. They also compared the cost of the operation and other O&M activities of this plant for the reflection of the system at their institute level.

Site Visit: Sewage Cure (DTS & Constructed Wetland System), College of Engineering Pune

In the last session on the first day, participants have visited the Sewage Cure (Decentralized Treatment System and Constructed Wetland) Plant situated at College of Engineering Pune. Mr. Saurabh Kale and Mr. Sagar Patil explained the background of the system, treatment process of the system, treatment units, 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 College of Engineering Pune has total residence capacity of 2000 students. They have new and old hostel blocks and in new hostel block segregation of black and grey water has been installed, while in old hostel blocks segregation system is not installed.

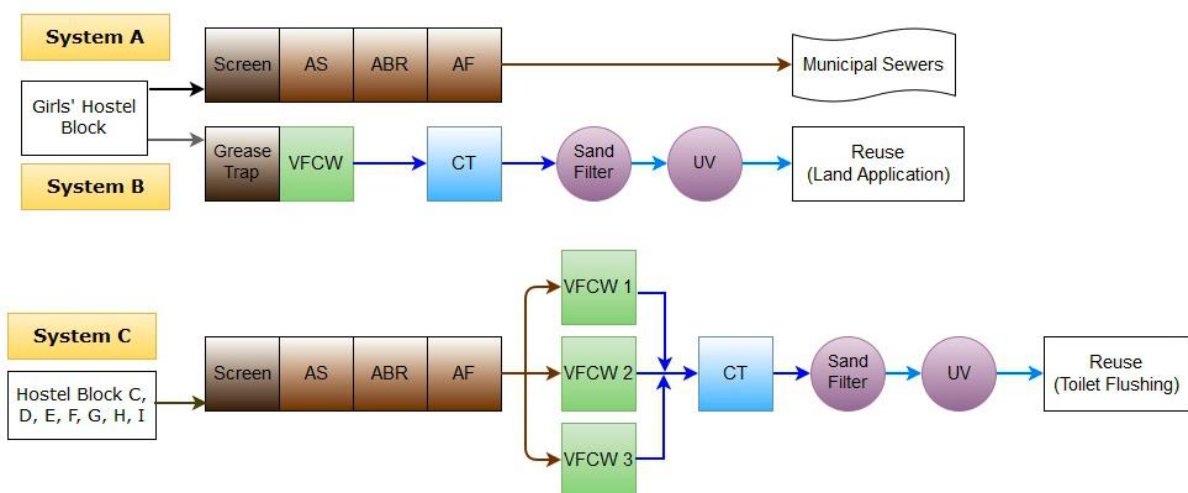


FIGURE 2: DTS AND CONSTRUCTED WETLAND

It is a decentralised treatment system and the treated water is reused in toilet flushing and gardening activity in 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 every processes and units, participants discussed about 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 to reflect this kind of system at their training institute campus.

Day 2, November 10th, 2017

Presentation 3: Sustainable Sanitation and Water Management II

The first session of second day was started with the presentation on Sustainable Sanitation and Water Management II. The key objective of this presentation was to provide an overview of concept of ecological sanitation and resource management. It also focused on the planning of sanitation systems and closing the loop. The session was facilitated by Mr. Saurabh Kale, Sr. Resource Person covering the following components:

- Ecological Sanitation – hygienically safe, economical and closing the loop
- Resource Management – centralized and decentralized approaches
- Planning of sanitation systems
- Closing the loop – urban water cycle, urban nutrient cycle loop



After this session, participants worked on the second part of the group exercise on understand your system. In this activity, Mr. Saurabh Kale, instructed the participants about methodology second part of the exercise. After the identification of the components of water and sanitation, Mr. Saurabh asked few questions to the participants about the system, mainly the problems in water and sanitation perspective for their city. All participants, actively participated in the group activity and discussed many points about their own city.

Presentation 4: Designing of Sanitation Systems

The next session was started with the presentation on Designing of Sanitation Systems. The key objective of this presentation was to provide a brief overview of the sanitation

systems and functional groups. It also focused on the decentralised systems and the systematic planning approach required in the designing. The session was facilitated by Mr. Dhawal Patil, Sr. Resource Person covering the following components:

- Designing of sanitation systems – functional groups, the ideal system, the appropriate system
- Decentralised system – shift in paradigm, limitations of centralised systems, features and constraints of decentralised systems
- Systematic planning – need of systematic planning, the best planning model, framework for strategic planning

Presentation 5: Sanitation Systems and Technologies I

This session was started with the presentation on Sanitation Systems and technologies. The key objective of this presentation was to provide a brief overview of the different sanitation systems and its objectives. It also focused on the emergency sanitation infrastructure. The session was facilitated by Mr. Dhawal Patil, Sr. Resource Person covering the following components:

- Sanitation and its objectives
- Functional Groups – User Interface, Collection and storage/treatment, conveyance, semi centralised treatment, use and/or disposal



Presentation 6: Non-Technical Aspects

This session was started with the presentation on Non-technical aspects. The key objective of this presentation was to provide a brief overview of the enabling environment and non-technical aspects involved in the sanitation systems. It also focused on institutional, political, economic and financial aspects. The session was

facilitated by Mr. Dhawal Patil, Sr. Resource Person covering the following components:

- Involvement of Stakeholders
- Enabling Environment – government support, legal framework, institutional arrangements, capacity building, financing
- Institutional and political aspects
- Economic aspects
- Financial aspects



Day 3, November 11th, 201

Presentation 7: Sanitation Systems and Technologies II

This session was started with the presentation on sanitation systems and emergency sanitation infrastructure. The session was facilitated by Mr. Dhawal Patil, Sr. Resource Person covering the following components:

- Sanitation systems
- Emergency sanitation infrastructure

After this session, a group activity was carried out on sanitation systems. This group activity helped the participants to visualize a sanitation system with a matrix of functional groups (columns) and products (rows) that are linked together where potential combinations exist. In this activity, participants were distributed in five groups and they have given two user interfaces. Participants visualised the whole sanitation system for those user interfaces. The detailed discussion was carried out in this activity.

Presentation 8: Wastewater Treatment Technologies

This session was started with the presentation on wastewater treatment technologies. The key objective of this presentation was to provide a brief overview of the basics of wastewater treatment and different technologies for the wastewater management. It also focused on an appropriate treatment system and treatment chain. The session was facilitated by Mr. Dhawal Patil, Sr. Resource Person covering the following components:

- Wastewater treatment basics – quantification of sewage, quality of sewage, treatment process, design parameters, stage of wastewater treatment.
- Primary treatment
- Secondary treatment
- Tertiary treatment
- Appropriate treatment system
- Treatment chain

After this session, a group activity was carried out on conceptualizing wastewater treatment systems. This group activity helped the participants to design the

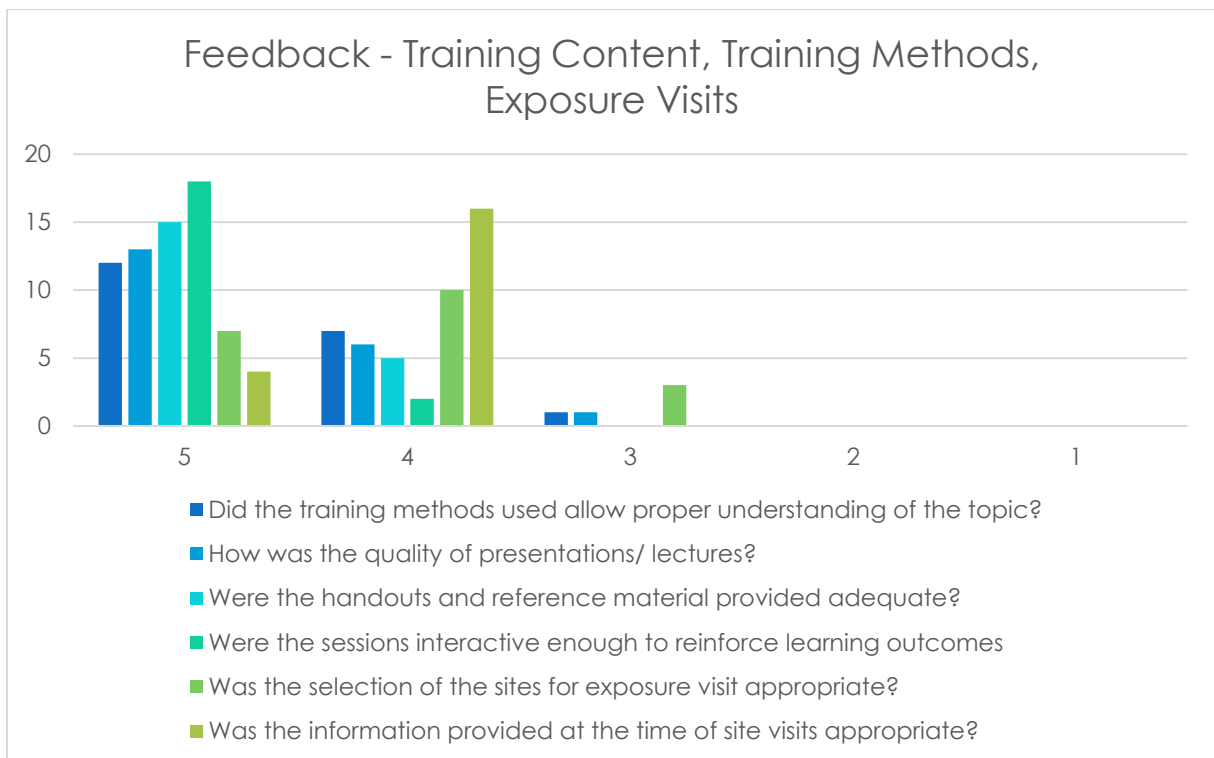
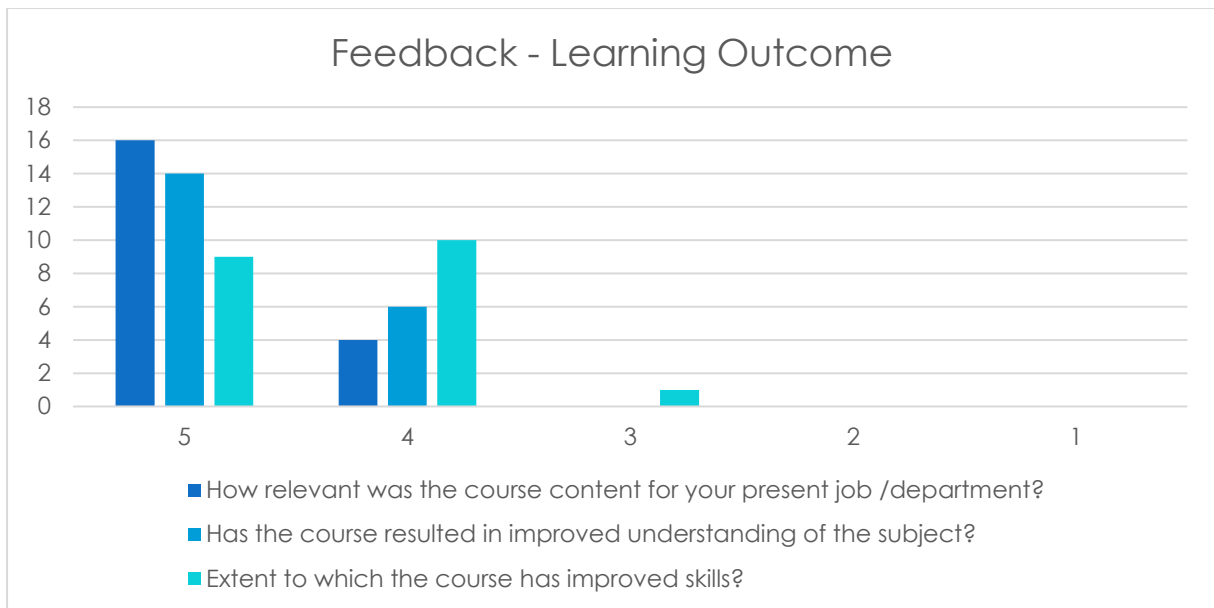
wastewater treatment system with different treatment units. In this activity, participants were distributed in five groups and they have given three cases of treatment systems a) Conventional Treatment System with Activated sludge process, b) Wastewater Treatment System with Tricking Filters c) Natural Wastewater Treatment System (DTS and Constructed Wetlands). Participants analysed their own city group wise and visualise the current status of sanitation. After visualisation, they have proposed the appropriate wastewater treatment system for their city. After the initial group activities, each group presented their own points and Mr. Dhawal facilitated the final group activity discussions.

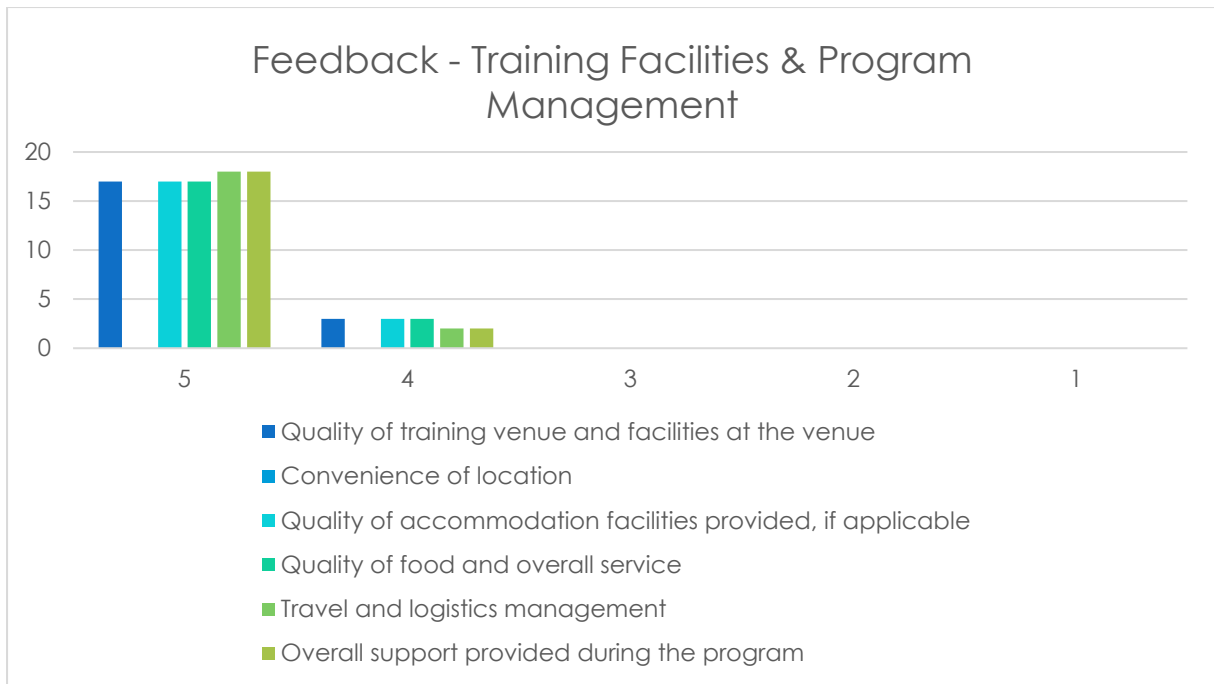


Feedback and Wrap-up Session

The participants were satisfied with the overall training of trainers and exposure visit and they found it to be very helpful to develop their own training programs at training institute level for AMRUT cities and other specific officials. as evident from the feedback conducted by the participants. They were observed to be motivated to go back with a good understanding of the Integrated Wastewater Management and concrete ideas for module development. The participants also showed their interest to implement the showcased decentralized treatment technologies as a pilot scale

at their institute level. The participants were asked to evaluate the workshop on five parameters – content of the training, training methods, trainers, relevance of the training to their work and the venue.





In the closing session, Mr. Dhawal Patil Sr. Resource Person, ESF thanked all the participants and the National Institute of Urban Affairs for their support on successfully organising the training of trainers at Pune. The participants also thanked the organizers, NIUA for the very useful training. The participants were awarded certificates for their participation. Mr. Dayanand Panse, Sr. Resource Person and Director, ESF felicitated the participants with Certificate of Participation. They thanked the participants for their active participation and making the training of trainers a success.





ANNEXURES

Attendance Sheet



Integrated Wastewater & Septage Management

Training of Trainers | Pune | November 09th – 11th, 2017



| Sr No. | Name | Organization | Signature | | |
|--------|--------------------------------|--------------------------------|-----------------------------|-----------------------------|-----------------------------|
| | | | Nov 09 th , 2017 | Nov 10 th , 2017 | Nov 11 th , 2017 |
| 1 | Ms. Amita Pathria | AIIISG, Mumbai | <i>Amita Pathria</i> | <i>Amita Pathria</i> | <i>Amita Pathria</i> |
| 2 | Dr. Anand Gupta Chakinala | Manipal University, Jaipur | <i>Anand</i> | <i>Anand</i> | <i>Anand</i> |
| 3 | Mr. Ananya Ghosh | EY | <i>Ananya Ghosh</i> | <i>Ananya Ghosh</i> | <i>Ananya Ghosh</i> |
| 4 | Dr. Anjali Mishra | RCUES, Lucknow | <i>Anjali</i> | <i>Anjali</i> | <i>Anjali</i> |
| 5 | Dr. Anuja Padma Gopalakrishnan | KILA, Suchitwa Mission, Kerala | <i>Anuja</i> | <i>Anuja</i> | <i>Anuja</i> |
| 6 | Ms. Apoorva Gangrade | IPE Global | <i>Apoorva</i> | <i>Apoorva</i> | <i>Apoorva</i> |
| 7 | Mr. Arvind Kumar | ISPER, Panchkula | <i>Arvind</i> | <i>Arvind</i> | <i>Arvind</i> |
| 8 | Mr. Awadhesh Kumar Singh | RCUES, Lucknow | <i>Awadhesh</i> | <i>Awadhesh</i> | <i>Awadhesh</i> |
| 9 | Mr. C Ram Babu | MCRHRD, Hyderabad | <i>C Ram Babu</i> | <i>C Ram Babu</i> | <i>C Ram Babu</i> |
| 10 | Mr. Chandra Naik | ATI, Mysore | <i>Chandra Naik</i> | <i>Chandra Naik</i> | <i>Chandra Naik</i> |

Attendance Sheet

| | | | | | |
|---------------|------------------------------------|----------------------------|---------------------------------|---------------------------------|---------------------------------|
| 11 | Dr. Deepa Nair | MCRHRD, Hyderabad | <i>Dr. Deepa Nair</i> | <i>Dr. Deepa Nair</i> | <i>Dr. Deepa Nair</i> |
| 12 | Dr. Mr. Gaurav Sancheti | Manipal University, Jaipur | <i>Gaurav Sancheti</i> | <i>Gaurav Sancheti</i> | <i>Gaurav Sancheti</i> |
| 13 | Mr. Hari Prakash Haihyvanshi | AILSG, Lucknow | <i>Hari Prakash Haihyvanshi</i> | <i>Hari Prakash Haihyvanshi</i> | <i>Hari Prakash Haihyvanshi</i> |
| 14 | Mr. Jaswant Singh | ISPER, Panchkula | <i>Jaswant Singh</i> | <i>Jaswant Singh</i> | <i>Jaswant Singh</i> |
| 15 | Mr. Pravin Lawande | EY | <i>Pravin Lawande</i> | <i>Pravin Lawande</i> | <i>Pravin Lawande</i> |
| 16 | Ms. Ruchi Singla | IPE Global | <i>Ruchi Singla</i> | <i>Ruchi Singla</i> | <i>Ruchi Singla</i> |
| 17 | Mr. Sagar Gupta | Manipal University, Jaipur | <i>Sagar Gupta</i> | <i>Sagar Gupta</i> | <i>Sagar Gupta</i> |
| 18 | Mr. Satyam Narayan | IPE Global | <i>Satyam Narayan</i> | <i>Satyam Narayan</i> | <i>Satyam Narayan</i> |
| 19 | Ms. Shweta Nagarkar | AILSG, Mumbai | <i>Shweta Nagarkar</i> | <i>Shweta Nagarkar</i> | <i>Shweta Nagarkar</i> |
| 20 | Mr. Siddhant Vivek Agrawal | AILSG, Jaipur | <i>Siddhant Vivek Agrawal</i> | <i>Siddhant Vivek Agrawal</i> | <i>Siddhant Vivek Agrawal</i> |
| 21 | Dr. Sunil Dhapte | YASHADA, Pune | | | |
| 22 | | | | | |

Attendance Sheet

| | | | | | |
|----|--------------|------|--------------|--------------|--------------|
| 23 | Jyoti Danu | NIVA | Jyoti Danu | Jyoti Danu | Jyoti Danu |
| 24 | Ankita Gupla | NIVA | Ankita Gupla | Ankita Gupla | Ankita Gupla |
| 25 | Saurabh Kale | ESF | Saurabh Kale | Saurabh Kale | |
| 26 | Dhawal Patil | ESF | | Dhawal Patil | Dhawal Patil |
| 27 | | | | | |
| 28 | | | | | |
| 29 | | | | | |
| 30 | | | | | |

Attendance Sheet

Feedback Form



Integrated Wastewater & Septage Management



Training of Trainers | Pune
November 09th – 11th, 2017

FEEDBACK FORM

| General Information | |
|---------------------|-------------------------------------|
| Name | C. Ram Balu |
| Designation | Technical Specialist Urban Planning |
| Organization | Dr. MCRHRDI, Hyderabad, Telangana |
| City and State | Hyderabad, & Telangana |
| Contact No. | 8341079393 |
| Email Id | ram060207@gmail.com |

| Learning Outcomes (tick for the appropriate option) | | | | | |
|---|---|--|--|--|--|
| How relevant was the course content for your present job /department? | ✓ | | | | |
| Has the course resulted in improved understanding of the subject? | ✓ | | | | |
| Extent to which the course has improved skills? | ✓ | | | | |
| Training Content, Training Methods, Exposure Visits (tick for the appropriate option) | | | | | |
| Did the training methods used allow proper understanding of the topic? | ✓ | | | | |
| How was the quality of presentations/ lectures? | ✓ | | | | |
| Were the handouts and reference material provided adequate? | ✓ | | | | |
| Were the sessions interactive enough to reinforce learning outcomes | ✓ | | | | |

Feedback Form

| | | | | | |
|---|--|---|--|--|--|
| Was the selection of the sites for exposure visit appropriate? | ✓ | | | | |
| Was the information provided at the time of site visits appropriate? | | ✓ | | | |
| Training Facilities and Program Management (tick for the appropriate option) | | | | | |
| Quality of training venue and facilities at the venue | ✓ | | | | |
| Convenience of location | | | | | |
| Quality of accommodation facilities provided, if applicable | ✓ | | | | |
| Quality of food and overall service | ✓ | | | | |
| Travel and logistics management | ✓ | | | | |
| Overall support provided during the program | ✓ | | | | |
| Any other qualitative feedback regarding the training facilities and management | <p>changed the Very good Training program changed the understanding towards the wastewater management</p> | | | | |