Ministry of Urban Development,
Government of India, New Delhi

"Water and Waste Water Management"

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Comprehensive Capacity Building Programme (CCBP)
Ministry of Urban Development
Government India

Prepared by:

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Aims

To develop Water and Wastewater Management skills and techniques among the officers to effectively formulate and implement the urban water and Wastewater management schemes in ULBs. JNNURM lays emphasis on securing effective linkages between asset creation and asset management so that the infrastructural services created in the cities are not only maintained efficiently but become self-sustaining over time.

Objectives

Participants will be able to;

- Understanding the Urban issues Water and Sanitation from national, states and Local Perspectives.
- Historical background and Objectives of JNNURM.
- Able to set goals, achievable targets, managing time and motivate others to deliver the services.
- Effective Communication skills, better equipped to prepare Project report and vet DPRs.
- Build team Spirit for better efficiency.
- Adopting Appropriate Strategies to tackle local Problems concerning Water and Wastewater Management.
- Exposure to national and international Learning, and Experience sharing.
- Understand Formulation, Appraisal, Implementation, Monitoring & Evaluation of Water Supply and Wastewater Projects.
- Explain the financial management of a project.
- Work in groups in solving bottlenecks and other problems, they encounter, in successful completion of a project.
- State how to repair and maintain the machineries and its accessories in Water Supply and Sewerage systems.
- Explain technical issues and maintenance of Water Supply and Wastewater Schemes.
- List the steps involved in participatory planning and community participation in Operation and Maintenance of water supply.
- Understanding the source of fund and expenditure patterns required for Operation and Maintenance of Water Supply Schemes.
- Understanding the Urban Lake Eco system and need to protect the Water bodies.

Course Content

The course covers the following themes;

- Legal and Policy framework – concerning Water Management
- Present Status of Water Management, Issues and Concerns
- Operation and Maintenance of Water Management and Sanitation
- IEC activities for sustainable Management of Water Management and Citizens Participation
- Economics of Water Management
- Operation & Maintenance of Pumping machineries in Water Management
- Funds for Operation and Maintenance
- Community Participation in Water Management
- Asset Mapping and Water Management
- Water Quality and Treatment methods
- PPP in Water and Wastewater Management

Course Methodology

1. Lecture
2. Participatory and interactive methods
3. Group study
4. Case Study
5. Exposure visit
6. Video / film show /PPT

Target Group

Environmental Engineers, AEE and Health officers/Inspectors of Urban Local Body will be the participants of the training.

Duration

The course is scheduled for 3 days, 2 & half day of class room and half (1/2) day field visit (Instead of 4 days).

Certification

The participants will be awarded certificates on completion of the course without any absenteeism on 3rd day at the end of the course.

Outcome

Participants will be able to implement Water Supply and Sanitation projects in ULBs without cost and time over run and successfully carry out O & M to ensure efficient and timely delivery and services

	Outline of the Module :01
COMPONENT	**DESCRIPTION**
Content	**Legal and Policy framework – concerning Urban Water and Wastewater Management**
Background	There is no comprehensive urban sanitation law in India, either at the Central or State levels. Instead, the sources of law relating to urban sanitation exist in a multitude of legal instruments, including pollution control laws enacted by the Central Governmenti and municipal laws,ii laws governing parastatal bodies,iii public health laws,iv and building and sanitation byelaws,v enacted at the State or local level. In addition, the National Urban Sanitation Policy 2010 and the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) provide the basis for government and private sector interventions for urban sanitation.
Target Groups / Intended Audience(S)	• Environmental Engineers, AEE and Health officers/Inspectors of Urban Local Body will be the participants of the training.
Learning Objectives	• List the provision of Environmental Protection Acts and Water Act • Explain the Role and Responsibilities of ULBs Acts related to Public service provision of Water and Wastewater Management Describe the importance of Lok Adalat and Sakala
Module Overview	All the municipal laws include provisions relating to water supply, drainage, sewerage and sanitation. Sanitation is one of the duties/functions of the municipal authorities. They are also required to ensure connection of private drains to the drainage network and to provide places for disposal of sewage. Similar obligations are cast on parastatal bodies under the applicable laws. While these laws do not address all aspects of urban sanitation, even the existing provisions are not often implemented. Non-availability of funds, prioritization of other public services, lack of awareness about the importance of sanitation, absence of public demand, etc. are some of the reasons for this state of affairs.
Module Delivery Outline	• Context of JNNURM – Historical background and status • Key provisions in Environmental Protection Act 1986 and Water Act 1976. • Public Service Provision – Role and Responsibility of ULB's and IS standards • Karnataka Water Policy – Key Provision • Lok Adalat and Sakala
Module Activities	Resource Person will brief the Act relevant Rules and Guidelines policy of GOI and GOK in environmental protection. He motivate trainees to share their experience and he present some case studies of success and failure effort in Water and Wastewater Management
Method	Lecture, Participatory and interactive methods ,Group study ,Case Study, Exposure visit ,Video / film show /PPT

Supporting Materials	As prepared / developed by the institute
Module Feedback	After the session trainees will gain knowledge on the legal issues in environment protection and the role of ULBs. The approach towards water and Wastewater will change and proactively work for creating healthy environment.

Outline of the Module:02	
COMPONENT	**DESCRIPTION**
Content	**Introduction to Water Management : Issues and Concerns**
Background	The key challenges identified include (1) inefficient rural institutions to manage water availability in a reliable manner, especially during dry seasons; (2) inadequate adaptation of successful institutions at a larger scale; (3) inequity in access to water for disadvantaged groups such as female and poor farmers; (4) change in farming practices due to migration of male labour from rural areas; (5) lack of comprehensive knowledge of spatial and temporal variability of water resources at local and regional scale; (6) coping mechanisms for rising energy costs for pumping groundwater; (7) coping with extreme climatic conditions in the coastal zones of EGP; and (8) coping mechanisms to minimize the damage to rural properties as a result of floods.
Target Groups / Intended Audience(S)	Environmental Engineers, AEE and Health officers/Inspectors of Urban Local Body will be the participants of the training**.**
Learning Objectives	• List the basic components of water and Wastewater management • Explain in brief the technical considerations and critical design aspects • List sustainability practices with quality issue List the water treatment methods and components of a water treatment plant
Module Overview	Over the duration of the workshop, participants openly shared their knowledge and experiences within the region and contributed towards developing concept notes that would address the key challenges and areas that were identified throughout the various sessions. The process included a total of 30 overview presentations, some of which were generic in nature while others addressed specific issues in each country. This was followed by two working sessions, one addressing thematic challenges and the second addressing regional challenges.
Module Delivery Outline	• Key components of water management in ULB's and basic design criteria. • Sources of water Viz., Surface and Ground water – Issues of sustainability and liability, • Quality aspects – Physical, Chemical and Bacteriological parameters and standards for potable water including relation to public health • Treatment methods - Unit Operations and Processes (depending on the quality of the source and contamination) • Transmission mains, pumping from the sources (intake well, bore well etc) including the valves and appurtenances Storage reservoirs- Capacity, Residual head & Distribution (GLSR, OHT, Cisterns, Public tap, HSC)
Module Activities	The Resource Persons will given us overview of the field problems faced by Engineers in delivering Water Supply. He will outline the basic design criteria and the relevant IS standards for potable water quality.
Method	Lecture, Participatory and interactive methods ,Group study ,Case Study,Exposure visit ,Video / film show /PPT
Supporting Materials	As prepared / developed by the institute

	Outline of the Module:03
COMPONENT	**DESCRIPTION**
Content	**Urban Lake Management**
Background	Lakes are important part of urban ecosystem. Though relatively small in size, lakes perform significant environmental, social and economic functions, ranging from being a source of drinking water, recharging groundwater, acting as sponges to control flooding, supporting biodiversity and providing livelihoods. Water in lakes is an easily available source of water for the needs of many sectors of economy such as agriculture, domestic and industrial. These water bodies, whether man-made or natural, fresh water or brackish play a very vital role in maintaining environmental sustainability particularly in urban environments especially in today's context when the cities are facing the challenges of unplanned rapid urbanization.
Target Groups / Intended Audience(S)	Environmental Engineers, AEE and Health officers/Inspectors of Urban Local Body will be the participants of the training**.**
Learning Objectives	• Describe the necessity to preserve, protect and develop water bodies in Urban areas. • List the factors responsible for present lake decay / vanishing in ULBs. • Explain various approaches for protecting lake • List the various low cost technologies for treating quality of Wastewater entering the lakes and also for promoting reuse.
Module Overview	• National Lake conservation plan : Overview • Historical background and development of Urban Lakes • Pollution and neglect of Urban water bodies • Preparation of Lake Management Plan on Ecological Consideration
Module Delivery Outline	Workbook, Case study, Discussion and presentation
Module Activities	Resource Person will give an overview of the GoI initiative on Lake conservation plan and highlight the need to arrest unabated pollution of water bodies
Method	Lecture, Participatory and interactive methods ,Group study ,Case Study,Exposure visit ,Video / film show /PPT
Supporting Materials	As prepared / developed by the institute

Outline of the Module:04	
COMPONENT	**DESCRIPTION**
Content	**Operation and Maintenance of Water Supply System**
Background	Strengthening the technical, operational and managerial capabilities required of the concerned personnel to operate and maintain water supply services as per acceptable norms of quantity, quality, sustainability, reliability and cost.
Target Groups / Intended Audience(S)	Environmental Engineers, AEE and Health officers/Inspectors of Urban Local Body will be the participants of the training**.**
Learning Objectives	1. Describe the steps involved in delivering efficient water supply service and preparation of a draft operational plan 2. List key technical and operational issues encountered at the field level. 3. Calculate the water losses due to leakage and list the cause for poor maintenance. 4. Explain the role and responsibility of each staff in improving the O&M practices for better delivery and services to the citizens
Module Overview	• Service level Gap in terms of quantity and quality of Water supplied • Operational Plan and Role of key functionaries involved in water supply • Preventive, regular and breakdown maintenance • Provision of House Service Connections including metering • Leakages, resulting Contamination and health hazards
Module Delivery Outline	Introduction, Strategy, Sources of water supply, Transmission of water, Water treatment plant, Disinfection, Reserviors including service reservoirs, Distribution systems, Drinking Water Quality, Monitoring and Surveillance, Repair of pipeline, Drinking Water Quality, Monitoring and Surveillance, Water Meters, Instrumentation, Telemetry & Scada Billing and collection, System management, Water audit and leakage control, Energy audit and conservation of energy, Human resources development, Public awareness and customer relations, Safety practices, Public-Private partnership
Module Activities	Resource Persons lays emphasis on the urgent need to improving the skills of Engineers and field staff in O & M. He will list the critical actions for good O & M practice including preparation of operational places.
Method	Lecture, Participatory and interactive methods ,Group study ,Case Study,Exposure visit ,Video / film show /PPT
Supporting Materials	As prepared / developed by the institute

Outline of the Module: 05	
COMPONENT	**DESCRIPTION**
Content	**Introduction to Sewerage System**
Background	Sewage originates in places of business, industries, and residences. From this source, the sewage flows through a main line into the collection system. The collection system channels the water from the source to the treatment plant. This system must be entered by operators from time to time for maintenance and inspection. Manholes and lines between manholes are used to access the collection system. The water flows from one manhole to the next down the line, all the while picking up sewage from service connections. The sewage in the collection system is either carried directly to the sewage treatment plant or is carried to a pumping station.
Target Groups / Intended Audience(S)	Environmental Engineers, AEE and Health officers/Inspectors of Urban Local Body will be the participants of the training**.**
Learning Objectives	1. Describe the steps involved in delivering efficient sanitation service and preparation of a draft operation plan 2. Describe the sewage leakage and resulting contamination due to poor maintenance 3. Explain the role and responsibility of each staff in improving the O&M of sanitation services List the measures for regular, prevention and breakdown maintenance
Module Overview	a) Basic design for components of Sewerage system b) Sources of Wastewater and sewage characteristics c) Quality aspects – Physical, Chemical Bacteriological parameters and standards for discharge into water bodies, on land or for reuse in agriculture d) Treatment methods- Unit operations and processes depending on the quality of the waste and intended reuse e) Septic tanks – desludging, Asset mapping f) Collection of sewage and transportation to treatment plant g) Safe disposal and / or reuse of treated Wastewater. h) Wet well and Sewage pumps including the valves and appurtenances
Module Delivery Outline	History, Early attempts, Chemical treatment, Activated sludge, Origins of sewage, Process overview, Pretreatment, Grit removal, Flow equalization, Fat and grease removal, Primary treatment, Secondary treatment, Aerobic granular sludge, Surface-aerated basins (lagoons), Filter beds (oxidizing beds), Constructed wetlands, Biological aerated filters, Rotating biological contactors, Membrane bioreactors, Tertiary treatment, Filtration, Lagooning, Nutrient removal, Nitrogen removal, Phosphorus removal, Disinfection, Odor control, Sludge treatment and disposal, Treatment in the receiving environment
Module Activities	The Resource Person will elaborate critical failures of key components during O & M phase in sewage system with special reference to the pipes, manholes and STP's. Further highlight the role and responsibilities of Engineers and field staff in regular and preventive O & M activities.
Method	Lecture, Participatory and interactive methods ,Group study ,Case Study, Exposure visit ,Video / film show /PPT
Supporting Materials	As prepared / developed by the institute

	Module: 06
COMPONENT	**DESCRIPTION**
Content	**Operation & Maintenance of Electrical and Mechanical components of Pumping machineries in Water and Wastewater**
Background	Pumps are used widely in industry to provide cooling and lubrication services, to transfer fluids for processing, and to provide the motive force in hydraulic systems. In fact, most manufacturing plants, commercial buildings, and municipalities rely on pumping systems for their daily operation. In the manufacturing sector, pumps represent 27% of the electricity used by industrial systems. In the commercial sector, pumps are used primarily in heating, ventilation, and air-conditioning (HVAC) systems to provide water for heat transfer. Mun-icipalities use pumps for water and wastewater transfer and treatment and for land drainage. Since they serve such diverse needs, pumps range in size from fractions of a horsepower to several thousand horsepower.
Target Groups / Intended Audience(S)	Environmental Engineers, AEE and Health officers/Inspectors of Urban Local Body will be the participants of the training**.**
Learning Objectives	• State how to repair and maintain the machineries and its accessories in Water Supply and Sewerage system • Explain Technical and operational matters in the management of electrical installations • List the steps involved in preparation of O & M plan
Module Overview	• Planning and design of key electrical and mechanical components. • Operational Plan for Electrical and Mechanical works • Roles and responsibility of field staff in O & • Every savings in water and Wastewater Management
Module Delivery Outline	Pumping System Basics Performance Improvement Opportunity Roadmap The Economics of Improving Pumping Systems
Module Activities	The resource person will be highlight the importance of operational plan skills required by field staff to successfully carry out O & M. He will make use of various electrical components kept on display table for better understanding of the O & M process.
Method	Lecture, Participatory and interactive methods ,Group study ,Case Study,Exposure visit ,Video / film show /PPT
Supporting Materials	As prepared / developed by the institute

	Module: 07
COMPONENT	**DESCRIPTION**
Content	**O & M of Sewerage System**
Background	It is important to properly operate and maintain facilities such as sewers, pumping stations and sewage treatment plants so that these facilities play their roles. In pumping stations and treatment plants, operation management work is conducted on 24-hour basis to meet the constantly changing volume of influent so that increased volume of storm water in wet weather can be drained anytime. In addition, influent is checked, illicit discharge is monitored, and also water quality of effluent is tested as well as sludge is analyzed in order to maintain the water quality of effluent from sewage treatment plants appropriately. To maintain the capacity of sewers, O&M work such as investigation, repairing and cleaning is conducted and we also patrol sewerage facilities to avoid damage from the other construction work around the sewer construction site.
Target Groups / Intended Audience(S)	Environmental Engineers, AEE and Health officers/Inspectors of Urban Local Body will be the participants of the training**.**
Learning Objectives	• Describe the steps involved in delivering efficient sanitation service and preparation of a draft operation plan • Describe the sewage leakage and resulting contamination due to poor maintenance • Explain the role and responsibility of each staff in improving the O&M of sanitation services • List the measures for regular, prevention and breakdown maintenance
Module Overview	• Sewer connection • Operational Plan and Role of field level staff • Preventive, regular and breakdown maintenance • Leakages and Contamination • Preventive, regular and breakdown maintenance • Provision of UGD connection and preventing blockage • Records and reporting • Safety issues
Module Delivery Outline	Operation and Maintenance (O&M) of sewers, Sewerage facility (sewer) management system (AS System), Operation and Maintenance (O&M) of Sewage Treatment Plants, Operation and Maintenance (O&M) of Pumping Stations, Response to citizen needs, Wastewater quality control
Module Activities	The Resource Person will elaborate critical failures of key components during O & M phase in sewage system with special reference to the pipes, manholes and STP's. Further highlight the role and responsibilities of Engineers and field staff in regular and preventive O & M activities.
Method	Lecture, Participatory and interactive methods ,Group study ,Case Study, Exposure visit ,Video / film show /PPT
Supporting Materials	As prepared / developed by the institute

	Module: 08
COMPONENT	**DESCRIPTION**
Content	**Field Visit**
Background	• The stages in, Water management, SWM & Land fill site management. • Explain the importance of energy conservation • List the various methodology adopted in treating fresh water, waste water and solid waste in the site. • Explain the importance of Solid and liquid waste management • Describe the importance on selection of the suitable technology to waste management.
Target Groups / Intended Audience(S)	Environmental Engineers, AEE and Health officers/Inspectors of Urban Local Body will be the participants of the training**.**
Learning Objectives	The participants will be able to; • Visit the projects • Observe the merits and demerits of the project • Prepare report of the field visit
Module Overview	Field Visit, Demonstration, Interaction, Presentation and Discussion
Module Delivery Outline	• List the various methodology adopted in treating fresh water, waste water and solid waste in the site. • Introduction to Land fill site in Mangalore city • Why management of Land fill site needed in the Cities? • Awareness of Land fill site for ULBs. • Achieving open Solid waste free cities • Integrated city-wide sanitation
Module Activities	The Resource Person will identify suitable projects and arrange the logistics for the field visit. The Resource Person /Course Co-ordinator will discuss with concerned project authority about the profile of project to be visited by the participants well in advance. Necessary demonstration, professional interaction by the concerned Officers at the project site and Project Office shall be ensured. The participants will be a given a checklist for structured interaction in addition overall picture of the project. The Participants will prepare and make a presentation of the field visit in the following session.
Supporting Materials	Checklist for field visit, Basic information on sites and PPT Presentations, Workbook, Case study, Discussion
Module Feedback	Exposure visit provide them the opportunities to look around the various methods and technologies in water, Energy and waste management. Trainees select the suitable method and technology to address their solid waste management issues in a short period.

	Module: 09
COMPONENT	**DESCRIPTION**
Content	**Operation & Maintenance of Electrical and Mechanical components of Pumping machineries in Water and Wastewater**
Background	• An ETP /installation needs to equip itself with proper protocol for O & M. The first step in preparation for O & M is preparing inventory of maintenance requirements. • This inventory is generally included in the Operation & Maintenance (O&M) Manual written down for the installation by the contractor who designs and builds the installation. • He on completion of the work hands over this manual to the Principal for whom he builds the installation
Target Groups / Intended Audience(S)	Environmental Engineers, AEE and Health officers/Inspectors of Urban Local Body will be the participants of the training**.**
Learning Objectives	• State how to repair and maintain the machineries and its accessories in Water Supply and Sewerage system • Explain Technical and operational matters in the management of electrical installations • List the steps involved in preparation of O & M plan
Module Overview	• Planning and design of key electrical and mechanical components. • Operational Plan for Electrical and Mechanical works • Roles and responsibility of field staff in O & • Every savings in water and Wastewater Management
Module Delivery Outline	O & m related etp components O & m requirement identification Etp o & m staff requirements Etp staff competency Etp staff training Guidelines for safety in etp operation Plant performance monitoring Guidelines for record keeping Criteria for appointing operation & maintenance agency
Module Activities	The resource person will be highlight the importance of operational plan skills required by field staff to successfully carry out O & M. He will make use of various electrical components kept on display table for better understanding of the O & M process
Method	Lecture, Participatory and interactive methods ,Group study ,Case Study, Exposure visit ,Video / film show /PPT
Supporting Materials	Complied reading material regarding o & m related etp components, o & m requirement identification, etp o & m ,staff requirements, etp staff competency, etp staff training, guidelines for safety in etp operation, plant performance monitoring, guidelines for record keeping criteria for appointing operation & maintenance agency

	Module: 10
COMPONENT	**DESCRIPTION**
Content	**Funds for Capital Investment, Operation and Maintenance of Water and Waste Water Management**
Background	Background information for development practitioners in the water and other infrastructure sectors. It outlines the major challenges related to financing the gap in global water infrastructure, including those systems that provide urban and rural water supply, and sanitation and irrigation services. Water infrastructure finance includes costs for capital works as well as the operations and maintenance costs that motivate sustainable service delivery. Section one introduces the linkages between water infrastructure and growing global challenges, including food and energy security as well as climate change. Section two describes investment needs in the sector and details various traditional funding sources. Section three proposes a five step reform cycle for making better use of limited funding in the sector.
Target Groups/ Intended Audience(S)	Environmental Engineers, AEE and Health officers/Inspectors of Urban Local Body will be the participants of the training**.**
Learning Objectives	Explain the budget and accounting practices
Module Overview	• Details of budget, accounting, tariff setting, tariff collection. • Types of Records – (tariff collection, expenditure, pump log, register of assets etc.,) • New concepts like computer usage in accounting
Module Delivery Outline	There is no more water on the earth today than there was hundreds of millions of years ago. There is no less either. We can't make it or destroy it. And while our planet may be over 70% covered with water, less than 2% of it is freshwater – the stuff we need to survive. Of that tiny 2%, some water is perpetually tied up as atmospheric moisture or as frozen saturated soil (permafrost) that we can never use. Put another way, *if all the world's water were in a one-gallon jug, fresh water wouldn't account for even a teaspoon of it*! So if the amount of water has remained the same since the beginning of time, what's the problem?
Module Activities	Lesson followed by Group Activity: The RP will make a presentation on the prevailing services provided and their status in the organizations & elicit the difficulties faced by the customers in availing the services. Evolve effective method of addressing the grievances and measure the satisfaction of the customers.
Method	Lecture, Participatory and interactive methods ,Group study ,Case Study, Exposure visit ,Video / film show /PPT
Supporting Materials	As prepared / developed by the institute

Participants will be able to implement Water Supply and Sanitation projects in ULBs without cost and time over run and successfully carry out O & M to ensure efficient and timely delivery and services

For information or queries, please contact,

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