GUIDELINES

FOR PREPARATION OF DPRs

FOR WORKS OF INTERCEPTION AND DIVERSION OF

DRAINS AND SEWAGE TREATMENT PLANTS

National Mission for Clean Ganga
Ministry of Water Resources,
River Development &Ganga Rejuvenation
Govt. of India, New Delhi

August 2018

DISCLAIMER

The data, information, used in this report has been obtained from different sources. Every care has been taken to ensure that the information is correct, consistent and complete as far as possible.

The constraints of time and resources available to this nature of assignment, however do not preclude the possibility of errors, omissions etc. in the data and consequently in the guideline preparation.

The contents of this guidelines can be used freely with the request that a reference may be made as follows:

"Guideline For preparation of DPRs for works of interception and diversion of drains and sewage treatment plants", National Mission for Clean Ganga, Ministry of Water Resources, River Development &Ganga Rejuvenation, Govt. of India, New Delhi, June 2018.

ACKNOWLEDGEMENT

The National Mission for Clean Ganga (NMCG), Ministry of Water Resources, River Development & Ganga Rejuvenation (MoWR, RD & GR) has given the assignment of developing fresh 'Guidelines for Interception, Diversion & Sewage Treatment Plant Works' to the Alternate Hydro Energy Centre, Indian Institute of Technology – Roorkee, which would serve as DPR Template to be used by States & Consultants to prepare specific DPRs.

A workshop was also organized by NMCG at New Delhi where all stakeholders covering state nodal agencies, state project management groups, PSUs, academic institutions and multilateral bodies participated and the matter was deliberated. Observations/ comments received via emails from World Bank, Support for Ganga Rejuvenation (SGR) Project, UP-SPMG, IIT Kharagpur, Tata Consulting Engineers Ltd, Engineers India Ltd (EIL), NBCC, Engineering Projects India Ltd (EPIL) and Aligarh Muslim University (AMU) were considered and after a series of discussions at NMCG, the guidelines were finalized.

We are especially grateful to Shri Upendra Prasad Singh, Secretary, MoWR, RD & GR and to the group of officials of NMCG led by Shri Rajiv Ranjan Mishra, Director General, NMCG and Shri Hitesh Kumar S. Makwana, Executive Director (Projects) including Dr. Pravin Kumar, Director (Technical) and Shri Rajat Gupta, Sr. Specialist. Suggestions received from Shri Devendra Pratap Mathuria, Executive Director (Technical) are thankfully acknowledged.

Shri Vinay Shankar and Shri V. K. Gupta were other members of the team that prepared the guidelines. Their contributions are thankfully acknowledged.

(ARUN KUMAR)
AHEC, IIT Roorkee

Contents

List of Tables

Table of Figures

ABBREVIATIONS

ADB	:	Asian Development Bank
ADP	:	Area Development Plan
AE	:	Assistant Engineer
AHEC	:	Alternate Hydro Energy Centre, IIT Roorkee
AL	:	Aerated Lagoon
AMRUT	:	Atal Mission for Rejuvenation and Urban Transformation
ASP	:	Activated Sludge Process
BCM	:	Billion Cubic Meters
BGL	:	Below Ground Level
BHP	:	Break Horse Power
BIS	:	Bureau of Indian Standards
BOD	:	Biochemical Oxygen Demand
BOOT	:	Build Own Operate Transfer
BOQ	:	Bill of Quantities
BOT	:	Build Operate Transfer
BHP	:	Break Horse Power
BTO	:	Build Transfer Operate
CAD	:	Computer Aided Design
CAG	:	Comptroller and Auditor General of India
CBO	:	Community Based Organisations
CCTV	:	Closed Circuit Television
CD		Compact Disc
CDM	:	Clean Development Mechanism
CDP	:	City Development Plan
CE	:	Chief Engineer
CER	:	Certified Emission Reduction
CETP	:	Common Effluent Treatment Plant
CFL	:	Compact Fluorescent Lamp
CGWB	:	Central Ground Water Board
CI	:	Cast Iron
CMS	:	Cubic Meter Per Second
COD	:	Chemical Oxygen Demand
CPCB	:	Central Pollution Control Board
CPHEEO	:	Central Public Health Environmental Engineering Organisation
CRR	:	Critical Review Report
CSIR	:	Council of Scientific and Industrial Research
CSP	:	City Sanitation Plan
CTE	:	Consultant to Establish

DI	:	Ductile Iron
CMC	:	Citizen’s Monitoring Committee
CTC	:	Community Toilet Complex
CW	:	Civil Works
CWC	:	Central Water Commission
CPM	:	Critical Path Method
CUMEC	:	Cubic meter per second
DBO	:	Design, Build & Operate
DBOT	:	Design, Build Operate Transfer
DG	:	Diesel Generator
DJB	:	Delhi Jal Board
DO	:	Dissolved Oxygen
DPR	:	Detailed Project Report
D/S	:	Down Stream
DSR	:	District Schedule of Rates
DSR	:	Delhi Schedule of Rates
DWCPP	:	Double Wall Corrugated Polyethylene Pipe
DWF	:	Dry Weather Flow
EA	:	Executing Agency
EE	:	Executive Engineer
EIA	:	Environmental Impact Assessment
ELCB	:	Earthing Leakage Circuit Breaker
EM	:	Electrical and Mechanical
EMI	:	Equated Monthly Instalment
EPA	:	Environment Protection Agency
ESAMP	:	Environmental Sanitation and Management Plan
ESC	:	Empowered Steering Committee
EWS	:	Economically Weaker Section
FAB	:	Fluidized Aerated Bed
FBAS	:	Fixed Bed Biofilm Activated Sludge
FBR	:	Fed Batch Reactor
FC	:	Faecal Coliform
F/M	:	Food to Microorganism
FR	:	Feasibility Report
FR	:	Frequency rate
GA	:	General Arrangement
GAC	:	Granular Activated Carbon
GAP	:	Ganga Action Plan
GRBMP	:	Ganga River Basin Management Plan
GAAP	:	Governance and Accountability Action Plan

GI	:	Galvanised Iron
GIS	:	Geology Investigation Survey
GIS	:	Geographical Information System
GL	:	Ground Level
GoAP	:	Gomti Action Plan
GoI	:	Government of India
GoS	:	Group of Secretaries
GoUP	:	Government of Uttar Pradesh
GPCU	:	Ganga Pollution Control Unit
GRC		Grievance Redressal Cell
GRP	:	Glass Reinforced Plastic
GWI	:	Ground Water Infiltration
DI	:	Ductile Iron
HDPE	:	High Density Polyethylene
HP	:	Horse Power
HRD	:	Human Resource Development
HRT	:	Hydraulic Retention Time
HT	:	High Tension
HUDCO	:	Housing and Urban Development Corporation Ltd.
IA	:	Impact Assessment
I&D	:	Interception and Diversion
IEC	:	Information, Education and Communication
IIPA	:	Indian Institute of Public Administration
IIT	:	Indian Institute of Technology
IPS	:	Intermediate Pumping Station
IL	:	Invert Level
IRMA	:	Independent Review and Monitoring Agency
IS	:	Indian Standard
ISO	:	International Organisation for Standardisation
ISRO	:	Indian Space Research Organisation
IT	:	Information Technology
ITI		Industrial Training Institutes
IWBC	:	Integrated Wood Based Crematoria
IWWA	:	Indian Water Works Association
JICA	:	Japan International Cooperation Agency
JnNURM	:	Jawaharlal Nehru National Urban Renewable Mission
JE	:	Junior Engineer
JS	:	Jal Sansthan
Kva	:	Kilovolts Ampere
KWH	:	Kilowatt Hours

LCC	:	Life Cycle Cost
LCS	:	Low Cost Sanitation
LIC	:	Life Insurance Corporation
LPCD	:	Litres per Capita per Day
LPM	:	Litres per Minute
LPS	:	Litres per Second
MH	:	Manhole
Mld	:	Million Litres per day
MoA	:	Memorandum of Agreement
MBBR	:	Moving Bed Biofilm Reactor
MBR	:	Membrane Bio Reactor
MGD	:	Million Gallons per Day
MG/L	:	Milligram/litre
MIS	:	Management Information System
MLD	:	Million Litres Per Day
MLSS	:	Mixed Liquor Suspended Solids
MLVSS	:	Mixed Liquor Volatile Suspended Solids
MoEFCC	:	Ministry of Environment, Forest and Climate Change Govt. of India
MNRE	:	Ministry of New and Renewable Energy, Govt. of India
MoUD	:	Ministry of Urban Development, Govt. of India
MP	:	Master Plan
MP	:	Member of Parliament
MPN	:	Most Probable Number
MPS	:	Main Pumping Station
MoWR, RD&GR	:	Ministry of Water Resources, River Development and Ganga Rejuvenation
MSW	:	Municipal Solid Waste
MWW	:	M
NABARD	:	unicipal Waste Water
NDMA	:	National Bank for Agriculture and Rural Development
NEERI	:	Natural Disaster Management Authority
		National Environmental Engineering Research Institute
NGRBA	:	National Ganga River Basin Authority
NGO	:	Non-Governmental Organisation
NIC	:	National Informatics Centre
NICNET	:	Nation-wide Information Network
NIT	:	Notice Inviting Tender
NMCG NOC	:	National Mission for Clean Ganga
	:	No Objection Certificate

NRCD	:	National River Conservation Directorate
NRCP	:	National River Conservation Plan
O&M	:	Operation and Maintenance
OP	:	Oxidation Pond
PC	:	Personal Computer
PDC	:	Permanent Disabilities Fatalities
PF	:	Power Factor
PFR	:	Pre-Feasibility Report
PERT	:	Programme Evaluation and Review Technique
PHED	:	Public Health Engineering Department
PIL	:	Public Interest Litigation
PMC	:	Project Management Consultant
PMU	:	Project Management Unit
PPM	:	Parts Per Million
PPP	:	Public Private Partnership
PMG	:	Project Management Group
PPMU	:	Project Preparation and Management Unit
PS	:	Pumping Station
PSC	:	Pre-stressed Concrete
PVC	:	Poly Vinyl Chloride
R&D	:	Research and Development
RBC	:	Rotating Biological Contactor
RBI	:	Reserve Bank of India
RCC	:	Reinforced Cement Concrete
RCCE	:	Recurring Cost of Capital Expenditure
RTI	:	Right to Information
RWC	:	Restricted Work Capacity
SAFF		Submerged Aeration Fixed Film
SBR	:	Sequencing Batch Reactor
SCADA	:	Supervisory Control and Data Acquisition
SCBA	:	Self-Contained Breathing Apparatus
SFBR	:	Submerged Fixed Bed Reactor
SOR	:	Schedule of Rates
SPCB	:	State Pollution Control Board
SPMG	:	State Project management Group
SPMU	:	State Project Management Unit
SPS	:	Sewage Pumping Station
SR	:	Severity Rate
SRT	:	Solid Retention Time
SS	:	Suspended Solids
STP	:	Sewage Treatment Plant

SWD	:	Side Water Depth
SWM	:	Solid Waste Management
SWM	:	Sewerage Water Management
TDS	:	Total Dissolved Solids
TF	:	Trickling Filter
TKN	:	Total Kjeldahl Nitrogen
TPA	:	Third Party Appraisal
TPI	:	Third Party Inspection
TSS	:	Total Suspended Solids
UA	:	Urban Agglomeration
UASB	:	Up flow Anaerobic Sludge Blanket
UF	:	Ultra-Filtration
UFW	:	Unaccounted for Water
UJS	:	Uttarakhand Jal Sansthan
UPJN	:	UP Jal Nigam
UIDSSMT	:	Urban Information Development Scheme for Small and Medium Towns
UKPJN	:	Uttarakhand PeyJal Nigam
UPSVENN	:	Uttarakhand Peyjal Sansadhan Vikas Evam Nirman Nigam
ULB	:	Urban Local Body
U/S	:	Up Stream
uPVC	:	Unplasticised Poly Vinyl Chloride
UNICEF	:	United Nations International Children Emergency Fund
USAID	:	United States Agency for International Development
UV	:	Ultra Violet
UWSS	:	Urban Water Supply and Sanitation Sector
VSS	:	Volatile Suspended Solids
YAP	:	Yamuna Action Plan
WB	:	World Bank
WHO	:	World Health Organisation
WQM	:	Water Quality Monitoring
WR, RD&GR	:	Ministry of Water Resources, River Development and Ganga Rejuvenation
WSSB	:	Water Supply and Sewage Board
WSP	:	Waste Stabilisation Pond
WTP	:	Water Treatment Plant
WWTP		Waste Water Treatment Plant
ZLD		Zero Liquid Discharge

EXECUTIVE SUMMARY

National Mission for Clean Ganga (NMCG) was constituted for effective abatement of pollution and rejuvenation, protection and management of the River Ganga and its tributaries. Under the above mission, no untreated municipal sewage and industrial effluent is to be discharged into the River Ganga.

An Integrated Ganga Conservation Mission namely "Namami Gange" has been approved as 'Flagship Programme' set up in June 2015 to accomplish effective abatement of pollution, conservation and rejuvenation of the river.

An ideal approach to achieve the above objective, is to prepare an integrated and comprehensive scheme to intercept and treat the entire quantity of waste water generated in the town and would flow through the drains into the Ganga. To improve the water quality of the Ganga in the immediate term, is to prevent untreated wastewater of drains from joining the river by intercepting those having their outfalls in the Ganga, divert them through sewers to Sewage Treatment Plants (STPs) for treatment and allow only treated sewage to be discharged into the Ganga.

.

The present '*Guidelines for preparation of project reports under NRCP and NGRBA, Ministry of Environment & Forests'* were prepared in Dec 2010. These guide lines provided for preparation of DPRs for pollution abatement of rivers in three steps namely City Sanitation Plan (CSP), Feasibility Report (FR) followed by the Detailed Project Report (DPR).

In view of the need to prevent pollution in the immediate term and the changes that have been introduced, the Guidelines for the preparation of DPRs for interception and diversion of drains out-falling in to the river and divert them to STPs for treatment need to be revised.

The draft guidelines were circulated by NMCG on Mar 30, 2017 to all stakeholders covering state nodal agencies, state project management groups, PSUs, academic institutions and multilateral bodies. Observations / comments were received from the World Bank, Support for Ganga Rejuvenation (SGR) Project, UP-SGRCA, IIT Kharagpur, Tata Consulting Engineers Ltd, Engineers India Ltd (EIL), NBCC, Engineering Projects India Ltd (EPIL) and Aligarh Muslim University (AMU).

A workshop was also organized on May 18, 2017 by NMCG at New Delhi where all stakeholders participated and matter was deliberated for the whole day. After considering the suggestions / comments received from different stakeholders through emails and during the workshop, the guidelines were finalised. Salient features of the guidelines are as follows:

- The guidelines provide for interception and diversion of drains out-falling in to the river, divert them through sewers to STP (s) for treatment. New CPHEEO Manual on Sewerage and Sewage Treatment Systems has since been published in Nov 2013. Many provisions of the manual have been incorporated into the guidelines.
- Water Quality Monitoring of the river should be done following the "Uniform Protocol on Water Quality Monitoring Order, 2005".
- Design periods for STPs has been increased to 15 years.
- Rate of water supply for users other than domestic such as hotels, hostels, schools/colleges, railway stations, offices, factories, cinemas etc. has been included.

- Methodology for measurement of flows in drains / sewers has now been provided in detail. A standard format for recording flow measurements has been prescribed.
- Design Flows for different components of proposed works have been clarified.
- Configuration of sewage pumps, hydraulic retention time, volume of sump, immersible pumps etc. as recommended in CPHEEO Manual Nov 2013 for sewage pumping stations, have been introduced.
- Instead of working out economical size, size of rising mains shall be selected, ensuring velocities between 0.8 to 3 m/sec at any time, to avoid silting. Rising mains must be designed for Water Hammer Head also.
- Trenchless technology may be proposed to be adopted at major road crossings/junction, railway tracks and highly dense roads for laying of sewers/rising main.
- For STPs, sulphates and emerging contaminants have been included in the list of raw sewage quality parameters. Some upcoming treatment technologies have also been referred. Highest flood levels of drains/river to provide safety and uninterrupted O&M of the STP/SPS are to be taken in to consideration.
- Funds for O&M of the assets created shall now be provided by the center for a period of 15 years, after which the responsibility of O&M will rest with the State Government/ ULB. However, such period shall be subject to policy of GoI in vogue.
- Annual O&M cost beyond 1st year is to be worked out by compounding present cost with general price index/inflation, which may be taken as 5% on Manpower and 2% on Chemicals. However, no escalation is to be considered on Power.
- Provision of quarters for maintenance staff has been deleted, as O&M shall be carried out by the contractor.
- On line monitoring of water quality at inlet and outlet of STPs has been proposed to be carried out for which devices shall be installed on STPs for proper monitoring of their performance and taking timely remedial measures when necessary.
- The chapter on Social and Environment Impact Assessment and Environmental Management Plan has been provided.
- Suggestive structure of the DPRs earlier provided in the Guide Lines has been revised.
- A flow chart showing different broad activities for preparation of DPRs has been provided.
- A list of drawings to be provided in DPRs has been provided.
- Reuse of treated water to a minimum extent of 20% shall be mandatorily explored.
- A detailed Sludge Management Plan including the treatment, storage, handling and approvals from ULBs to accept the solid waste generated by the STPs for its safe disposal / effective management is now to be prepared.
- Septage/faecal sludge management practices are to be assessed and appropriate provisions need to be built in while designing the STPs.
- Soil investigation has been proposed to be carried out at all major sites such as deep sewers, SPS, STPs and for locations such as flood plains, landfill sites and locations having dispersive soil characteristics.

GUIDELINES FOR PREPARATION OF DPRS FOR WORKS OF INTERCEPTION &DIVERSIONOF DRAINS AND SEWAGE TREATMENT PLANTS

CHAPTER 1: Introduction

1.1. GANGA BASIN

Ganga basin is the largest of the 12 major river basins of India. The river Ganga passes through the states of Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, and West Bengal. Ganga has many tributaries. Even though the surface water resource potential of Ganga has been assessed as 525 billion cubic meters (BCM), substantial abstraction of water for various purposes from the river has impacted the quantity of flows in the river. A map of the Ganga River Basin, a flow Diagram of the River may be seen in Annexure I and Annexure II.

1.2. STATUS OF WATER QUALITY

Rapidly increasing population, rising standards of living and exponential growth of industrialization and urbanisation have exposed the river to various forms of degradation. The dominant source of pollution is the discharge of untreated wastewater from the towns on the banks of Ganga.

It is estimated that in the year 2011, the amount of wastewater discharged into the river by 36 Class I and 14 Class II towns situated along the mainstream of river Ganga, was 2723 Mld. Of this quantity, the capacity to treat it was limited to only 1209 Mld *(Source: Pollution Assessment: River Ganga, published by CPCB in July 2013).* Although there are non-point sources of pollution as well, their contribution is relatively small.

On the basis of the sources that cause pollution of Ganga, the parameters that have been adopted for judging the water quality of the river are Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD) and Faecal Coliform (FC). Except in the upper reaches of the Ganga i.e., from its origin up to Rishikesh, the presence of FC is higher than the permissible limit for bathing throughout the river. The BOD levels are much higher than the desired level in the stretch of Ganga from Kannauj to Varanasi. It is therefore a critical stretch. In West Bengal again, the BOD is higher in the stretch from Uluberia to Diamond Harbour.

Thus the water quality of Ganga river is fit for bathing (Class B) except a few locations only, which have already been identified and corrective actions by sanctioning projects have been taken by NMCG.

1.3. ACTION TAKEN BY AUTHORITIES FOR RIVER GANGA

A beginning towards its restoration was made with the launching of the Ganga Action Plan (GAP) in 1985. Its objective was to improve the water quality in the river. But for a variety of reasons only partial success in the objective of pollution abatement could be achieved.

1.3.1. National Mission for Clean Ganga (NMCG)

National Mission for Clean Ganga (NMCG), a society registered under the Societies Registration Act, 1860 (21 of 1860), is an authority constituted under the River Ganga (Rejuvenation, Protection and Management) Authorities Order, 2016 of Govt of India. NMCG

is a nodal agency for the implementation of the provisions of this Order and for effective abatement of pollution and rejuvenation, protection and management of the River Ganga and its tributaries. It is an empowered arrangement with two tier management having administrative, appraisal and approval powers and duties, functions and powers for the purpose of effective abatement of pollution and rejuvenation, protection and management of the River Ganga.

The States comprising River Ganga Basin, namely, Himachal Pradesh, Uttarakhand, Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Bihar, Jharkhand, Haryana, Rajasthan, West Bengal and the National Capital Territory of Delhi and such other States, having major tributaries of the River Ganga are covered under this mission. NMCG shall approve the planning, financing and execution of programmes for abatement of pollution in the River Ganga including augmentation of sewerage and effluent treatment infrastructure, catchment area treatment, protection of flood plains, creating public awareness, conservation of aquatic and riparian life and biodiversity and such other measures for promoting environmentally sustainable river rejuvenation. NMCG shall also coordinate, monitor and review the implementation of various programmes or activities taken up for prevention, control and abatement of pollution and protection and management in the River Ganga and its tributaries.

1.3.2. Ganga River Basin Management Plan

The Ganga River Basin Management Plan (GRBMP) is an integrated river basin management plan for maintenance and restoration of wholesomeness of Ganga system and improvement of its ecological health with due regard to resolution of conflict of interest in water uses in the entire river Basin. This Plan is presumed to have an adequate provision for soil, water and energy conservation to accommodate the growing population, urbanization, industrialization and agriculture while ensuring that the continuous flow (*Aviral Dhara*), unpolluted flow (*Nirmal Dhara*), longitudinal and lateral connectivity, fluvial geomorphology and ecology of the river are protected.

1.3.3. Integrated Ganga Conservation Mission Namely "Namami Gange"

An Integrated Ganga Conservation Mission namely "Namami Gange" has been set up. While it seeks to ensure that ultimately i.e. in the long term there is an integrated and comprehensive plan of collection, conveyance and treatment of wastewater in the towns covering both the point and non-point sources of pollution, in the immediate term its objective would be to ensure that the quality of Ganga is improved so that it can be put to its best – designated - use i.e., bathing. A list of 118 important towns, which contribute to the pollution of the Ganga, has been prepared by NMCG. Important drains that carry the wastewater from these towns to the Ganga have been also been identified.

Thus the immediate objective would be to prevent untreated wastewater of drains from joining the river by intercepting the drains that have outfalls in the Ganga, divert them through sewers to Sewage Treatment Plants for treatment and allow only treated sewage to be discharged into the Ganga.

1.3.4. Categorisation of Towns on the Basis of I&D and Treatment Infrastructure

The towns may fall in several categories based on the type of the existing arrangements for the collection, conveyance and treatment of wastewater. In one category of towns / cities

there may not be any sewers and the wastewater including that from the septic tanks and toilets would flow in the covered or uncovered drains on the sides of the streets reaching a storm water drain, which in turn would discharge into the Ganga.

In another category of towns/cities, there may be localities where sewers are laid and localities not provided with sewers. The wastewater would be carried through the sewer or the drain to a sewage treatment plant (STP). If a STP has not been installed, the wastewater would be discharged into the Ganga.

In yet another category of towns, I&D and STP schemes may have been constructed. However, the system is unable to handle the entire wastewater and there is need to repair, upgrade and refurbish the existing infrastructure.

1.3.5. Integrated Plan of Management of Wastewater – Measures Involved

A sustainable programme to achieve the improvement in the water quality of Ganga should deal with the issue of pollution in an integrated and comprehensive manner dealing with both point and non-point sources of pollution. It will imply that the following steps be taken

i. Prepare an integrated and comprehensive scheme to intercept and treat the entire quantity of wastewater that would be generated in the town and would flow through the drains into the Ganga. The existing infrastructure, if any, would be integrated with the comprehensive scheme that would be prepared.

ii. If under the GAP, schemes for pollution abatement of the Ganga have been implemented, an assessment of the condition of the prevailing infrastructure that exists in the town for the disposal of wastewater would be required to be made so that it could be repaired, upgraded and refurbished.

1.3.6. Phase wise preparation and implementation of the Pollution Abatement Scheme

A comprehensive approach as outlined above will require resources and considerable time for preparing and implementing schemes. It, therefore, makes sense that the objective of improving the water quality may be achieved in two phases.

Phase 1 will seek to improve the water quality of the Ganga in the immediate term. The wastewater from the towns / cities situated on the bank of river Ganga in five basin states of Uttaranchal, Uttar Pradesh, Bihar, Jharkhand and West Bengal, flowing into the Ganga through the drains may be intercepted, diverted and treated before discharge in to Ganga. The interception, diversion and treatment schemes should be so designed that they take into consideration the wastewater load that will need to be dealt with when the long term integrated comprehensive wastewater management plan is prepared.

Phase 2 will consist of the integrated and comprehensive schemes to deal with the pollution from both point and non-point sources of pollution. The works planned and implemented in Phase 1 will be integral part of the schemes in Phase 2.

Since the formation of existing guide lines, a number of changes such as policy decisions, revision of water quality parameters and design criteria in new CPHEEO Manual on Sewerage and Sewage Treatment Systems in Nov 2013 etc. have taken place. The Guidelines,

therefore, need to be revised. These Guidelines, accordingly, deal with the various aspects of schemes in Phase 1.

CHAPTER 2: COLLECTION OF DATA

2.1. INTRODUCTION

This chapter deals with collection of data required for preparing DPRs for works of interception and diversion of drains and sewage treatment plants of the project area.

The DPR should be prepared on the basis of available data that has been generated by the concerned agencies. Additional data (primary data) may be needed. It will have to be generated by undertaking suitable survey and investigation. However, DPR should integrate all the data provided by agencies concerned for pollution abatement.

2.2. PROJECT AREA

As the DPR is for intercepting the drains and treating the diverted sewage, the project area for the purpose of the DPR is only that area of the town which is discharging into drains and contributing to the pollution of river and may not the whole town within municipal limits.

There may be towns where some areas outside the municipal limits are also discharging into drains of the town under consideration and subsequently polluting the river, but for some or the other reasons are not included within its municipal limits. These areas must also be considered as a part of the project area.

It is therefore, of utmost importance to precisely demarcate the project area so as to correctly project design population, sewage flows and design proposed works. The project area under consideration should be clearly marked on a key plan of the town so that the area can be measured from the map.

2.3. DATA REQUIRED

The data needs to be gathered for the town whose wastewater is causing pollution of the river and for which the project is to be prepared for abatement of pollution. A town may have to be divided into a number of sewerage districts for getting optimal results and data gathered should meet this need**.**

2.4. TOWN RELATED DATA

2.4.1. General Information of the town

i. Location – Latitude, Longitude
ii. Important features
iii. Climate
iv. Brief history of the city
v. Commercial activities
vi. Industrial activities
vii. Educational activities
viii. Cultural activities
ix. Religious activities
x. City development plan or city sanitation plan, if prepared, should be obtained.
xi. Data on water supply as per para 2.4.6,

xii. Project reports of sewerage and pollution works in the city executed, under execution and proposed for future should be obtained.
xiii. Slum population and their development/rehabilitation plan.
xiv. Community toilets
xv. Present sewerage management including existing or proposed septic tanks, number of septic tanks and their maintenance scenario in the catchment such as septic tank sludge/septage treatment etc.
xvi. Solid Waste Management (SWM) system.
xvii. Areas within and adjoining the town contributing to the pollution of river, its boundary and area
xviii. HFL of the river at the sites of all infrastructure works proposed near the river
xix. Minimum and maximum flow in the river, along with dates.

2.4.2. Maps

Digital maps, as may be available, showing the following features on a scale large enough to understand the physical features may be prepared.

i. Important land marks of the town
ii. Rivers
iii. Other water bodies
iv. River banks where solid waste is dumped
v. Drains, and points of their respective outfalls and catchments (drainage areas)
vi. Surface utilities
vii. Municipal wards
viii. Open spaces
ix. Residential areas
x. Industrial estates
xi. Industrial units outside industrial estates
xii. Points of discharge of industrial effluents
xiii. Slums
xiv. Areas covered with septic tanks
xv. Water supply system – Including intake points and ground water.
xvi. Places used for open defecation
xvii. Community toilets
xviii. Existing sewers in each drainage area of the town with diameters and invert levels, if existing.
xix. STPs and sewage pumping stations, if existing.
xx. Points of discharge of treated effluents into the river and their distance from points of water supply intake works.
xxi. Garbage dumping sites including land fills
xxii. Bio-medical waste treatment facilities
xxiii. Pollution abatement works carried out in the past with details
xxiv. Components of proposed works along with those of existing works, if any, are to be shown on maps with different colours and legends.
xxv. Areas within and adjoining the town contributing to the pollution of river, its boundary and area

2.4.3. Use of State of Art Tools Like Remote Sensing and GIS

Maps of Survey of India may be used. If there are easily accessible facilities with the State Remote Sensing Centre or other specialized agencies, an attempt should be made to use remote sensing to gather spatial information observable from space and present it and other data mentioned above in Geographical Information System (GIS) format. It gives the ability to prepare maps on different themes as required. For cities with a population of one million or more the data must be presented in GIS format. For other cities it is optional.

As expertise of this kind may not be generally available with the implementing agencies, the work may be done by hiring qualified experts for such purposes from outside. A good map depicting all the above features would help in improving decision making and finalizing appropriate sewerage routes without disturbing other civic utilities.

2.4.4. Status of Sewerage Management Works Undertaken in the Past, if any

In the past, some works related to pollution abatement and sewerage may have been planned and implemented, for which the following details may be collected:

a. A note describing in brief history / details of sewer system introduced in the town, works carried out / under progress in different programmes, sanctioned cost, year of sanction, year of commissioning, brief details of works done such as SPS (with their diameters, details of pumps installed, rising mains, year of commissioning etc.), STPs (with their capacity, type, year of commissioning etc.), sewer network, other works, technical studies / condition assessment reports conducted in the past for assessing the condition of existing structures.
b. Photographs of existing works
c. Number of drains out falling into the river(s), nos. intercepted and diverted to STPs, copies of reports on discharge measurement and sewage quality of drains carried out in the past.
d. Designed capacity/performance, present performance & O&M details
e. A plan showing existing major works such as drains, SPS, rising mains, STPs and major trunk sewers etc.
f. A separate plan of existing sewers showing diameters, lengths and RLs etc.
g. Information relating to existing sewage disposal works, Septic tanks, existing STPs and drains intercepted may be presented in tables 2.1, 2.2 and 2.3.
h. Condition assessment of existing works: Condition assessment should invariably be carried out for all existing works. Normally this is carried out by destructive and or non-destructive tests on structures and other works by qualified and experienced test houses and experts. For this draining out of the tanks, if required, may also be done so that the true assessment of life of works can be made. If the performance of the works is less than the designed one or that required at the end of the design period, the causes and remedial measures may be identified component wise
    1. Interception works
    2. Sewers
    3. SPS
    4. STPs
    5. Septic tanks

Table 2.1: Present Sewage Disposal System

S. No.	Waste water disposal works	Quantity				Future Plans	Remarks
		DA_1	DA_2	DAn	Total		
1	Interception works, nos.						

S. No.	Waste water disposal works	Quantity				Future Plans	Remarks
		DA_1	DA_2	DAn	Total		
2	Sewers, kms						
3	SPS						
	Locations						
	Nos.						
4	STPs						
	Locations						
	Technology						
	Mld						
5	Septic tanks						
6	Others						

Note: DA stands for Drainage Area

Table 2.2: Details of existing STPs

S.No		DA_1	DA_2	DAn
1	**Location (DA or ward)**			
2	**Operational Yes or No**			
3	**Process**			
4	**Installed Capacity, Mld**			
5	**Current Capacity, Mld**			
	Desired capacity at the end of the design period			
6	**Raw Sewage Design Parameters**			
	BOD, mg/l			
	COD, mg/l			
	TSS, mg/l			
	NH_4-N mg/l			
	N-total, mg/l			
	Faecal coliform, MPN/100 Ml			
7	**Treated Sewage Design Parameters**			
	BOD, mg/l			
	COD, mg/l			
	TSS, mg/l			
	NH_4-N mg/l			
	N-total, mg/l			
	Faecal coliform, MPN/100 Ml			
8	**Raw Sewage Actual Parameters**			
	BOD, mg/l			
	COD, mg/l			
	TSS, mg/l			
	NH_4-N mg/l			
	N-total, mg/l			
	Faecal coliform, MPN/100 Ml			
	Phosphorus mg/l			
	Sulphate mg/l			
9	**Treated Sewage Actual Parameters**			
	BOD, mg/l			

S.No		DA_1	DA_2	DAn
	COD, mg/l			
	TSS, mg/l			
	NH_4-N mg/l			
	N-total, mg/l			
	Faecal coliform, MPN/100 Ml			
	Additional parameters (if there is a chance of industrial contamination).			
	Overall efficiency of STP			
10	**Date of installation**			
11	**Condition of assets**			
12	**Operating agency and mode of O&M**			
13	**Mode of discharge of effluents**			
14	**Whether sewer tax imposed**			

Table 2.3: Status of interception of drains

S. No.	Drain number	Name of drain	Drain discharging into river--------	Intercepted and diverted to STP at --------on ----	Status of interception works
1	**D1**				
2	**D2**				
↓	↓				
↓	↓				
↓	↓				
↓	↓				
n	**Dn**				

2.4.5. Population of the Town

Past Census Population of the town should be provided in the table 2.4.

Table 2.4: Census Population of the town during the last decades

Year	No of wards	Area of town	No of houses including slums	Population	Growth rate	Density of population no / sq. km
1971						
1981						
1991						
2001						
2011						

2.4.6. Water Supply

Status of present supply of water drain wise should be provided in table 2.5.

Table 2.5: Status of water supply in the town / project area

Items	Installed capacity, Mld	Water supplied, Mld	Remarks
Sources of water supply			
Surface (Describe source wise)			
Tube wells (nos.)			
Hand Pumps (nos.)			
Total, Mld			
Private bore wells (nos.)			
Total including private bore wells, Mld			
Water supply required for the town as per GoI guidelines, lpcd			
lpcd for which present water supply project has been designed			
Base year Population of the town			
Water supplied on base year population (excluding bore wells), lpcd			
Water supply on base year population including bore wells, lpcd			
Plans for augmentation of water supply			

2.4.7. Status of River

i. Purposes for which river water is being used

a. Drinking
b. Irrigation
c. Industry
d. Navigation
e. Other uses such as water sports, boating, etc.

(State the location of the above works and show them in a map)

ii. River Water Quality

Central Pollution Control Board (CPCB) has classified all inland waters in five categories according to the designated – best - use class (Table 3.1, Chapter 3). The designated best use as well as actual quality of river water should be reported.

Water quality of the river should be analysed at the following points:

a. upstream of the city,
b. downstream of the city
c. downstream points of outfalls of major drains
d. downstream points of outfalls of treated effluents of STPs
e. upstream of intakes of waterworks.

The programme aims at improving the river water quality to Class B for outdoor bathing. Though, pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), and Total coliform organisms have been prescribed as water quality parameters for Class B, for actual base line data water quality monitoring should be done following the "Uniform Protocol on Water Quality Monitoring Order, 2005". The relevant order is attached as Annexure III. The towns may be treated as Trend or impact or flux stations. Ideally, there should be a report for

every month, in all 12 reports. But for the purpose of this programme, the parameters such as pH, BOD, DO, FC and TC prescribed for water quality of the river for bathing, may be monitored quarterly and the remaining parameters may be monitored pre-monsoon once a year.

Water quality monitoring is necessary to assess the current water quality and the extent of improvement that can be achieved through interventions proposed in the DPR. The sampling for water quality should be from well-mixed section of the river or main stem 30 cm below the water surface to represent accurate impact. Copies of laboratory test reports should be made a part of DPR

Water quality of the river may be presented as given in table 2.6

Table 2.6: Water quality of river

Month:…….

Parameters	**u/s of town**	**d/s of town**	**d/s of outfall of major drain**	***downstream of outfalls of treated effluents of STPs**	***upstream of intakes of waterworks**	**At important ghats**
pH						
Biological Oxygen Demand (BOD)						
Dissolved Oxygen (DO)						
Faecal Coliforms						
Total Coliforms						
Colour						
Odour						
Temperature						
Electrical Conductivity (EC)						
Turbidity						
Total Dissolved Solids (TDS)						
Ammoniacal Nitrogen (NH_4-N)						
Nitrite & Nitrate Nitrogen ($NO_2 + NO_3$)						
Total Phosphate (Total P)						
Chemical Oxygen Demand (COD)						

Parameters	u/s of town	d/s of town	d/s of outfall of major drain	*downstream of outfalls of treated effluents of STPs	*upstream of intakes of waterworks	At important ghats

*Required to view the impact of discharge of treated sewage into surface water to be used as source of drinking water d/s.

In addition to parameters mentioned in the above table, other parameters prescribed under Uniform Protocol (Pesticides, toxic metals, major ions) may be included, if required, depending upon site conditions. If any secondary data is available from the State Pollution Control Board (SPCB) or the Central Pollution Control Board (CPCB), that too should be reported. Report on Pollution Assessment: River Ganga July 2013 published by CPCB carries spatial distribution of water quality data w.r.t. DO, BOD, Faecal coliform, Total Coliform and Conductivity for the period 2011 at various places in the country. Data if available for the town, may also be extracted from the said report and presented in the DPR. Comments on river water flows and quality on the basis of the above shall also be given.

2.4.8. Sewage Generation

Quantity and quality of sewage generated in a town carried by the drains untreated into the river and by sewers to STP(s) for treatment need to be measured and tested.

2.4.8.1.Volume of Sewage Generated

A note and a plan showing the names of drains, discharge carried by them, location points of their outfalls into the water body, points of their interception and STPs into which diverted should be prepared.

Actual present flows should be recorded three times: Pre-monsoon, during monsoon and after monsoon. If this is not feasible, flows may be recorded in dry weather before the point of outfall into the water bodyfor at least one month. Samples should be taken on a day in every week for diurnal variation on hourly basis for twenty four hours. Considering a four-week month, three sample days are to be taken on weekdays, whereas the fourth one on an off day i.e. Sunday.

If the drain has been intercepted for treating the sewage, the discharge diverted to the STP should be measured. Data on the flows measured in the past should also be collected and reported.

Details of the quantity of sewage reaching STPs through sewers may be collected from the records of STPs for the last 3 years. In the absence of records, the same may be measured in dry weather.

Details of flows may be provided as in tables 2.7 and 2.8.

Table 2.7: Discharge carried by drains as measured on ----

Drain Name and No.: Method of Measurement: Float Method/Current Metter/V-notch, Rect. Notch/Other: Season: Place/Location of measurement: Global Positioning: Name of the outfall point:																		
Date of measurement	Week of the month	Day of the week (e.g. Monday)	Time													Av. Discharge		Remark
			8:00 am	9:00 am	10:00 am	11:00 am	12:00 noon	1:00 pm	2:00 pm	3:00 pm	4:00 pm	5:00 pm	6:00 pm	7:00 pm	8:00 pm	cusec	mld	
	I	*Mon-Sat.																
	II	*Mon-Sat.																
	III	*Mon-Sat.																
	IV	**Sunday																
														Average				

*Any day between Monday to Saturday
**The last & IV measurement should be taken on Sunday only.

Copies of flow measurement reports need to be made a part of DPR.

Summary of flows carried by drains

Flow carried by each drain be summarized in table ----, showing average, peak and non peak flow

Table 2.8: Actual average, peak and non peak flow carried by drains

SN	Name of Drain	Flow carried by drain			
		Date	Average Flow, Mld	Peak Flow, Mld	Non Peak Flow, Mld

Table 2.8: Daily Incoming Discharge at STPs installed and functioning---

No/Name of STP	Daily (Monthly Average) Incoming raw sewage at STP , Mld						Average Inflow, Mld
	Jan					Dec	
1							
n							

Note:

1. The date / method of measurement of incoming flows should specifically be mentioned.
2. Copies of flow measurement reports / log books of STP need to be made a part of DPR.

2.4.8.2.Measurement of Flows in Existing Drains/Sewers

The assessment of the flows in drains can be done by a variety of methods right from the rudimentary crude method to the most sophisticated dye tracer method. The choice of methods presented hereunder is considered to be appropriate to the conditions in the country particularly, away from metropolitan centres.

Measurement of flows may be carried out as described in para 3.10 of CPHEEO Sewerage Manual Nov 2013 and reproduced as below. The float measurement is normally not recommended for discharge measurement due to its large uncertainty. However, it may be adopted in consultation with NMCG under some exceptional situations, justification for which may be provided.

a) **The Float Method**

In this method, surface velocity of flow of the drain is worked out by the time taken by a float like an empty match-box or a plastic box to travel for about 3 m in a straight reach and flow is calculated by measuring the depth and flow in the drain.

b) **The V notch method**

Preferably, V-notch method should be used up to discharge of 20 Mld. This requires the insertion of a V notch plate in the drain at a location where the downstream discharge can be a free fall. These plates can be cut out from stainless steel (SS) or Teflon sheets of nominal thickness of about 2 mm and inserted tightly into the drain and the gaps can be closed by a mixture of clay and cement in equal proportion mixed to a thick consistency and smeared on the downstream side. The V notch is the best chosen such that the angle subtended is 90 degrees. The clearances to be ensured are shown in Figure 1.

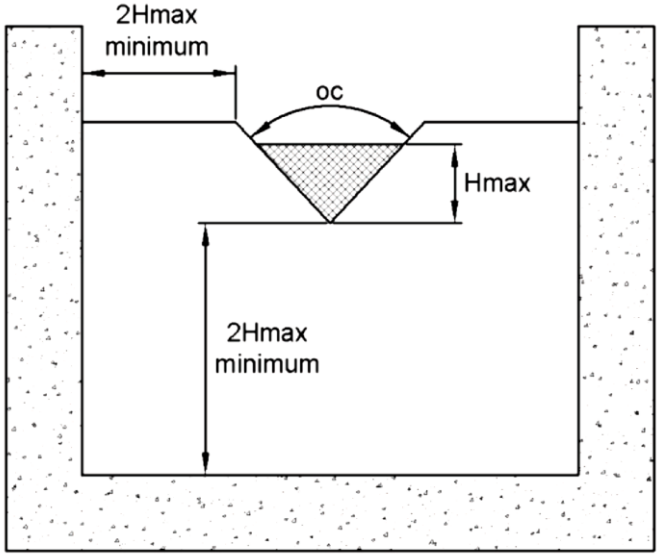


Fig. 1: **Typical mounting of a V Notch in a drain**

The depth of flow is measured over the lower tip of the V bottom and the discharge is

Q = 1.42 × tan of angle of V notch × H power 2.5

As the angle is 90 degrees, the tangent is equal to 1 and hence, the equation simplifies to

Q=1.42× H power 2.5

Where Q is cum/sec and H is in m

c) The rectangular weir method

This can be used if there is already an existing leveled overflow weir like the overflow culverts in irrigation canals. In smaller drains and in places where workmanship of V notch cuts are difficult, these can be used easily by cutting a mild steel or wood sheet as shown in Figure 2.

This method may be used for discharges more than 20 Mld.

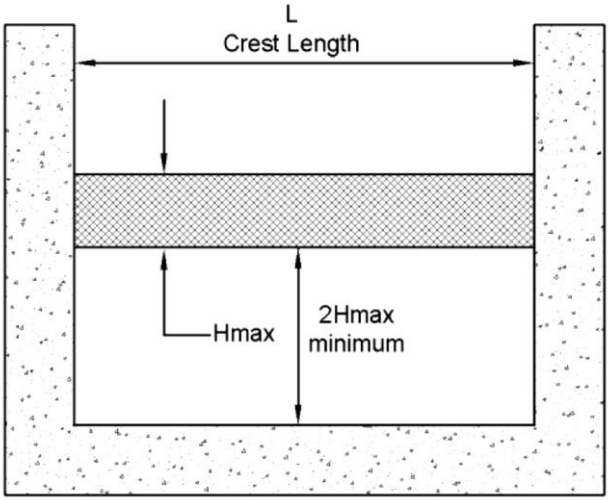


Fig. 2: **Typical mounting of a rectangular weir in a drain**

The depth of flow is measured over the overflow edge of the notch and the discharge is

$$Q = 1.85 \times L \times H \text{ power } 1.5$$

Where,

Q is cum/sec,
H is in m,
L is the length of weir

d) The rectangular weir with end contractions method

These are similar to the rectangular weir except that the length of the weir is smaller than the width of the drain as in Figure 3-3 overleaf.

The depth of flow is measured over the overflow edge of the notch and the discharge is

$$Q = 1.85 \times (L - 0.2H) \times H \text{ power } 1.5$$

Where

Q is cum/sec,
H is in m,
L is the length of weir

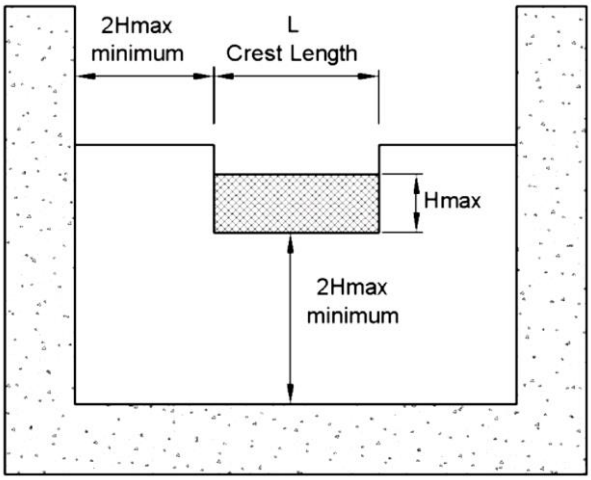


Fig. 3: **Typical mounting of a rectangular weir with end constrictions in a drain**

e) The Palmer-Bowlus Flume

This can be used in case of both the drains and pipes flowing under gravity. Its major advantages are (i) less energy loss; (ii) minimal restriction to flow and (iii) Easy installation in existing conduits. It is a readymade piece for various widths and diameters. The placement in a drain will be as in Figure 4 and that in a sewer pipe will be as in Figure 5 overleaf.

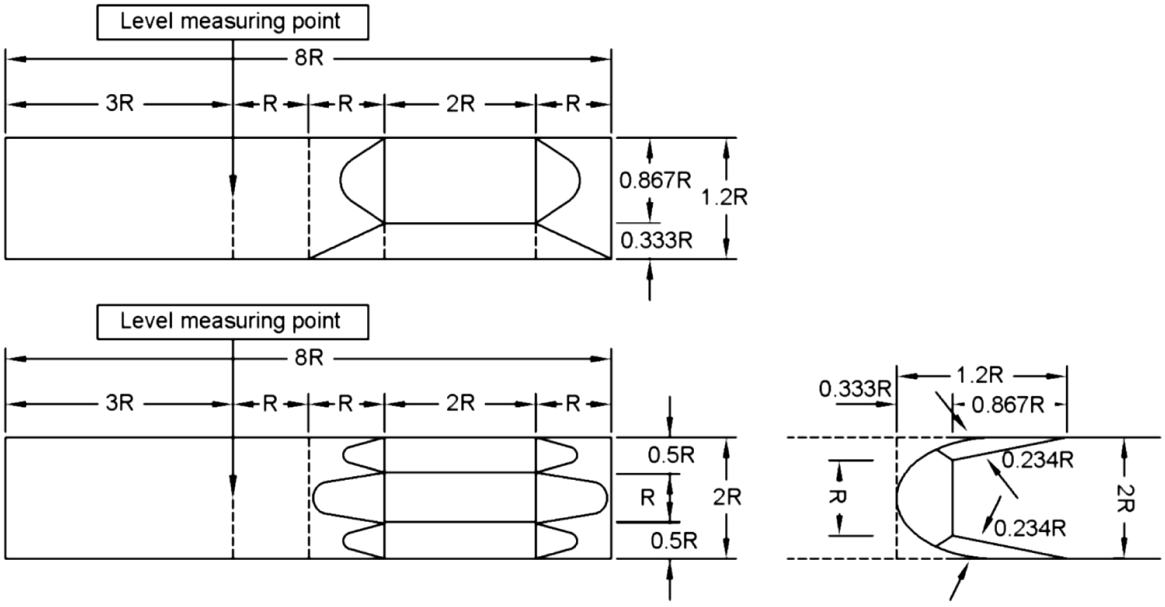


Fig. 4: Palmer-Bowlus flume installation in drains

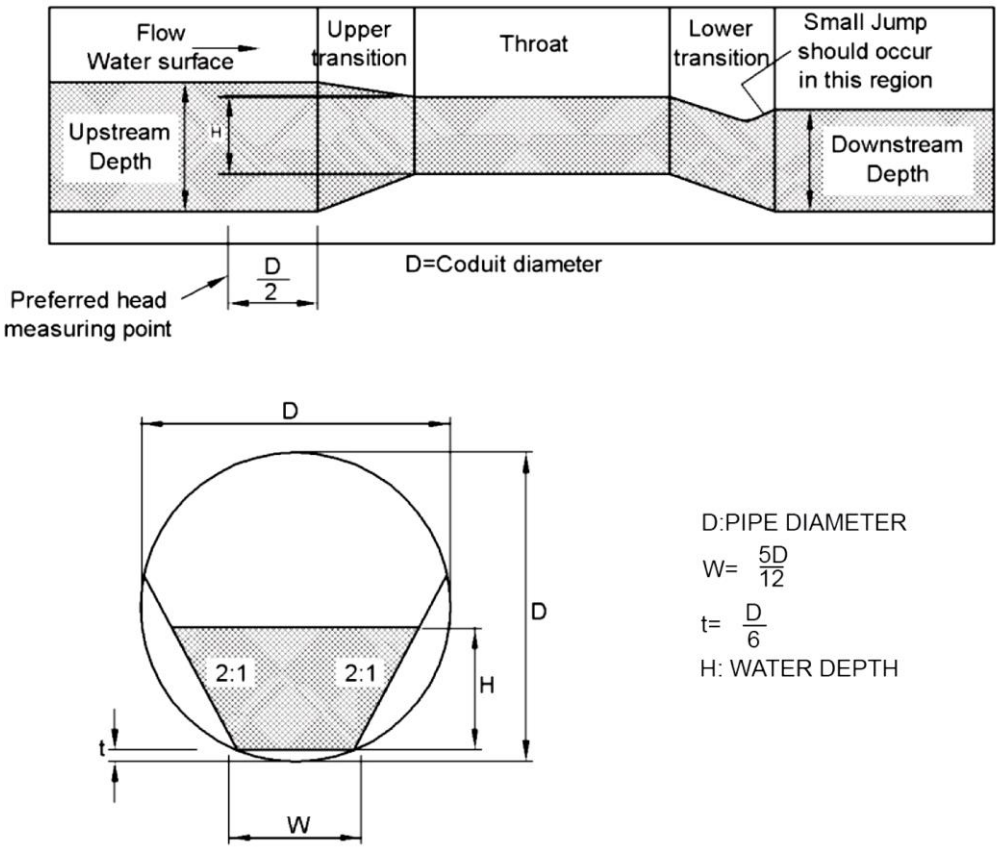


Fig. 5: Palmer-Bowlus flume installation in circular sewer

This has the specific advantage of its ability to be placed in a manhole to measure the sewage flow in the gravity sewer as long as the flow is not exceeding the diameter of the sewer. Typical installation details are seen in Figure 6 overleaf.

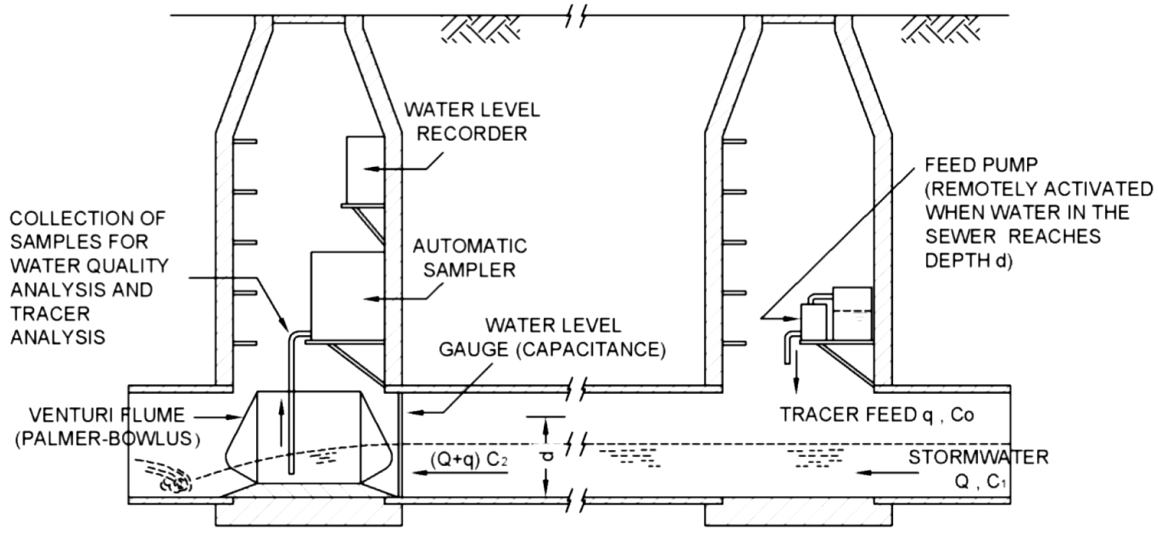
The depth of flow needs to be measured in only one location and thus it is a lot easier. In addition, it can be easily removed after measurement. The only disadvantage is it cannot be used when the depth of flow exceeds the diameter of the sewer and to this extent, it may have limitations in the surcharged condition of sewers in historical cities. This also has the advantage of facilitating a flow measurement in large diameter sewers, which flow under gravity and the flume itself is much simpler as in Figure 7.

The chart for getting at the flow once the depth is measured is obtained by relating to a standard curve supplied by the plume manufacturer depending on the shape of the plume. This is also available as software linked to a personal computer.

The combination of the Palmer-Bowlus and Tracer dye techniques have been reported as early as 1974 as illustrated in Figure 7. It is a system worth inducting in large trunk sewers near the outfalls to have an integrated measurement of the flows and key quality parameters or at least for the flow details and variation patterns.

Top Left and Right- The installation in manholes by inserting the pipe ends into the sewer and measuring the depth of flow by ultrasonic sensor to integrate to a computer as needed.
Bottom left- The Flume, originally invented by Palmer &Bowlus for the Los Angeles County Sanitation District and in use for over three decades, is made by many manufacturers.
Bottom Right- The installation, in a large circular sewer by merely placing the readymade flume at the invert and measurement of the depth, which can be done by ultrasonic sensor.

Fig. 6: Configuration and use of Palmer-Bowlus flume



Source: J. Marsalek, 1974

Fig. 7: Instrumentation for flow measurement and sampling in urban large conduits

f) The Venturi Pipe or the Dall Tube

While dealing with old pumping mains, there is a chance of detecting a venturi pipe fitting in the pipeline, as was the standard practice in those years. The flow through it is a function of the difference in head of the fluid at the mouth and the throat and the formula for a given venturi metre is very simple as

$$Q = K \times (a1 \times a2)\ (factor)$$
$$factor = SQRT\ (2gh/(a12-a22))$$

Where

K = 0.95 to 0.98
a1 = area in sqm at mouth
a2 = area in sqm at throat
h = h1-h2
h1 = piezometric water level in m at mouth
h2 = piezometric water level in m at throat

It is thus clear that once the difference in head is measured between sewage pressure head at mouth and at throat, the square root of the same is directly proportional to the flow. It is possible to connect a differential Mercury manometer to the sampling ports in the metre and open the quarter turn-cock when flow needs to be measured and to note the reading. A simple wall chart relating the difference to the flow will be more than needed. Of course, instrumentation is possible by connecting the two pressures to a differential pressure transmitter and taking its output to a square root extractor and then to a multiplier for the constant for the metre and thereby get a continuous reading of the flow without any interventional systems.

Suffice to say that so far as estimation of flows for design of sewer systems or augmentation of sewer systems are concerned, where an existing pumping station with a venturimeter in the delivery main is available, a simple mercury manometer U tube, connected to the ports of the venturi meter may help in ascertaining the variation of the flow pattern and arrive at peak flow factors etc. more realistically.

A Dall tube is nothing but a venturi pipe-fitting of a reduced length and as otherwise all other properties of flow measurements are the same.

In fact, if possible this can be inserted into an existing pumping main for the evaluation of the above flow patterns.

g) Salt Dilution method

May be used for lower range of flows in the drains up to 6 m^3/s in the hills where flow is highly turbulent and is difficult to measure by other methods. In this method, the tracer i.e. common salt and other chemicals is injected at some point along the stream, and the tracer concentration in streamwater is measured at a downstream point by an electrical conductivity meter, where the tracer has become uniformly mixed with the streamwater. The probe of conductivity meter should be immersed, close to the bed of the stream or ideally at the mid-

depth. After injecting the salted water, the salt starts spreading itself out while travelling downstream. At a certain point downstream it will have filled the width of the stream. For a given volume or rate of injection, greater stream discharges will result in greater tracer dilution and lower concentrations measured at the downstream site. Equations based on the mass balance principle are applied to compute the stream discharge.

The method of flow is easy to accomplish, accurate (<±7%), and reliable for a wide range of stream types. Using this method, stream flow can be measured in less than 10 minutes and very little equipment is needed. The total streamflow, assuming that the streamflow was constant over the test, is

$$Q = \frac{Mass\ of\ Salt}{Conversion\ Factor\ \times Area\ under\ Curve}$$

2.4.8.3.Characteristics of Raw Sewage

The characteristics of raw sewage carried by the drains / reaching STPs may vary from town to town depending upon rate of water supply, per capital pollution load and prevailing socio-economic conditions. The values should be collected from recent records or tested in dry weather (pre-monsoon).

Samples should be analysed for the parameters prescribed in para 5.1.14 of CPHEEO Manual and the following table.

Samples for testing water quality should be composite and flow proportional, taken on a day in every week for diurnal variation on hourly basis from the existing drain or sewage outfall. Considering a four-week month, three sample days are to be weekdays, whereas the fourth is to be an off day i.e. Sunday.

Sampling for water quality should be conducted for at least one month during dry weather (pre-monsoon) to assess pollution load quantitatively and qualitatively. Water quality of the drain should be monitored just before its outlet into the river. The test report should indicate the time of drawing sample and its testing.

This information may be provided in table 2.9.

Table 2.9: Raw Sewage Characteristics, as measured on ----.

***Parameters**	**Monitoring Sites of Drains / Inlet to STPs**								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
pH									
Temperature									
Colour									
Odour									
Alkalinity, mg/l									
TSS									
Volatile SS									
BOD, Total									
BOD, Filtered									

*Parameters	Monitoring Sites of Drains / Inlet to STPs								
	1	2	3	4	5	6	7	8	9
COD, Total									
COD, Filtered									
Nitrogen, NH_3									
Nitrogen, TKN									
Nitrogen, NO_3									
Phosphorus (Ortho-P)									
Phosphorus (T-P)									
Total Coliform									
Faecal Coliform									
TDS									
Chloride									
Sulphates									
Additional parameters if there is a chance of industrial contamination in the town or the catchment of a drain)									
Heavy metals *(for industries likemetal plating, dying, leather etc.)* The choice of heavy metals to be tested will depend on the kind of industrial units									
Pesticides *(For industries like food processing, pesticide etc.)*									
Organo Chlorines									
Organo Phosphates									
Carbamates									
Detergents *(For industries like soap etc.)*									
Other parameters									
Depending on type of industry									

** Source: Para 5.1.14 of CPHEEO Manual Nov*

2.4.8.4.Pollution from commercial, industrial and agricultural activities.

Broad raw water quality parameters that need to be tested have been listed in table 2.10. However, typical waste compounds produced by commercial, and agricultural activities and specific industrial activities are available in Wastewater Engineering Treatment and Reuse standard text books authored by like Metcalf and Eddy. Depending on the nature of activity that is undertaken in the town, appropriate parameters may be monitored in the water samples drawn from the drain or the river.

Data related to industrial waste water, points of discharge into the sewer network/drains etc. may also be provided by the CPCB/SPCB/concerned Govt. body.

The effluent from slaughter houses contains high BOD (1000 to 4000 mg/l), COD (2000 to 10,000 mg/l)), SS (200 to 1500 mg/l), total dissolved solids (4000 to 5500 mg/l), high oil and grease, high chloride from skins, etc. If it is suspected that wastewater from any slaughter house may reach a drain or the river, attention should be paid to monitoring of the above water quality parameters and changes in their values should be looked for.

The mixing of industrial effluents with domestic sewage adversely affects the sewage treatment process. In such cases, necessary corrective / enabling actions may be adopted and the flow parameters should be measured accordingly before finalizing the STP technology.

2.4.8.5.Raw Sewage Characteristics for newly developed areas and in the absence of drain or outfall

For newly developed areas and in the absence of drain or outfall discharging in to the river, raw sewage characteristics may be adopted from the table 2.10 or preferably actual measurements from nearby town(s) having similar rate of water supply and socioeconomic conditions. Table has been prepared with the rate of water supply as 135 lpcd and may be revised depending on rate of water supply.

Table 2.10: Concentration of various parameters in the absence of drain or outfall

Item	Per capita contribution g/c/d	Water supply lpcd	Sewage Generation 80% of (3)	Concentration mg/l
1	**2**	**3**	**4**	**5**
BOD	27.0	135*	108	250.0
COD	45.9	135	108	425.0
TSS	40.5	135	108	375.0
VSS	28.4	135	108	262.5
Total Nitrogen	5.4	135	108	50.0
Organic Nitrogen	1.4	135	108	12.5
Ammonia Nitrogen	3.5	135	108	32.5
Nitrate Nitrogen	0.5	135	108	5.0
Total Phosphorous	0.8	135	108	7.1
Ortho Phosphorous	0.5	135	108	5.0

Source: Para 5.1.14 / Table 5.4 of CPHEEO Manual 2013
Table may be revised based on rate of water supply

2.4.9. Soil Investigations

For laying deep sewers, soil investigation and test bores must be made at suitable intervals along the alignment of sewers to ascertain the type of soil at different depths and

behaviour of ground water table and bearing capacity of the soil. For deep sewer laying, wherever required, a mechanical system may be proposed as a safety and speedy measure.

Soil investigation should be carried out at all major sites such as deep sewers, SPS, STPs and for locations such as flood plains, landfill sites and locations having dispersive soil characteristics.

Soil investigation report should include soil description, characteristics, bearing capacity etc. HFL at the disposal point is also to be provided in the DPR.

2.4.10. Ground Water Investigations:

The information about groundwater levels and their fluctuation should be obtained along the river bank where the interception sewer is to be laid. The levels should be recorded pre monsoon and just after the monsoon when the levels are the highest.

2.5. SOURCES OF DATA

The following sources may provide the needed information:

i. State Pollution Control Board and the Central Pollution Control Board.
ii. Executive Engineer of Water Resources department in the District maintains information about drainage basins and rivers in his district.
iii. District planning office
iv. District officers of agriculture, forests etc.
v. Survey of India topographical sheets
vi. India Meteorological Department
vii. State Remote Sensing Agency
viii. District Census Office
ix. For flora and fauna Botanical Survey of India, Zoological Survey of India, State Pollution Control Board / Central Pollution Control Board and (local University in case any research has been done).
x. Urban Local Body
xi. CGWB / State GWBs; State UDD; NIC cell at State / District level; PHED/ Water & Sewerage Board/Authority
xii. CWC / State Water Resources Department about the flows in the river.

CHAPTER 3: PREPARATION OF DETAILED PROJECT REPORT

The DPR shall be prepared to achieve clearly spelt objective and outcome in terms of abatement of pollution from the drains carrying waste water of the town and improving water quality of the river to make it suitable for bathing.

3.1 OBJECTIVES OF DPRAND OUTCOME

The objective is to prepare a project report for constructing Interception and Diversion works of drains including Trunk Sewers and Sewage Pumping Stations and Sewage Treatment Plants in an optimal manner so that the wastewater from the town carried by the drains is treated to the desired standards before it is discharged into the river.

The expected outcome from the implementation of the DPR is that the water quality of the river should be improved to satisfy the standards prescribed for the best designated use of the river as prescribed by the CPCB and thus make it suitable for the best designated use (bathing in this case).

3.2 DESIGNS

Detailed designs and engineering of the works shall be based on extensive survey and investigation and collection of the required data. In data collection, their analysis, design and implementation of the DPR, the relevant provisions of the CPHEEO Manual on Sewerage and Sewage Treatment Systems, Nov 2013(http://moud.gov.in/sewerage) may be followed. In the event of absence of guideline in the manual on a particular aspect, relevant specifications of Bureau of Indian Standards (BIS), standard books, State / CPWD manuals may be followed. Highest Flood Levels (HFL) of drains/Nala/Rivers should be considered for designing the interception works/Sewage pumping stations (SPS)/Sewage treatment plants (STPs).

An integrated and comprehensive scheme of management of wastewater in the town will include other aspects such as covering all the localities with sewers and connecting every household to it, dealing with non-point sources of pollution, solid waste management etc. These Guidelines deal with the preparation of a part, though a major part, of the Integrated Scheme. Thus the interception and diversion sewers, sewage pumping stations and sewage treatment plants proposed under this DPR would ultimately become a part of the town's integrated and comprehensive system of dealing with wastewater. This aspect should be kept in mind while designing the infrastructure works. The sizes and invert levels of different components shall, therefore, be provided accordingly and for the needs of the next 30 years.

For a town that is sewered, even if partly, the existing Master Plan of sewerage of the town, sewerage zones, designs of trunk sewers, locations of sewage pumping stations and STPs will need to be referred to in order to determine the invert levels of Diversion Sewers now being proposed.

In case of towns with no sewerage system and no sewerage plan, ideally it would be desirable to prepare the Master Plan for sewerage, if not prepared earlier and carry out the design of sewerage network of sewers. However, in case it is not feasible or practical for any reason to prepare a master plan of sewerage, it is necessary to ensure that in the future when a comprehensive sewerage plan of the town is prepared and implemented, the proposed works that will come up then will be in consonance with the diversion works that are being planned

now. For this purpose, topography of the area, gradient, obstructions, levels of the localities need to be ascertained and mapping using total station and GIS.

3.3 DEVELOPING OPTIONS FOR THE SCHEMES

3.3.1 Utilising an existing system

In drainage areas and districts where there is an existing system of interception and diversion of waste water from drains, their (existing system's) status may be presented on a plan and in the form of a note stating the components, their details and condition etc.

3.3.2 Condition assessment

The condition of every component of the system should invariably be assessed for their status, designed performance, present performance, designed capacity and present capacity and useful life left, and whether they should be repaired, refurbished, upgraded or modernized. If it is found that the system can be brought to a to a degree that the waste water satisfies the prescribed standards by the time it reaches the river , items of work that are needed should be identified and details worked out and costs estimated. Existing sewerage works should be dovetailed with the proposed scheme.

3.3.3 Alternatives

Alternative systems if I&D and STPs, keeping in view the location of drains and availability of land for construction of sewage pumping stations and STPs, should be developed so that the optimal system may be adopted and accordingly DPR prepared.

i. Centralised System

The wastewater from all the drains is intercepted in a sewer and conveyed to a centralised STP for treatment from where it could be suitably disposed of into the river or used for irrigation, or, locating the STP further away where land is available at cheaper rates and cheaper technology can be adopted. In this approach the sizes and length of sewers would be relatively large and the STPs also would need to have much larger capacity. Such a system is useful in towns where it is difficult to get the needed land at one place. In this system, the sewers may have to be laid over a long distance involving high costs.

ii. Decentralised System

As opposed to the Centralised System in which all the wastewater of a town is treated at a single point STP, in a decentralised system the entire town is divided in to convenient areas. The wastewater of one area is taken to a point where it is treated in STP. The division of areas is done on the basis of topography and overall cost of I&D including treatment. In such a system, wastewater flowing in one or, sometimes more than one drains, is intercepted and carried in sewer(s) to treatment plant(s) near to their outfalls. In the decentralised approach, sizes of sewers and STPs would be smaller involving lower capital cost. The staff requirement is more and the land required would be at a number of places.

3.3.4 Techno Economic Evaluation

Techno-economic evaluation should be done for each alternative. Economic evaluation should be carried out on life cycle analysis of major components. This analysis should include cost of implementation, capitalised annual O&M cost less revenue from resource recovery, recycling and by-product utilization and cost of mitigation of any adverse environmental impacts, Interest on borrowed capital, debt servicing charges & depreciation provisions should also be taken into consideration to arrive at the Net Present Values (NPV).

Technological evaluation may include ability of the proposed system to achieve the desired outcomes, ease of O&M, time required to implement the project, likely adverse environmental impacts and the feasibility of undertaking measures to mitigate them. The quality of human and physical resources required, electrical and other forms of energy needed, other pros and coins, reliability and long term sustainability should also be given appropriate weightages.

On such an evaluation, the best option should be selected.

3.4 RIVER WATER QUALITY

3.4.1 Water Quality Standards for Rivers as per CPCB

The classification of Designated - Best - Use of inland surface water as stipulated by CPCB is given in table 3.1.

Table 3.1: River Classification Based on Designated Best Use

Designated – Best - Use	Class of Water	Criteria	Prescribed Value
Drinking Water Source without conventional treatment but after disinfection	A	Total coliforms organism pH Dissolved oxygen Biochemical oxygen demand 5 days 20°C	50 MPN/ 100 ml or less Between 6.5 and 8.5 6mg/l or more 2mg/l or less
Outdoor bathing (Organised)	B	Total coliforms organism pH Dissolved oxygen Biochemical oxygen demand 5 days 20°C	500 MPN/ 100 ml or less Between 6.5 and 8.5 5 mg/l or more 3 mg/l or less
Drinking Water source after conventional treatment and disinfection	C	Total coliforms organism pH Dissolved oxygen Biochemical oxygen demand 5 days 20°C	5000 MPN/ 100 ml or less Between 6 to 9 4 mg/l or more 3 mg/l or less
Propagation of Wild life and Fisheries	D	pH Dissolved oxygen Free ammonia (as N)	Between 6.5 and 8.5 4 mg/l or more 1.2mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	pH between Electrical conductivity at 25^{o}C Sodium absorption Ratio Boron	Between 6.0 and 8.5 Max 2250 micro mhos/cm Max 26 Max 2mg/l

Designated – Best - Use	Class of Water	Criteria	Prescribed Value
	Below E	Not meeting A, B, C, D & E Criteria	

Source: CPCB

3.4.2 Actual Water Quality of the River

Data collected on river water quality as discussed in Chapter 2 of these guide lines shall be commented upon and tabulated here.

3.5 DESIGN PERIODS

Design periods for sewerage mains and STPs have been often debated due to cost considerations. Keeping in view the resource constraints and optimum utilization of assets, a modular approach may be followed for the different components of the system.

The year of expected commissioning of the project shall be taken as the base year for design of various components of all projects. The base year may be taken as three (3) years later from the year of preparation of the DPR. Design periods of various components, as prescribed by CPHEEO Sewerage Manual, 2013 are as given below in table 3.2.

Table 3.2: Design Periods

S. No.	Component	Design period, from base year	Design Period* Years (from base year)
1	Land acquisition	30 years or more	Land will be required to add STP modules later. Accordingly land should be acquired.
2	Interceptions	30 Years	
3	Conventional sewers (A)	30 Years	
4	Non - conventional sewers (B)	15 Years	
5	Pumping Mains	30 Years	In case of low velocities, dual pumping mains to be examined
6	Pumping Stations – civil works	30 Years	Cost of civil works is economical for full design period.
7	Pumps & Machineries	15 Years	Considering modular approach
8	Sewage Treatment Plants	15 Years	Construction may be done with a modular approach in a phased manner as the population grows.
9	Effluent disposal	30 Years	Provision of design capacities in the initial stages itself is economical
10	Effluent Utilization	30 Years	15 years or as the case may be

(A) Typical underground sewers with manholes laid in the roads
(B) All types such as small bore, shallow sewers, pressure sewers, vacuum sewers

**Source: Table 2-1 of CPHEEO Manual on Sewerage and Sewage Treatment Systems, Nov 2013 and Table 5.1, Guide Lines for preparation of Project Reports under NRCP and NGRBA, Dec 2010.*

3.6 FUTURE POPULATION

Correct and realistic projections of population for design of various components must be done to optimize costs. Floating population in respect of cities having cultural, tourism or religious importance may be considered judiciously and basis for the same be given.

3.6.1 Census Population

Population should be collected from past census records up to the year 2011. In case ULB is established after 1971, respective rural population of the geographical boundary of the ULB should be considered for this purpose.

Data collected on past census population, as discussed in Chapter 2 of these guide lines, shall be commented upon and tabulated here.

There may be towns where the whole area / population with in municipal limits is not contributing to pollution of the river. As the DPR is for intercepting the drains and treating the diverted sewage, it is of utmost importance to precisely consider the population of the area contributing to flows in drains, for projecting design population and sewage flows.

On the other hand, there may be towns where some areas outside the municipal limits are discharging into drains of the town, but for some or the other reasons are not included with in municipal limits. Such areas may also be considered as a part of the project area.

3.6.2 Future Population Projections

The base year shall be taken as year of completion of the project for which the DPR is being prepared. Population projections for the base, after 10 years, mid and design years shall be made considering the past decadal growths using different recognized methods such as:

a. Arithmetical increase method
b. Incremental increase method
c. Geometrical increase method
d. Decreasing rate of growth
e. Graphical projection method
f. Logistic method
g. Land use and future density method - This shall be carried out at micro level for individual wards depending upon the growth potential of individual wards in consultation with local body, development authority (if any) and city country planning department.

Future population, which appears to be more realistic and acceptable, shall be adopted by giving proper justification for the same.

3.6.3 Floating population

Floating population should also be considered, which includes number of persons visiting the project area for tourism, pilgrimage or for working. The numbers should be decided in consultation with the tourism departments and specified for water supply and sewerage. Equivalent permanent population shall be worked out in proportion to the rate of water supply required for floating and permanent population.

3.6.4 Unauthorized Population:

In major cities, slum areas, unauthorized colonies, houses and establishments have been generating substantial amount of wastewater. Population of such areas should also be considered during estimation of population and sewage generation.

3.6.5 Design Population adopted (including floating population)

Design population shall be adopted as a sum of permanent and equivalent floating and unauthorized population and shall be given for base year, 10, 15, 30 years. In case the town has been divided into a number of sewerage zones, design population in different years shall also be given zone wise.

3.7 RATE OF WATER SUPPLY

3.7.1 Required rate of water supply, as per CPHEEO Manual

As per CPHEEO Manual on Water Supply and Treatment 1999, the recommended values of water supply for domestic and non-domestic purposes are given in table 3.3.

Table 3.3: Recommended Per Capita Water Supply Levels for Designing Schemes

S. No.	Classification of towns / cities	Recommended Maximum Water Supply Levels (lpcd)
1.	Towns provided with piped water supply but without sewerage system	70
2.	Cities provided with piped water supply where sewerage system is existing/ contemplated	135
3.	Metropolitan and Mega cities provided with piped water supply where sewerage system is existing/ contemplated	150

NOTE:

1. In urban areas, where water is provided through public stand posts, 40 lpcd should be considered.
2. Figures exclude “unaccounted for water (UFW), which should be limited to 15%.
3. Figures include requirements of water for commercial, institutional and minor industries. However, bulk supply to such establishments should be assessed separately with proper justification.

Source: Table 2.1 of CPHEEO Manual on Water Supply and Treatment, May 1999

3.7.2 Rate of water supply required for institutions

The water requirements for institutions should be provided in addition to the provisions indicated in para above, where required, if they are of considerable magnitude and not covered in the provisions already made. The individual requirements would be as per table 3.4:

Table 3.4: Water Supply Requirements for Institutional Needs

S.No.	Institutions	Litres per head per day
1	Hospital (including laundry)	
	(a) No. of beds exceeding 100	450 (per bed)
	(b) No. of beds not exceeding 100	340 (per bed)
2	Lodging houses / Hotels	180 (per bed)
3	Lodging houses /Hostels	135
4	Nurses' homes and medical quarters	135
5	Boarding schools / colleges	135
6	Restaurants	70 (per seat)
7	Air ports and sea ports, duty staff	70
8	Airports and sea ports, alighting and boarding persons	15
9	Junction stations and intermediate stations where mail or express stoppage (both railways and bus stations) is provided, duty staff	70
10	Terminal stations	45
11	Intermediate stations (excluding mail and express stops)	45 (could be reduced to 25 where bathing facilities are not provided)
12	Train and Bus stations, alighting and boarding persons	15
13	Day schools / colleges	45
14	Offices	45
15	Factories, duty staff	45 (could be reduced to 30 where no bathrooms are provided)
16	Cinema, concert halls and theatre	15

Source: Para 2.2.8.3 of CPHEEO Manual on Water Supply and Treatment, May 1999 and Table 3.4 CPHEEO Sewerage Manual 2013

3.7.3 Status of Existing Water Supply in the project area

Status of existing water supply shall be prepared as stated in para 2.4.6 and table 2.5.

It shall be ensured that the existing water supply or that proposed to be added by projects under execution, has the potential to meet the water demand of the projected design population at the rate specified in the above table. Details of projects (such as estimated cost, source of water, year of sanction/completion, brief details of works, lpcd proposed, design population etc.) which have been taken up or are contemplated for augmentation of water supply should be given.

3.7.4 Rate of water supply adopted

Rate of water supply adopted for design purposes should be mentioned, keeping in view the existing water supply, plans for augmentation and required for the project, giving full justification of the same.

3.8 INTERCEPTION FACTOR

The observed dry weather flow reaching the sewer system is less than that of the per capita water supply due to loss of some water in leakage and evaporation. It varies from 40% of water supplied in arid regions to 90% in well developed areas. For design purposes, interception factor or return factor may be adopted as 0.80 in developed areas. However, conventional sewers shall be designed for a minimum sewage flow of 100 lpcd or higher as the case may be.

3.9 GROUND WATER INFILTRATION

The inflow to sanitary sewers may also include flows due to infiltration of groundwater through joints. As per CPHEEO manual, since sewers are designed for peak discharges, allowances for groundwater infiltration for the worst condition shall be made as per table 3.5 and that design infiltration value shall be limited to a maximum of 10% of the design value of sewage flow.

Table 3.5: Ground Water Infiltration

Item	Unit	Minimum	Maximum
Area	Litres/ha/day	5000	50,000
Length	Litres/km/day	500	5,000
Manhole	Litres/day/manhole	250	500

Source: Table 3.3 of CPHEEO Sewerage Manual 2013

The depth of subsoil water in the project area be mentioned. For design purposes, ground water infiltration through sewers may be adopted depending on depth of sewers to be laid and depth of sub soil water.

3.10 PEAK FACTORS

Flow in drains and sewers varies hourly and seasonally. However, for design purposes, peak factors may be adopted as per table 3.6. Minimum flow may vary from 1/3 to ½ of average flow. For population less than 10,000, Babbitt's formula[1] with minimum and maximum limit of 3.0 and 6.0 respectively may be used.

Table 3.6: Peak Factors for contributory population

Contributory Population	Peak Factor
Up to 20,000	3.00
20,001 to 50,000	2.50
50,001 to 750,000	2.25
Above 750,001	2.00

Source: Table 3.2 of CPHEEO Sewerage Manual 2013

Babbitt formula for peak factor = $5\times P^{-02}$, where P is population in thousand.

3.11 DESIGN FLOWS

Sewage flows in design years (base, 10, 15 and 30 years), should be worked out by the following methods:

- Computed flow based on rate of water supply and projected population (including floating) of the catchment, in design years. For calculating sewage flows, ground water drawn through private bores and ground water infiltration through sewers laid below ground water table should also be added.

- Actual flows measured in drains and sewers in dry season projected for design period, taking into consideration the population for the respective design period. In hills, actual flow should be measured during yatra season also. Copies of reports of flow measurements indicating the date / method of measurement should invariably be made a part of DPR. Data collected on actual sewage carried by drains, as discussed in Chapter 2 of these guide lines, shall be commented upon and tabulated here.

Higher values, worked out above, may be adopted as design flow unless justified for the specific city having specific reasons and climatic condition. In some towns, the flow in the drains is many times higher than the computed flow based on the water supply indicating the contribution of ground water or some other sources like back water, canal or springs. In such situation, a judicious and well considered value should be taken for designing the interception/diversion works, SPS and STPs. Efforts should be made to isolate the sewage from such other sources.

In towns, where water supplied is higher than recommended rate of water supply, a programme for gradually decreasing the same to recommended rate of water supply shall be adopted, in view of the National policy of water conservation.

A hydrograph for 24 to 72 hrs. exhibiting the peaks may be plotted against measured flows and area, to make an assessment of volume of accumulated flows. The assessment based on population projection may, quite often, neglect, some areas which are not accounted for or are outside municipal limits, but are actually contributing to flows in drains. The estimated quantity based on hydrograph may therefore be used as reference figures for taking a judicious decision.

Design flows adopted in different years shall be worked out and tabulated sewerage zone wise / drain wise so as to indicate the raw sewage flow to be diverted for treatment.

However, in towns where present water supplied is less than recommended rate and there is no possibility of increasing the same in near future, design sewage flows for STPs and

E/M works of SPS may be based on current drain flows projected for the design period instead of on computed flows. Their capacity be increased as and when the rate of water supply and flow in the drains increases. However, suitable provisions in the structure and space be provided in the beginning.

Design flows shall also include the flow reaching STPs from drains flowing into the city from areas outside city boundary limits.

As Per 2.4.9 (CPHEEO Manual) Geographical Information Systems (GIS) should be an integral part of sewage collection system. The spatial modelling capabilities of GIS can be used to estimate current and future sewage flows, evaluate the capacity of the sewers and estimate the condition of the sewers.

Design flows shall be adopted in different components as per table 3.7.

Table 3.7:Table: Design Flows to be adopted for different components

S. No.	Component	Design capacity based on
1	Interceptions	Projected peak drain flow in 30 years
2	Sewers	Computed sewage generation in 30 years @ 135/150 lpcd*
3	Sewage pumping stations CW	Computed sewage generation in 30 years @ 135/150 lpcd*
4	Sewage pumping stations EM works	Computed sewage generation in 15 years @ 135/150 lpcd*
5	STPs	Computed sewage generation in 15 years @ 135/150 lpcd*
6	Effluent sewers	Computed sewage generation in 30 years @ 135/150* lpcd*
7	Land	For STPs / SPS on computed sewage generation in 30 years @ 135/150* lpcd*

*Depending upon size of town

3.12 INTERCEPTION WORKS

a. These shall comprise of cross overflow weir, gates, screens, interception channel, diversion drain, grit chamber, proportional flow weir etc.
b. These shall be provided near the outfall of the drains carrying untreated sewage into the river.
c. These shall be provided taking into account the design peak flow, size of the drain and highest flood level (HFL) of the river. These should not be designed using empirical rainfall-runoff formulae's. Data should preferably be obtained from CWC/ other government agencies as defined in para 2.5 of this report. In absence of authentic data, proper observations need to be carried out.
d. Some portion of the drain u/s and d/s of the interception works shall be remodelled to suit the site requirement.

e. During the rainy season, the sewage flowing into the drains will be supplemented by storm water. As this happens, the gates provided at the interception chamber shall be raised to allow rain water to pass through and bypass the STP for which suitable arrangements shall be made.
f. Suitable arrangements shall be provided for removal and disposal of solids, floating materials and silt to prevent silting of diversion sewers.
g. There is a wide variation in the discharge in the Indian rivers during dry months and the rainy season. Because of this phenomenon, the flood plain of the rivers especially in Gangetic plains is very wide. The location of the interception works shall take due consideration of the flood plain of the river to provide unobstructed approach for O&M.
h. Anti-corrosive measures like cathode protection and use of anti-corrosive materials shall be taken to prevent corrosion of the works.
i. Hydraulic design shall be provided for every component of I&D works along with hydraulic flow diagram.
j. I&D works to be so provided that they become integral part of the comprehensive sewerage plan of the town.

3.13 DIVERSION / INTERCEPTING SEWERS

(i) The sewers proposed under the DPR should be so designed that they ultimately become a part of the town integrated and comprehensive system dealing with wastewater. The sizes and invert levels of sewers shall therefore, be provided accordingly and for the needs of next 30 years.
(ii) Minimum size of sewers shall be adopted as 200 mm for towns having present/base year population of over 1 lac and 150 mm in smaller towns. In hills, minimum diameter of 100 mm shall be adopted.
(iii) Minimum velocity at initial/ultimate peak flow shall be adopted as 0.6/0.8 m/s and maximum velocity not to be more than 3 m/s. In hills, CI/DI pipes may be adopted along with suitable drop manhole arrangement to reduce the velocity greater than 3 m/s.
(iv) Maximum depth of flow shall be limited to 0.8 of the diameter at ultimate peak flow for ventilation.
(v) Life cycle cost analysis of different pipes shall be done and included in the DPR, if pipes other than RCC are proposed in gravity sewers.
(vi) Condition assessment of existing sewers shall be carried out and the same shall be integrated into the proposed sewers. The report of such condition assessment should be invariably appended with DPR. Hydraulic design of sewers shall show integration of existing sewers with proposed ones.
(vii) The alignment of proposed sewers shall take due consideration of HFL and flood plain of the river to provide safety of works and unobstructed approach for O&M. Measures taken in this regard, shall be stated.
(viii) Trenchless technology method may be adopted at major road crossings, railway tracks and other important junctions for laying of sewers. However, full justification for adopting trenchless technology instead of open excavation will need to be given along with plans showing such stretches.
(ix) Sewers rehabilitation or laying of sewers by trenchless method shall be proposed on technology neutral basis.
(x) The plans should show basic details such as GLs, contours, land marks, major drains, their points of outfall, diameter and invert levels of existing and proposed major sewers, especially at junction points.

3.14 SEWAGE PUMPING STATIONS

a. The civil works of sewage pumping stations proposed under this DPR would be provided for 30 years need and would ultimately become a part of the town's integrated and comprehensive system of dealing with wastewater. The sizes of pumping stations and RLs of different components shall therefore, be provided accordingly. However, considering modular approach, pumping plants shall be provided to cater to next 15 years and further pumps may be provided with a modular approach in a phased manner as the population grows.

b. The configuration of sewage pumps may be adopted as per table 3.8:

Table 3.8:Configuration of Sewage Pumps, based on length of rising mains

Length of rising main	**Pumps**	**No. of pumps**
Where rising main is long and where head losses are the dominant factor	Peak Flow/2 pumps	3 nos. (including 1 standby)
	Non Peak Flow pumps	2 nos. (including 1 standby)
Where rising main is short and static head is dominant	Peak Flow/4 pumps	6 nos. (including 2 standby)

Source: Table 5.1, Guide Lines for preparation of Project Reports under NRCP and NGRBA, Dec 2010

c. Alternatively, pumps may be provided as given in table 3.9.

Table 3.9: Configuration of Sewage Pumps, based on size of sewage pumping station

Size of Sewage Pumping Station	**Pumps**	**No. of pumps**
Small capacity pumping station	1 pump of 1 DWF 1 pump of 2 DWF 1 pump of 3 DWF	3 nos.
Large capacity pumping station	2 pumps of 1/2 DWF 2 pumps of 1 DWF 1 pump of 3 DWF	5 nos.

Source: Para 4.5.4 CPHEEO Manual on Sewerage and Sewage Treatment Systems Nov 2013

d. The number of pumps may be so chosen to provide a 100% standby capacity during peak hours, if the site conditions so warrant. For the purpose, required number of pumps may be kept in reserve in store for use in emergency.
e. Design of pumping stations should take into consideration the lean, average and peak flows. Pumping configuration should be appropriate for effective pumping of sewage in any of these flow conditions.
f. Hydraulic retention time (Volume of wet well below invert of incoming sewer) shall be worked out as below, subject to minimum of 3.75 minutes of design peak flow:

Volume of wet well V = T x Q / 4
Where,

V: Effective volume of wet well (in cubic meters)
T: Time for one pump cycle (in minutes)
Q: Pumping rate (cubic meters per minute)

The value of T is related to the number of starts per hour and it is not advisable to exceed 6 starts per hour. Accordingly, the value of T in the design is to be taken as 10 minutes for smaller pumps but 15 minutes is desirable.

Ideally this volume has to be provided below the invert of the lowest incoming sewer. However, it may not always be possible especially in large sized pumping stations. In such cases, volume in the sewers calculated at 0.8 times their total volume can be considered as the extended wet well volume. *(Source: Para 4.6.6 CPHEEO Sewerage Manual (Nov 2013).*

g. Size of sump of the pumping station shall be checked with the pump manufacturer(s) for adequacy and so mentioned in the DPR.
h. Provision of control room shall be made in the DPR as per specifications of the respective Discom.
i. Submersible sewage pumps may be used, which are more economic in terms of both capital and operating cost besides being operation friendly.
j. Recent version to submersible pumps are immersible pumps with a seal of oil around the motor which takes care of its cooling. Thus it is possible to pump out the wet well to almost the mid height of the pump and reduce the height of wet well below the incoming sewer, saving considerable construction cost. *(Chapter 4 of CPHEEO Sewerage Manual (Nov 2013.)*
k. Condition assessment of existing pumping stations shall be carried out and the same shall be integrated into the proposed ones. The report of such assessment should be invariably appended with the DPR.
l. To ensure constant running of pumping stations, diesel operated generating sets may be proposed at each pumping station. Provision should also be made for dedicated feeder line as well, as discussed in para 3.21 of these guide lines.
m. HFL of the river shall be taken into consideration while deciding RLs of different components of the SPS to provide safety and uninterrupted operation and maintenance of SPS.
n. DG set capacity needs to be provided for peak flow requirement.
o. To scale site plans of the proposed pumping stations should be provided, showing land available, layout plan of the proposed works and open space available for future requirement.
p. Hours of power availability in the project area should be mentioned in the project.

3.15 RISING MAINS

In case of water supply works, economical size of the rising main is worked out by trying out various sizes and finding out net present value of the capital costs of pipe line/pumping machinery and capitalised electric energy costs. In case of rising mains carrying sewage it is not possible to calculate the economical size because of complexity of varying pumping rates etc. As such,

a. size of rising main selected should be such that to avoid silting, ensuring velocities not less than 0.8 m/sec (barest minimum) and not exceeding 3 m/sec at any time (*Para 4.20 of CPHEEO Manual on Sewerage and Sewage Treatment Systems Nov 2013*). Suitable provision of rising main accessories, wherever needed, such as thrust blocks, anchor blocks, expansion joints, scour/drain valves, air/vacuum release valves and surge protection devices shall be made in the DPR. Surge/water hammer analysis shall be calculated and made a part of the DPR.

b. Rising mains must be designed for WHH (Water Hammer Head) also: It is important to select the suitable class of the pipe based on clause no. 6.17.3(a), (b) and (c) of CPHEEO manual on water supply. Accordingly, if (a) Pumping Head (PH) + Water Hammer Head (WH) < 1.1 × Allowable Pressure (AP)/Working Pressure (WP) of pipe, then the same class of pipe can be used, if (b) PH + WH > 1.1 × AP/WP < 1.5 ×AP/WP, the same class of pipe can be used with provision of water hammer controlling devices and if (c) PH + WH > 1.5 × AP/WP, then higher class pipe shall be proposed.

3.16 SEWAGE TREATMENT PLANTS

3.16.1 Raw Sewage Quality for STP Design

3.16.1.1 Past experience indicates that normative values of parameters like BOD and SS have been taken for influent sewage despite actual quality characteristics having been established through field investigations. Such considerations result in over design of STPs with higher cost implications. This must be avoided and actual influent quality with an appropriate mark up only be considered for design purposes. For adopting BOD levels above 150 mg/l, proper justification must be provided. Copies of laboratory test reports of waste water incoming at existing SPS/STPs in the town or other towns in the vicinity, under similar situation, shall form part of DPR. The date and time of measurement of raw water quality shall invariably be mentioned in test reports.

3.16.1.2 The raw sewage quality should be ascertained by composite sampling once a week for diurnal variation on hourly basis from the drain or nearby existing sewage outfall (SPS/STP). Considering a 4-week month, 3 samples are to be collected on weekdays and the fourth on an off day i.e. Sunday. Sampling for water quality should be conducted for at least one month during dry weather to assess pollution load quantitatively and qualitatively.

3.16.1.3 The samples should be analysed for the parameters: pH, temperature, colour, odour, alkalinity, TSS, VSS, BOD (Total & filtered), COD (Total & filtered), N (NH3, TKN, NO3), Phosphorus (Ortho-P, T-P), TC, FC, TDS, Cl, Sulphates. For chances of industrial contamination - Heavy metals, Pesticides (Organo Chlorides, Organo Phosphates, Carbonates), Detergents, other parameters as per type of industry. One or two samples may also be tested for emerging contaminants involving presence of pesticides, personal care products and antibiotics etc. as these are becoming important in future treatment processes. Such tests shall provide a good baseline data.

3.16.1.4 In the absence of existing SPS / STP(s), actual measurements of raw sewage quality, from nearby town(s) having same rate of water supply and similar socioeconomic conditions, should be carried out as stated above.

3.16.1.5 Copies of raw sewage quality being monitored at the influent of existing STPs should also be collected for the last 2 years and shall be made a part of DPR.

3.16.1.6 Summary of above laboratory water quality test reports should be provided along with their copies and shall be made a part of DPR.

3.16.1.7 Raw sewage quality for design of STPs should be adopted accordingly. Basis of raw sewage quality adopted should be given

3.16.2 Treated effluent Quality

MoEFCC, vide Gazette notification, 843 dated 13th October,2017 under Environment (Protection) Rules, has prescribed the effluent discharge standards for Sewage Treatment Plants (STPs) as given in table 3.10.

Table 3.10: Effluent Standards for Sewage treatment plants

S. No.	Industry	Parameters	Standards	
1	2	3	4	5
		Effluent discharge standards (applicable to all mode of disposal)		
105”	Sewage Treatment Plants (STPs)		Location	Concentration not to exceed
			(a)	(b)
		pH	Anywhere in the country	6.5 – 9.0
		Bio-Chemical Oxygen Demand (BOD)	Metro Cities*, all State Capitals except in the State of Arunachal Pradesh, Assam, Manipur, Meghalaya Mizoram, Nagaland, Tripura Sikkim, Himachal Pradesh, Uttarakhand, Jammu and Kashmir, and Union territory of Andaman and Nicobar Islands, Dadar and Nagar Haveli Daman and Diu and Lakshadweep	20
			Areas/regions other than mentioned above	30
		Total Suspended Solids (TSS)	Metro Cities*, all State Capitals except in the State of Arunachal Pradesh, Assam, Manipur, Meghalaya Mizoram, Nagaland, Tripura Sikkim, Himachal Pradesh, Uttarakhand, Jammu and Kashmir and Union territory of Andaman and Nicobar Islands, Dadar and Nagar Haveli	<50

			Daman and Diu and Lakshadweep	
			Areas/regions other than mentioned above	<100
		Fecal Coliform (FC) (Most Probable Number per 100 milliliter, MPN/100ml	Anywhere in the country	<1000

*Metro Cities are Mumbai, Delhi, Kolkata, Chennai, Bengaluru, Hyderabad, Ahmedabad and Pune.

Note :

(i) All values in mg/l except for pH and Fecal Coliform.

(ii) These standards shall be applicable for discharge into water bodies as well as for land disposal/applications.

(iii) The standards for Fecal Coliform shall not apply in respect of use of treated effluent for industrial purposes.

(iv) These Standards shall apply to all STPs to be commissioned on or after the 1st June, 2019 and the old/existing STPs shall achieve these standards within a period of five years from date of publication of this notification in the Official Gazette.

(v) In case of discharge of treated effluent into sea, it shall be through proper marine outfall and the existing shore discharge shall be converted to marine outfalls, and in cases where the marine outfall provides a minimum initial dilution of 150 times at the point of discharge and a minimum dilution of 1500 times at a point 100 meters away from discharge point, then, the existing norms shall apply as specified in the general discharge standards.

(vi) Reuse/Recycling of treated effluent shall be encouraged and in cases where part of the treated effluent is reused and recycled involving possibility of human contact, standards as specified above shall apply.

(vii) Central Pollution Control Board/State Pollution Control Boards/Pollution Control Committees may issue more stringent norms taking account to local condition under section 5 of the Environment (Protection) Act, 1986".

These standards should be followed. However, if is felt that more stringent norms are required, they may be adopted after giving justification

3.16.3 Sewage Treatment Technology

Sewage treatment plants are based on the technology which may have the natural, chemical, powered or non-powered based processes. The choice of technology option for sewage treatment is of great importance. In the NRCD MOEFCC document "Compendium of Treatment Technologies" published in 2009, (http://moef.nic.in/modules/recent-initiatives/NGRBA/Final%20Compendium.pdf) technologies have been evaluated on basis of

i. Performance,
ii. Energy requirement,
iii. Resource requirements and associated costs,
iv. Land requirements.
v. Annualized cost has also been worked out.

This compendium may be referred for selection of an appropriate sewage treatment technology. It implies that depending on the desired water quality of the effluent of the STP, land requirement, availability of electricity and funds available, the technology that appears feasible should be selected using the matrix given in Compendium of Technologies. Graph showing annualised cost (as in 2008) of treatment and corresponding land requirement for various treatment technologies, as given in the above compendium, is placed as Fig 8. Constructed wetland technology may also be included in the sewage treatment plant technology options as it offers one of the most promising methods to treat sewage with low capital expenditure (CAPEX) and operation expenditure (OPEX) subject to the availability of land. This option may also be studied for improving the performance of existing oxidation and stabilization ponds to the desired level.

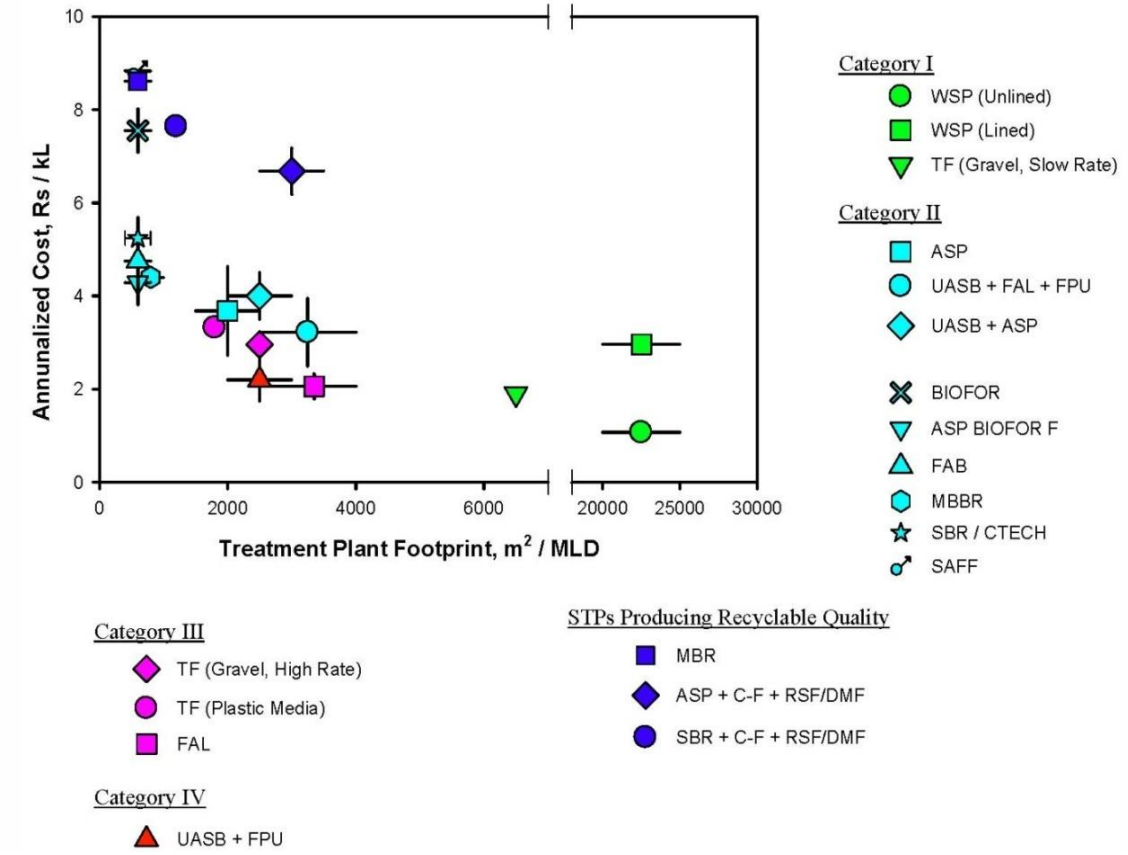


Fig. 8: Annualised cost (as in 2008) of treatment and corresponding land requirement for various treatment technologies
(*Source: Compendium of Treatment Technologies – MoEF 2009)*

Description of these technologies has been given in the Compendium, which may be referred to. Since the publication of the Compendium, more technologies have been developed and used. Up-coming technologies like A2O process, MLE (modified ASP) may also be included as these address exclusively Nitrogen and Phosphorus, apart from conventional pollutants.

Bioremediation technique has also been developed involving the use of organisms to neutralize pollutants from a drain itself. .However, most of the work on Bioremediation has been done on laboratory scale or limited pilot instances. A State-of-the-Art report on 'Bioremediation, its Applications to Contaminated Sites in India' has been published by the

MoEF, Govt. of India (http://www.moef.nic.in/downloads/public-information/BioremediationBook.pdf). This report gives a list of institutions having expertise in bioremediation. Appropriate institution may be consulted if bioremediation appears to be a feasible solution to the problem in the circumstances of a town.

The CPHEEO Manual on Sewage Treatment Nov 2013 (para 5.8) makes the following observation:

"It covers such of those technologies for which validated design guidelines are available in India over the past many decades. There are more recent technologies with each of them having their own design guidelines by the respective equipment vendors and for which obviously there are proprietary issues in procurement out of public funds. No doubt, unless these are tried out at some point in time, there is no way of inheriting these forever, but at the same time, the proprietary issue has to be got over. Hence, these technologies will be addressed later in this chapter under the title "Recent Technologies". Accordingly, the technologies to be considered in this chapter will be the Activated Sludge Processes, Attached Growth Systems, Treatment Methods Using Immobilization Carrier, Stabilization Ponds and Anaerobic Treatment. It is decided to phase out the stone media trickling filter technology considering the difficulties of upkeep of its rotary distributor, Psychoda flies nuisance and the recent light weight media which give much more surface area for unit volume of the media as compared to the stone media."

NRCD has, in the year 2011, sanctioned 4 (four) demonstration/pilot project of "In-situ treatment of sewage through bio-remediation" at (i) Budha Nala, Ludhiana, Punjab (ii) Bakarganj Nala at Patna, Bihar (iii) Morigate Nala, Allahabad, UP and City Drain, Farukabad, UP under NRCP/NGRBA with CPCB as the nodal agency for project implementation. The results of the project are not published yet. However, expected BOD from the pilot projects is limited to only 30 to 50 and TSS 80 to 130 only which are not in conformity to the new effluent parameters.

Hence those technologies should be considered for selection in respect of which reliable information is available along with those mentioned in the compendium of Treatment Technologies (2009) and the Manual of CPHEEO on Sewage Treatment Nov (2013).

3.16.4 Life Cycle Cost Analysis

The most cost effective and feasible option may be selected through their life cycle cost analysis of various technologies. The cost components that should be included are the following:

a) Capital (One time cost)
   i. Land
   ii. Cost of various components of the system.

b) Recurring (Annual)
   i. Energy (electricity & diesel)
   ii. Manpower cost in operation and maintenance
   iii. Consumables

iv. Repair and maintenance
v. Resource recovery (negative cost.)

c) Water quality parameters – Influent quality, effluent quality standards, effluent quality for reuse.

This analysis should include capitalized costs, less revenue from resource recovery, recycling, by-product utilization etc. Ease of O & M, time required to construct and for achieving the desired objectives and costs of mitigation of any adverse environmental impacts must be considered on the costs assigned for the alternatives. Best option arrived from the LCC analysis should be selected and details should be presented in the DPR.

Standard methodology for calculating life cycle costs should be adopted.

3.16.5 Provision for STPs on technology neutral basis

Provision for STPs should be made on technology neutral basis. The technology provider may be asked to quote the rates based on the criteria such as raw sewage quality, effluent quality for reuse of effluent, availability of land and O&M cost and ease in maintenance of the STPs etc.

Costs of STPs constructed elsewhere on latest effluent parameters should be given in support of estimated cost adopted in the DPR.

3.16.6 Capacity / location of STP

a. Present Capacity of STP shall be provided to cater to the needs of the next 15 years and construction may be done with a modular approach in a phased manner as the population grows. Condition assessment of existing STPs shall be carried out and the same shall be integrated into the proposed ones.
b. The DPR is for intercepting the drains and treating the diverted wastewater. It is presumed that in the dry months the drains will carry mainly the wastewater from the town and there will be negligible storm water. Therefore, the entire flow in the drain should be diverted to the STP and treated. The STPs will, therefore, need to be designed based on the flow in the drains for the flow in the dry months and the sewage generation based on the population, whichever is higher.
c. Proposed STP shall take due consideration of HFL (Highest Flood Level) of drain / nala / river to provide safety and uninterrupted operation and maintenance of the STP.

3.16.7 Condition assessment of existing STPs

Condition assessment and integration of existing STPs with the proposed one should invariably be carried out. Non Destructive tests on RCC structures should be done to provide confirmation of the stability and integrity of civil structures. The report of such condition assessment should be appended with the DPR

3.16.8 Resource Recovery

Following methods of resource recovery are:

i. Sale of sludge as manure or fuel
ii. Sale of treated water for irrigation, horticulture
iii. Fisheries etc.
iv. Generation of electricity
v. Carbon credit

All key parameters should be explained with detailed justification in the DPR.

3.16.9 Sludge Management

The DPR should have provision for a detailed Sludge Management Plan including the treatment, storage, handling facilities at site and approvals from ULBs to accept the solid waste generated by the STPs for its safe disposal / effective management.

Chapter 6 of CPHEEO Sewerage Manual (2013) has laid down detailed Guiding Principles on sludge treatment and its uses. These need to be followed. Disposal of sludge shall have to be as per the hazardous waste (handling and management) rules of MoEF if ceiling concentration of heavy metals and faecal coliform limits are violated. Every effort should be made to go eco-friendly in dealing with biological sludge from STPs. They need to be dried to about 20% moisture and then integrated with the agriculture and farm forestry. If needed to be applied on sensitive lawn, Gamma ray radiation of the sludge is mandatory before such application. The advancement in anaerobic sludge digestion in the coming years may address these processes

3.16.10 Septage / Faecal Sludge Management

In areas where the sewerage network coverage is low, there has been reported tendencies of the septage being dumped at the receiving chambers or the drains to the STPs causing shock loads and leading to failure of the STP's performance. Hence Septage / Faecal Sludge management practices are to be assessed and appropriate provisions need to be built in while designing the STPs.

3.16.11 Reuse of treated sewage

Paragraph 2.12.1.7 of CPHEEO Manual recommends that reuse of treated water to a minimum extent of 20% shall be mandatorily explored. This should be kept in mind. In view of higher treated effluent quality, concerted efforts will have to be made to explore and sell all the treated effluent to the potential buyers, 1st in industrial application, 2nd in domestic purpose and 3rd in agriculture sector. These may include laying new pipe lines for reusing the treated water by industries, domestic (toilet, cleaning) and horticulture. For the purpose, the end users will need to be identified, user agreement finalized and provision for recycled water network need to be established to ensure the recycling of treated sewage.

3.16.12 Instrumentation and Data Acquisition

The process instruments of proven technology may be provided for efficient continuous online monitoring at inlet and outlet of STPs, measurement of flows / water quality parameters

and safety of operating staff and equipment as per prevailing norms. The instruments should show compliance to agencies such as ISO, BIS, EPA etc. as applicable.

The SCADA system should be capable of taking care of the complete Data Monitoring and Data Logging facility and should be based on latest version of SCADA system.

3.17 LAND REQUIREMENT

Sewers are laid on the road side on publicly owned land. Hence no land is required to be acquired for sewers. However, land is required for sewage pumping stations and sewage treatment plants. In the above referred Compendium i.e., "Compendium of Treatment Technologies" published in 2009, (http://moef.nic.in/modules/recent-initiatives/NGRBA/Final%20Compendium.pdf)", the land required per unit of wastewater treated in treatment plants has been given. It should be used to estimate the land required for STPs.

3.17.1 Land for Sewage Pumping Stations and STPs should be arranged to meet the requirement for next 30 years.

3.17.2 To scale site plan should be provided in the DPR showing the layout of proposed works, land required for proposed works and open space for future requirement.

3.17.3 Status of availability of land to be given on a statement showing land required for ultimate needs (of Interception works, SPS, STP, other works), land available, balance required, funds required for acquisition, provision made in DPR.

3.17.4 Land for construction of various structures / sewage pumping stations / STPs shall be in possession of executing agencies and land documents shall be attached to the DPRs.

3.17.5 Photographs of the existing and the proposed land sites be attached with the DPR.

3.18 FACTORS IN SELECTION OF SYSTEM OF WASTE WATER MANAGEMENT

Sewerage Districts – Configuration of STPs.

Depending on the availability of land especially for STPs, the locations of STPs may be determined. At one location where wastewater will be treated will receive wastewater from areas covered by one drain or more. This area will be the Sewerage area or Sewerage district of the STP.

Factors which affect the selection of system are given below:

i. Feasibility of utilising an existing interception & diversion system with necessary repairs, renovation, up gradation and modernisation.

ii. Where new systems are to be established, availability of land is a critical factor. In a district if suitable land of the required size is not available for installing STP, waste water must be carried to a place where land for the STP is available.

iii. Availability of electricity. It is crucial as a centralised system usually involves a long interception sewer necessitating laying of sewers at considerable depth and installation of intermediate pumping stations. These require power and since in most states there is shortage of power, standby arrangements in the form of DG sets have to be provided for. Thus centralised system involves high capital cost and high O&M cost.

iv. There are pros and cons of centralised and decentralised systems. They should be carefully analysed and compared. Life cycle costs of different systems should be compared.

v. The ability and willingness of the people to meet their obligations to sustain the system etc.

vi. Over the life cycle of the system, the net present value of annual costs and revenues should be worked out of systems that are considered feasible and on that basis the system found to cost the least should be selected.

Based on the above factors the most suitable system may be selected.

3.19 PREPARING DRAWINGS

Drawings of works proposed should be incorporated in the project report. The DPR should be prepared in the Geographical Information System (GIS) format if it is feasible**.**

Following drawings should be provided in DPRs:

Sl.No.	Drawing Title
	General Drawings
1.	Map of the Country and State Showing the Location of the Town
2.	Map Showing Ganga River Basin and Location of Town
3.	Base map of Town (Road, Railway track, Wards, Slum and important landmarks etc.)
4:	Satellite lmagery of Town
5.	Land use Map/ Master Plan of Town (if any)
6.	Catchment Area of the town.
7.	Map Showing overall drainage and their Outfall Point related to Town
8.	Map of Town showing locations of industries, CETPs and points of, untreated/ treated effluent outfalls of industries, etc.
9.	Map Showing Contours for Town
10.	Map Showing Existing Sewer Network for Town
	Proposed Drawings
11.	Key Plan of Proposed Scheme integrated with existing system along with Gls and ILs at critical points, drains, their points of outfall, proposed SPS, STPs (Capacity in MLD)
12.	L-sections of sewers to show GLs/ ILs/ dia / length / type of sewers, profile of ground and sewers.
13.	Plan and section for the outflow channel up to its merger with the river including outfall structure. All plans may invariably show the NSLs and HFL duly certified from the line deptts viz., CWC/State Irrigation/ Water Resources deptts.
14.	Location Map of Interception & Diversion of drain
15.	Map Showing Proposed Drains Interception and Diversion (I & D) Works
16.	Map Showing Proposed Fencing Stretches on various Drains (if considered)
17.	Location Map of SPSs/STPs as per actual site layout (showing lat/long, important landmarks and site surroundings).
18.	General Arrangement Drawing for Sewage Pumping Station

Sl.No.	Drawing Title
19.	Layout Plan of Proposed/Existing STP with unit sizing, specific modification requirement (if any), Road, Guardroom, Staff quarter, Solar Panel, Plantation etc.
20.	Hydraulic Flow Diagram for Proposed/Existing STP.
21.	Plan and Profile of Treated Effluent Reuse Pipe Line
22.	Typical Details of Manhole (Various Sizes)
23.	Typical House Connecting Chamber
24.	Typical Sewer Bedding Details
25.	Typical Boundary Wall
26.	Typical Single line Diagram for STP integrated with Solar Power (Electrical)
27.	Typical Single Line Diagram for SPS and MPS. (Electrical)
28.	Typical Process and Instrumentation Diagram integrating with SCADA system
29.	Typical cross-sectional drawing of drains (Existing & Proposed)
30.	Excavation plans and sections utilized for cost estimates towards excavation works.

Note: All drawings shall be in appropriate scale to ensure the legibility and easy handling of drawings.

a. A design memorandum providing the design calculations, assumptions and specifications adopted to be provided in the report.
b. Details of water hammer pressure in form of calculation sheet indicating that the pressurized pipe system pipe system viz. rising main is safe against water hammer needs to be provided.

3.20 DEDICATED ELECTRICITY FEEDERS AND GENERATORS

3.20.1 Sewage pumping and treatment need uninterrupted electricity supply. Therefore, average duration of supply of electricity should be ascertained so that the number of hours during which the Diesel generation (DG) sets will need to be operated can be known. Diesel generation sets will need to be provided to ensure constant running of the same. However, provision of dedicated electricity feeders for SPSs and STPs is also essential to meet programme objectives. DPR should contain details of such feeders like the length of the cable from the source of power, specifications of transformers, and estimated cost. However, capacity is to be determined on the basis of requirement.

3.20.2 Hrs. of availability of power at the sites of existing and proposed works in the project area should be given.

3.21 OBJECTIVES, PERFORMANCE PARAMETERS AND RISK FACTORS

The objectives and outcome of the project, in terms of abatement of pollution of the river and improvement of water quality and of environment improvement, should be clearly spelt. There should be performance parameters of the system as a whole and of each component so that the effectiveness can be monitored and evaluated.

3.22 PERFORMANCE PARAMETERS

There should be performance parameters of each project component and the system as a whole so that the effectiveness can be monitored and evaluated. Sub-system alternatives for

major components such as sewage should include the alternatives of centralised systems and decentralised systems.

Since the systems consisting of sewers involving pumping stations, and STPs are complex and are energy and capital intensive, the guidelines may be followed for designing the components of the system.

3.23 COST ESTIMATES

Based on survey and investigation, data collection and design criteria, detailed estimates may be prepared, and abstract of cost may be presented as per Table 13.1.

3.24 STRUCTURE OF DPRs

Suggestive structure of DPRs is placed at Annexure IV.

3.25 FLOW CHART OF ACTIVITIES FOR PREPARATION OF DPRS

A flow Chart showing different broad activities for preparation of DPRs is shown in Fig 9.

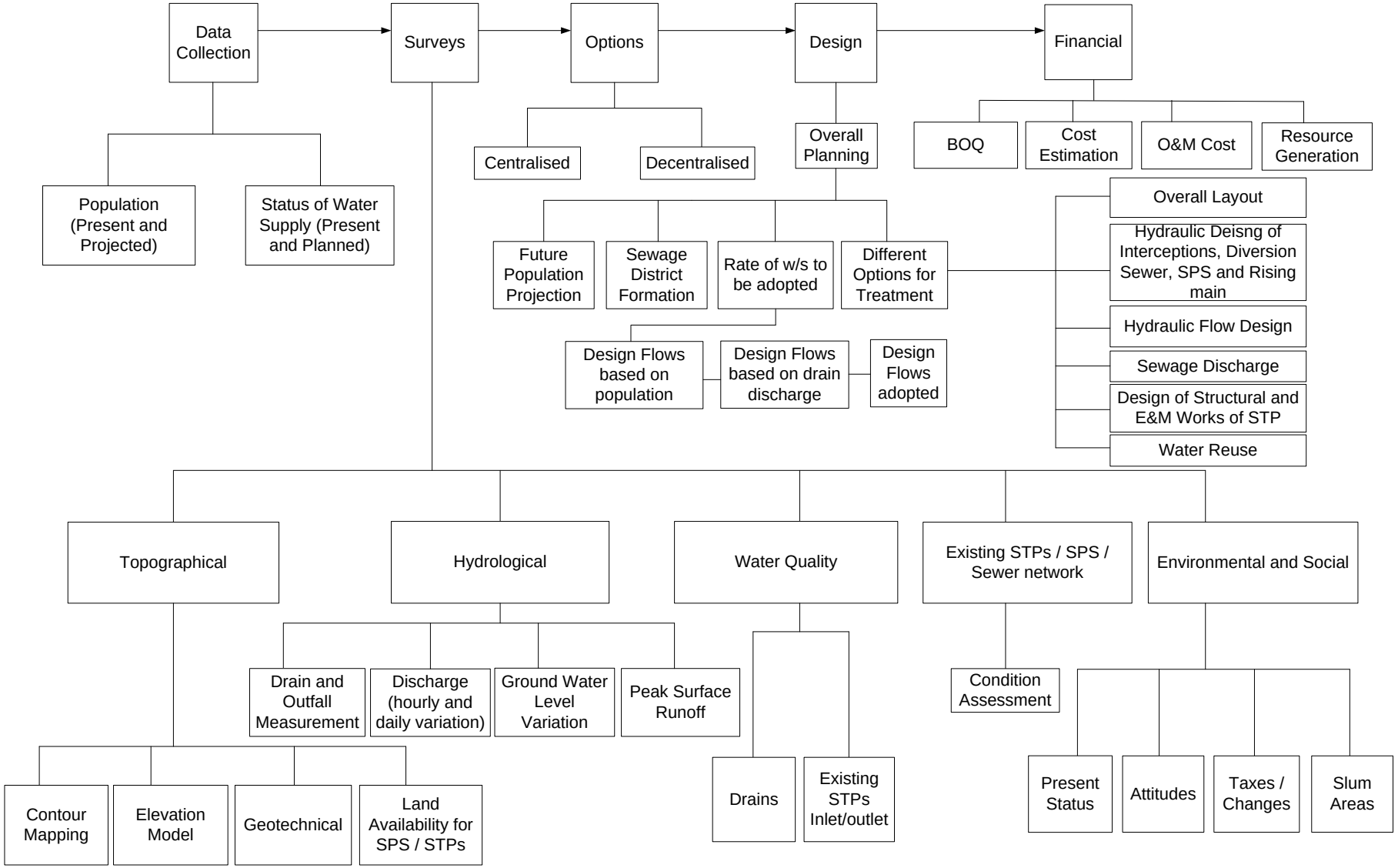


Fig. 9: Flow chart of Activities for Preparation of DPR

CHAPTER 4: OPERATION AND MAINTENANCE

4.1 CRITICALITY OF O&M

Operation and maintenance of assets has emerged as a major concern in the success of this programme. NGRBA has now decided that funds for O&M for a period of 15 years initially, would be funded by the center. The O & M responsibility beyond the 15th year will rest with the State Government/ ULB.

Tripartite MoA amongst MoEF, State Government and the local body is also to be signed. State governments are expected to take all necessary measures available at their control to address this problem in a sustainable manner.

A centralized and computerized monitoring of performance of the system is also required to be established by state for all STPs to monitor the performance and take necessary remedial actions as required. Directions have been issued by CPCB vide notification dated Mar 02, 2015 for online monitoring of influent and effluents of highly polluting industries, CETPs etc. Copy of notification dated Mar 02, 2015 may be seen as Annexure V. Accordingly, devices may be installed on STPs dealing with domestic waste also for their proper monitoring of the performance and taking timely remedial measures when necessary.

It is necessary to accurately work out O&M cost. The records of O&M of assets created under GAP/NRCP may be examined carefully and updated to the current levels as well as the periods when new facilities would be ready for operation. Cost of electricity is the major component of O&M accounting singly for 65-70%. These as well as other components like manpower, consumables, etc. should be calculated on a realistic basis to arrive at the total annual cost to operate an asset. Continuous availability of electricity for both STPs and PSs must be ensured on round the clock basis by the implementing agency.

Preventive maintenance or repairs needed after a few year's initial operations are often lost sight of. This is an important element of overall O&M cost and must be provided for appropriately.

The DPR must clearly reflect the component-wise and total funds needed for O&M and how and wherefrom these would be provided.

The O&M should be optimized by adopting tools like SCADA etc. and as per CPHEEO Sewerage Manual. Manpower required for maintenance need to be assessed considering optimization using SCADA and centralized automation.

Given the provision of 15 years O&M expenditure in the project cost, outsourcing of O&M for this period would seem to be obvious. The contractor must be asked to offer performance guarantees through proper O&M to achieve the outcomes. If O&M is outsourced, effort should also be made to build O&M capacity within the organization also. The contractor must also provide operation manual with answers to FAQs, identification to sensitive locations, risk involved and preventive measures with Dos and Don'ts properly listed

As part of capacity building programme, operation and maintenance manuals have to be made available to the ULB's staff by the DBO contractor.

4.2 RESOURCE RECOVERY AND REVENUE GENERATION

With little additional and dedicated efforts, sewage treatment could be converted into a resource generation activity to partly meet the O&M costs. Treated sewage and sludge are both rich in nutrients and, therefore, can be suitably marketed as biological manure. With the increasing health consciousness, people prefer to eat food grown with such manure. It is, therefore, necessary to exploit this potential to the extent possible as a source of revenue generation.

Biogas rich in methane is available from ASP based plants and much more from anaerobic treatment of sludge and also from anaerobic treatment process like UASB. It is necessary to fully exploit the potential of biogas through cogeneration of power. A well-designed treatment system may produce electricity from biogas to meet the entire in-house requirement. Anaerobic process like UASB, which is energy effective, may even produce extra power to supply to the grid after meeting the in-house requirement.

Additionally, a cogeneration project can be converted into a CDM (Clean Development Mechanism-of Kyoto Protocol) activity, which would provide additional revenue through generation and sale of CER (Certified Emission Reduction) certificates. Given the global warming potential of methane as 21 times that of CO_2, a well-designed CDM project could help generate considerable revenue through the sale of CERs.

Given the fact that electricity alone accounts for nearly 65% to 70% of the O&M cost, a cogeneration project with CDM benefits could help in offsetting the expenditure on this account to a large extent. Therefore, STPs proposed on treatment processes like ASP, UASB etc. may include the cogeneration component depending upon economic viability. The project team must study well operating plants in the country in this regard. In this connection reference is invited to the Ministry of New and renewable Energy, GoI publication. “Guidebook – Power from Biogas as Sewerage treatment Plants” available on their website.

It is necessary for the local bodies to enlarge the property tax base and utilize the additional revenue so generated to meet the O&M cost. There could be several other innovative ways for local bodies to raise revenue towards O&M costs e.g. taxes from pilgrim/tourist/floating population visiting the city, undertaking plantation on municipal lands and generating revenue there from etc. The underlying need is to explore all avenues to raise matching resources for O&M to achieve sustainability.

- Net O&M cost to be worked out after considering recovery of resources from treated sewage, bio gas, power generation, sewage sludge etc.
- Present tariff, annual revenue/ expenditure, revenue collection efficiency, sewer connection ratio be intimated.

4.3 COST ESTIMATES FOR O&M

The abstract of cost of annual O&M expenditure may be presented as per table 4.1. The estimates of costs of each component and the abstract shall form a part of DPR. If it is proposed to install the STP on a turnkey basis, the O&M may be made a part of the work of turnkey

contract of the STP. The O&M cost of each component shall be supported by its details. O&M cost shall be worked out for 15 years of commissioning of works

Table 4.1: Abstract of Annual O&M Cost

Rs. In Lakhs

Components	**Interception Works**	**Diversion / Interception sewers**	**SPS (s)**	**Rising Mains**	**STP(s)**	**Others (specify)**	**Total**
Manpower							
Power from grid and other sources as available							
Chemicals							
DG sets							
*Repairs and Maintenance							
On line Monitoring System							
Others (specify)							
Total Annual O&M Cost							
****O&M Cost during**							
1st year							
2nd year							
15th year							
Total O&M cost for 15 years							

*Average annual maintenance cost may be taken as 1% of the capital works.

**Annual O&M cost beyond 1st year to be worked out by compounding present cost with general price index / inflation which may be taken as 5% on Manpower and 2% on Chemicals. However, no escalation may be considered on Power.

CHAPTER 5: PUBLIC PARTICIPATION & PUBLIC AWARENESS ANDSTAKE HOLDERS CONSULTATION

5.1 INTRODUCTION

The programme is for the preservation of natural resources and these are necessary for the benefit and welfare of public. The benefits of involving public in the decision making process are immense. It greatly helps in increasing public understanding of pollution abatement and subsequently defusing conflicts on government action by generating support of beneficiaries. The river cannot be conserved without the cooperation of the public and also they must have a sense of ownership with the programme. With a small investment public awareness, public ownership and public participation can be generated and many complex problems can be resolved.

It is necessary to formulate an effective **public education, awareness and participation** programme as part of DPR so as to make them socially inclusive. The programme must take into consideration the following issues.

An expert agency with right kind of background and experience may be engaged to formulate public participation strategy. Two types of outcomes are expected from this activity. The first one is public participation and through it agreement on complex issues like house connections, water conservation at household levels, proper collection of garbage so that it does not choke sewers/drains, sharing increased burden of O&M cost, proper layout of sewerage systems and location of STPs, diffusing conflicts, if any, on programme components etc. This can be best achieved through consultation at various stages of project formulation and implementation. The second one is increasing public understanding about the programmes through awareness. This should be achieved through workshops, seminars, street plays, city runs and riverside walks. Active involvement of students and teacher's community in schools and colleges can greatly help in achieving the objectives. Public can also play the role of a watchdog in supervising project implementation and operation and maintenance which would help improve the quality of the programme.

Emphasis may be placed on increasing public participation for the projects/schemes supported by NMCG or Namami Gange. Apart from hiring expert agencies for this purpose, arrangements to involve active non-governmental organisations should also be made.

In the above background, a comprehensive programme giving details of the activities with timetable and cost involved should be prepared and presented in the DPR. This should be taken as a continuous activity right from the beginning of the programme and must continue in post commissioning stages also.

5.2 OBJECTIVE

The objective of public education, awareness and participation programme should be to ensure that

i. The communities are aware that -
    a. There is a need for the programme to intercept the drains that carry the wastewater of the town into Ganga and treat it before it is finally discharged and that they will derive multiple benefits from it. The benefits need to be specified.

b. Though there will be recoveries in the form of compost and nutrient rich water and electricity, still there would be additional costs in O&M and these costs may have to be borne by them,

ii. The communities are effectively involved in all stages of the project cycle from conceptualisation, to preparation, to finalisation, to implementation and finally O & M. Such involvement will generate a sense of ownership of the programme among the stakeholders.

iii. To keep the stakeholders and citizens informed of the progress of the project at all stages, a website with updated information about important features of the project may be created and arrangement made to send replies to project related queries.

5.3 PUBLIC AWARENESS AND PUBLIC PARTICIPATION AS FRONT ENDACTIVITY

Public Awareness & Public Participation should be a front-end activity of the project. The entire programme of conservation should be conceived, formulated, implemented, monitored and evaluated in close consultation with the stake holding communities following the approach of 'Participatory Appraisal'.

The agency that will plan, implement and coordinate the awareness campaign should be identified. With a view to focus on issues relating to protection and improvement and cleaning of rivers, a massive program of environment education and awareness is imperative. Centre and states may launch this campaign through a program of volunteers called **GREEN VOLUNTEERS.**

5.4 TARGET GROUPS

i. Local influential/Community leaders,
ii. Local NGOs,
iii. School teachers and students,
iv. Elite groups and organisations like Rotary Club, Lions club, Associations and forums of writers and artists, doctors, lawyers and other professional bodies etc.,
v. Religious leaders and priests,
vi. Representatives of industry and commerce,
vii. Leaders of trade unions and organisations like safai karamchari sanghs,
viii. Leaders of teachers and students associations,
ix. Representatives of political parties including the elected office bearers and members of local bodies,
x. Members of legislative assemblies, legislative councils and parliament representative of local constituencies,
xi. Representatives of media viz. editors/correspondents of local press and key functionaries of local radio and TV stations,
xii. Grass root level functionaries of Municipalities and state government departments like public health, forestry, Jal Nigam, PWD, etc.,

5.5 ACTION POINTS FOR COMMUNITY AWARENESS

i. Action be taken to get the Urban Local Body (ULB) to discuss the issue of river pollution – causes and effect and the need to take conservation measures.

ii. Request the ULB to set up a Committee on Awareness Generation and Public Participation for the entire city. Members of the Lok Sabha and the Vidhan Sabha may be co-opted as special invitees. In turn, the Committee should invite civil society

organisations in the city that are active to participate in the Awareness Generation and Public Participation Programme.

iii. With the involvement and help of the ULB, or otherwise, for each ward identify an active NGO or promote a group of interested and committed people to be involved in Ganga Pollution Abatement Project.

iv. The agency preparing the Pollution Abatement Project should prepare a plan of awareness generation and public participation and submit it to the Committee on Awareness Generation and Public Participation for approval. The plan could consider including the following activities, among others:-

a) Print and electronic media including the local news papers should be invited and supported in covering the issue of pollution of rivers.
b) A website may be created to provide facts about the state of sanitation, in particular, the degradation of the river. It should be regularly updated.
c) Holding locality wise meetings and group discussions with influential people, whereby the extent of river pollution, the related physical and human factors, the consequent health hazards and the possible remedial measures are highlighted through talks and technical presentations by the experts and social workers (Action: Identified NGO of reputation).
d) Motivating influential group to play a leading role in promoting environmental sanitation and community health, particularly prevention of river pollution (Action: Identified NGO of reputation).
e) Motivating and advising local NGOs to participate in outlining execution and follow up efforts of community action plans for ensuring a clean and healthy community life in general and protection of river water quality in particular (Action: Identified NGO of reputation).
f) Promoting schools as models of clean living and healthy environments and training school teachers and students as motivators and informal change agents for involving families and communities in clean river programmes in general and maintenance of toilets/bathing ghats/crematoria in particular (Action: Identified NGO with excellent track record of having rendered specialised services in the area).
g) Motivating school management, administrative and teaching faculty to organize events and special programmes for checking river pollution and plantation of trees on river banks (Action: Identified NGO and functionaries of the Department of Forestry).
h) Motivate the local influential trade, business, professional, social service, religious associations/chambers/Clubs and individuals to participate in awareness generation programme.
i) Inform, educate and invite potential investors to associate themselves in activities such as solid and liquid waste management services through an effective strategy of public-private partnership. They can also sponsor plantations on river banks and adopting a certain planted area for protection and preservation.
j) Inform, educate, organise and motivate religious leaders and priests to participate actively in river pollution control through such efforts as educating the masses, checking the dumping of temple waste on the river bank and immersing half burnt or unburnt dead bodies into the river (Action: NGO of reputation).
k) Motivate the office bearers of trade unions and other professional organisations like teachers and students associated to win public support for their cause by rendering some fruitful service to the society. While doing so they may give

highest priority to community health promotional measures like river pollution control and conservation of the quality of river water (Action: NGO of reputation).

l) Motivate local MLAs and MPs and leaders of political parties to participate actively in the promotional efforts of community involvement for protecting river against the hazards of pollution-an effort, which shall pay them abundantly through the building of positive public opinions. They should also be motivated to form local level all party organisations/ forums to promote the measures of river pollution control. In addition, they should be motivated to take keen interest in the proper utilisation of the funds provided for river pollution. In addition, they should be persuaded to play effective liaison between the government and the people to ensure the timely completion of different programmes and activities undertaken by the Directorate of National River Conservation Programme (Action: NGO having a sound background of linkages with the legislative and political leaders).

m) Motivate leading persons representing local press and electronic media. They need to be encouraged to be conscious of their social commitment and social obligations. They should also be convinced that socially conscious media shall always be aptly recognised and enormously rewarded through the creation of a sound base of enlightened clientele group which in the long run will help them through the image building process. Accordingly, the editors and correspondents of local press, the officers and key functionaries of the programme of river pollution control measures through the active involvement of the people need to be associated with creation of public awareness and participation. (Action: NGOs of repute having a sound organisation infrastructure of public relations unit).

n) Awaken, educate and encourage the grassroot level functionaries belonging to Urban local bodies, offices and agencies dealing with public health, sewerage, forestry, water supply, public works, electricity, industry, tourism etc. to take special interest in the activities which are directly related to the aspect of river pollution control. They should be particularly motivated to be more conscious of their commitment and obligation to ensure the purity of river water so that the future of the present and coming generations of the society and so also the members of their own community is safe-guarded against health hazards. (Action: NGO having the background of specialised contribution to the area concerned).

o) Organise campaigns to encourage the use of community toilets and discourage open defecation, especially on open land near river banks.

p) In areas where there are sewers, encourage people to connect their houses to the sewer.

q) Organise, for different sections, events such as essay, debates, posters, slogan, painting, script etc.

r) Send information sought by the stake holders about the project during different phases beginning with preparation of the project to its implementation, commissioning, operation and management.

5.6 IMPORTANT STAGES OF STAKEHOLDER CONSULTATION AWARENESS GENERATION AND SECURING PUBLIC PARTICIPATION

i. Preparation of DPR
ii. Submission of the project to the State Government
iii. Stage of sanction by the NRCD
iv. During implementation

v. Any stage when obstacle if faced, say in identification of land needed for works.
vi. Implementation of DPR
vii. Commissioning and evaluation

5.7 COST ESTIMATE

A provision of 2%-3% of the project cost may be made for generation of public awareness and securing public participation. Various items of cost for which provision should be made are illustrated in the table 5.1.

Table 5.1: Cost Estimate for Public Awareness and Public Participation

S. No.	Item	Basis of Calculation (Amount in Lakhs of Rs.)	Total Amount Rs. In Lakhs
A	**Mass Media**		
1 (a)	Television (films and promotional for TV Advertisement) (Professional grade digital recording)		
(b)	Advertisement of local Cable Network		
2 (a)	Radio talks (preparation and subject expert charges)		
(b)	Advertisement in Local F.M.		
3	Print Media publicity in local papers, magazines etc. Advertisement in the tourist guide books etc., Special features and commissioned articles		
4	Print material for Distribution including publicity on match boxes, stationary, stickers, etc.		
5	Hoarding at strategic points in the city and on buses, rickshaws etc.		
6	Website Development with hosting and updation for three years		
B.	**Events**		
7	Sponsoring / Organising Events like Puja, Local Festivals etc.		
8	Preparation of Exhibition Material, Posters and Organising these events- river festival and run for the river events		
9	Special Cultural Events, Performances of Folk Media: (Folk theatre, Folk Music, Folk Stories) Street Plays **(performances specially for slum localities)**		
C.	**Groups and Meetings**		
10	Environmental Awareness at Schools Level (Talks, Essay, painting competitions, debates, other activities 5 per ward per year for 3 years		
11	Formation of Action Groups, Self help groups and support to social groups/clubs for awareness generation activities		
12	Other Awareness activities like public meetings, public debates, Meetings with different Unions, felicitation of best workers etc.		
	Total for Public Awareness and Public Participation Activities		

S. No.	Item	Basis of Calculation (Amount in Lakhs of Rs.)	Total Amount Rs. In Lakhs
	Grand Total		

CHAPTER 6: TRAINING, HRD AND CAPACITY BUILDING

6.1 PHASES OF POLLUTION ABATEMENT PROJECT

A project passes through the following phases:

1. Project preparation
2. Project implementation,
3. Operation and maintenance
4. Monitoring and evaluation
5. Management of the completed project

6.2 DOMAINS OF KNOWLEDGE INVOLVED

1. Scientific and technical – water quality, aquatic biology, civil engineering, electrical engineering, mechanical engineering, remote sensing and GIS
2. Social sciences– stakeholders analysis; social survey,
3. Communication science: awareness generation and public participation
4. Financial & economic: financial evaluation of projects, raising of financial resources
5. Institutional: institutional effectiveness in performing its functions
6. Administrative: administrative aspects
7. Legal and regulatory: developing suitable laws and regulations for effective functioning of the ULB

6.3 HUMAN RESOURCE REQUIRED

Successful project preparation, implementation and management need the manpower with diverse expertise in the above domains of knowledge with relevant experience in similar works. Skill acquisition is achieved through education, training and experience.

6.4 EDUCATION NEEDS

The table 6.1 the required educational attainments of manpower.

Table 6.1: Educational Requirement of Staff Required for Pollution Abatement projects

Stage of Project	Requirement of Manpower			
	Highly educated Master's Degree	Degree Level	Diploma Level	Certificate Level
Problem Identification	√	√		
Conceptualization	√	√		
Project Planning	√	√		
Project Preparation	√	√	√	
Project Implementation		√	√	√
O&M		√	√	√
Monitoring, creating data base and its analysis for corrective action	√	√	√	

Stage of Project	Requirement of Manpower			
	Highly educated Master's Degree	Degree Level	Diploma Level	Certificate Level
Evaluation	√	√		
Management - regulatory	√	√		

6.5 TRAINING NEEDS

Training needs of skilled manpower are met through short term training programmes of duration of a few days, weeks and months. But training can be imparted only if the trainee has the necessary educational attainment. Regarding a project that is under execution, after it has been commissioned, it is necessary that staff with proper training and experience is in place for O&M of assets. The responsibility of operation and maintenance of STPs and main pumping stations should rest with the contractor who supplied the plant, for 10years after commissioning of the project. It should be ensured that the contractors/suppliers of equipments deploy properly trained and experienced staff for this work. Even if contractors and suppliers are bound by the contract to operate and maintain the equipment they supplied or erected, they should be required to

i. Impart training to the identified personnel of the agency that owns the project and has the responsibility for its proper functioning.
ii. Provide operating manuals of the equipment installed.

6.6 EXPERIENCE NEEDS

These needs are met by the personnel working on real assignments. Those in charge of personnel management need to ensure that the needed experience is available to them within the organization.

6.7 FULFILLING MANPOWER NEEDS –MANPOWER DEVELOPMENT PLAN

The State Government, in the light of the state of degradation of their water resources, in particular of their rivers, should prepare a plan of capacity building and manpower development, in addition to their normal plan for capacity building, for deployment in the 118 towns where the I&D and STP projects are to be taken up.

An assessment of the personnel needed for various functions, their training needs and availability of persons who can be trained should be prepared. Academic disciplines in which personnel with postgraduate degree, undergraduate degree, diploma and certificate are needed and the numbers in each need to be identified. The personnel that would, after education and training constitute, a pool of human resource that is equipped to handle the items of work, mentioned in these guidelines including O&M should be identified. They should be sent to undergo suitable educational programmes and training programmes. . The O&M personnel are mandated to acquire the certification of Waste water treatment plant technicians and Helpers by Skill Council for Green Jobs (SKGJ), M/o Skill Development & Entrepreneurship, GOI. Two National Occupational Standards SGJ/Q6601 and SGJ/Q6602 have been developed by SCGJ for waste water treatment plant technicians and helpers respectively.

A list of institutions of higher education with the academic disciplines where the personnel can be sent for education should be prepared.

Training need identification is a continuous process and in the identified subject areas training institutions can be requested to develop training programmes.

It is the responsibility of those in charge of human resource development in the States – in the government and local bodies – to ensure that they have the necessary manpower resources with needed educational attainments, training and experience for undertaking the work arising out of the programme of pollution abatement of rivers.

Standing arrangement with institutions engaged in education and training can help the States to ensure that they are not short of the needed manpower.

In case of shortage of manpower in specific disciplines, suitable persons can be obtained on loan or on contract or the work can be assigned to an agency that has the capability to deliver.

6.8 CAPACITY BUILDING

Capacity is a function of two aspects, namely human resource and physical and financial resources. Human resource has been dealt with above. Physical resources imply equipping the staff deployed for this work with necessary financial resources and physical resources such as space, laboratory, tools etc. The DPR should incorporate the requirement of these resources for proper operation and maintenance and management of the project.

6.9 COST ESTIMATES

Various activities involved in HRD and capacity building are mentioned in the table 6.2.

Table 6.2: Cost Estimate of HRD and capacity building

S. No.	Items	Cost (Rs. Lakhs)
1.	Project Implementation Secretariat	
1.1	Office building, equipment and infrastructure for project Implementation Secretariat and design cell	
1.2	Hiring of professional for design, management, technology, monitoring	
1.3	Establishment expenses during the project implementation, audits, inspection including Staff salary	
2	Motivational Training, study tour and Skill development for supervisors, safaikaramchari, sanitary inspectors, officers, design cell etc	
3	Monitoring Stations at different locations of air and water quality in the city, STPs, rivers, bathing ponds	
4	EIA assessment of works and evaluation after commissioning of the project	
	Total	

CHAPTER 7: PROJECT IMPLEMENTATION MECHANISM

The State Nodal Department and the state PMG must explore the possibility of promoting joint ventures in Public Private Partnership (PPP), departmental implementation of projects, existing state/central governmental undertakings or setting up a special purpose vehicle to implement these projects.

The State Government may employ a number of project executing agencies for different types of projects. For the preparation of DPR reputed professional consultants may be engaged by the State Government.

CHAPTER 8: PROJECT MANAGEMENT & INSTITUTIONAL ISSUES

The institutional arrangement for the implementation of this programme at the Central and State levels is visualized as below.

8.1 NATIONAL MISSION FOR CLEAN GANGA (NMCG)

It has been established as a registered society that is responsible for effective implementation of the overall NGRBA program at the national level with well-defined functions, powers, resources and autonomy. It has (i) formal devolution of powers to ensure appropriate level of operational autonomy; (ii) single-point responsibility for planning and execution of the NGRBA program; (iii) powers to manage its human resources, with the objective of attracting and retaining well-qualified staff; and (iv) institutional sustainability as the permanent entity responsible for the conservation and health of the river Ganga in the long term. The Program Management Group (PMG) is headed by the Director General.

8.1.1 State Program Management Group (SPMG)

Each state has a State (SGRCA) Program Management Group (SPMG) as a registered society, to ensure effective implementation at state level with the exception of Jharkhand, which has a dedicated cell within the UD Department, as a very small stretch of the Ganga main stem passes through the state.

The SPMGs are the respective state level counterparts of the PMG and have state level responsibilities for management and implementation of the NGRBA Program in accordance with the agreed NGRBA program framework. They are also responsible for capacity building of Executing Agencies (EAs); managing state level IEC campaigns, stakeholder consultations and community participation; and other state level activities in the Institutional Development Component (Component One) of the project;

The SPMG is headed by a Project Director and includes specialists in basin planning, wastewater engineering and management, ecology, environment and social management, finance & economics, operations, procurement, knowledge management, IT, communications, human resources management, and monitoring and evaluation.

8.1.2 Executing Agencies

Execution of the infrastructure investments is done by the Executing Agencies (EAs), selected for each investment. The choice of EAs includes the existing state-level technical agencies, which have the mandate of urban infrastructure (especially wastewater) management in their respective states.

8.1.3 Program Management Consultancy

This consultant is to provide program management support to PMG, including planning, technical support for investments review and appraisals, portfolio management, procurement, financial, management, monitoring and evaluation, and reporting

8.1.4 Technical Support Consultancy

This consultant is to provide technical support to SPMGs and EAs, for upgrading the process and practice of preparation of schemes of investments and their execution to global standards.

8.1.5 Other Partner Agencies

The PMG and SPMGs are to collaborate with and seek support from and partnership with a range of other agencies, to draw upon their specialized expertise and supplement the capacity of main implementing agencies. These will include international, national and local knowledge institutions, private sector business houses and industries, and civil society groups.

8.1.6 Tiered Implementation Structure

Thus the programme implementation at various levels is envisaged as follows: (a) National Level: PMG, (b) State level: SPMG, and (c) Activity level: Executing Agencies (EAs) selected for specific activities with local coordination for planning and implementation provided by Urban Local Bodies (ULBs) where needed.

8.1.7 Programme Framework

NGRBA has prepared a Programme Framework containing provisions in detail that will govern this programme. These include

- Implementation Arrangement
- Detailed Investment Framework
- Financial Management Manual
- Environmental and Social Management Framework
- Communications and Public Outreach Framework
- Governance and Accountability Action Plan
- Memorandum of Agreement – Programme
- Memorandum of Agreement – Investment
- Procurement Manual

8.1.8 Preparation of DPR Component Scheme Wise and Integrated Summary

Works are sanctioned only on the basis of a DPR. Each component scheme will have a DPR. Therefore, a pollution abatement project in respect of a city may have as many DPRs as the number of component schemes so that it is convenient to submit it to the funding agency. However, there should be a consolidated summary of all DPRs that gives an overall view of the project, its components and costs.

DPR is very crucial and forms the foundation for the success of efforts to improve the water quality of rivers and to achieve the objectives of the NRCP. Every care should be taken to ensure that it is of high quality and, therefore, preparation of DPR deserves to be treated as a project in itself. A suggestive structure of DPR is given in Annexure IV.

8.1.9 Appointment of Team to Prepare DPR Departmentally

Every agency that is assigned a component scheme should appoint a team of competent staff to undertake different activities that are required to be performed at different stages of the

scheme. The project reports can either be prepared departmentally if there is in-house capacity or through a competent consultant.

8.1.10 Appointment of Consultants to Prepare DPR

If it is felt that circumstances are such that it will be difficult to departmentally undertake all the activities involved in the preparation of the DPR, an outside agency can be appointed to undertake identified activities or prepare the entire DPR. However, care has to be exercised in selecting the agency. For selecting the agency Expression of Interest (EOI) may be invited from agencies and then selecting agencies that have the manpower, financial and physical resources to prepare the DPR. Papers for submitting the EOI have to be prepared carefully so that it can be ensured that all the information needed to evaluate the capacity, competence and suitability of the agencies is provided by the interested parties. Technical and financial offers may then be invited from the selected parties.

8.1.11 ULB participation

The participation of the concerned Urban Local Body (Municipality / Municipal Corporation) in the project should be ensured by getting their concurrence to the DPR and including MOM of the meetings with the ULB in the DPR. They should be encouraged to build technical capacity to undertake O&M the assets and to manage the system.

8.1.12 Responsibility for activities and schemes

Table 8.1 suggests the agencies that can be given responsibility for schemes

Table 8. 1: Planning and Implementing Agencies

Type of Schemes	Item of work	Planning and Implementing Agency
	Study of River and its basin	State Project management Group (SPMG) or Pollution Abatement Cell (Jharkhand)
	Selection of cities	SPMG with the approval of Central PMG
Sewerage Schemes	Sewerage Works & STPs	Institutions like Jal Nigam, Sewage Boards, PHEDs etc where they exist. In other places, the State Level Agency will decide who should do the work.
Non Sewerage Schemes	Solid Waste	ULB
	CSS / CTC	ULB
	Crematoria	ULB
	Carcass disposal	ULB
	Cattle Wallowing	ULB
	Dairies	ULB
	Dhobi ghats	ULB
	Motor Garages	ULB

Type of Schemes	Item of work	Planning and Implementing Agency
	River Front Development	Water Resources / Irrigation Department
Plantation	Plantation	Respective Implementing Agencies in whose schemes plantation is to be done

8.2 MONITORING, SUPERVISION, GUIDANCE AND QUALITY CONTROL

Whether the DPR is prepared departmentally or by a Consultant, it is necessary for the implementing agency to arrange regular monitoring, supervision of activities involved in preparation of the DPR and provide guidance from time to time and exercise quality control. This should be done by the State PMG's own staff or, if there is shortage of suitable expertise, help of suitable consultants can be taken.

8.3 IMPLEMENTATION OF DPR – EXECUTION OF WORKS PROPOSED IN THE DPR

8.3.1 Mode of Implementation:

For implementing the works in the DPR, there are a number of options available as described below:

i. Departmental supervision,
ii. Project management agency
iii. Combination of above

8.4 INSTITUTIONAL ISSUES IN MANAGEMENT

8.4.1 Activities

In conservation and management there are a number of institutions dealing with activities including:

i. Policy, strategy and programme formulation and their implementation
ii. Supply of services
iii. Development,
iv. Management,
v. Regulation and enforcement,
vi. Coordination with national, state and local organizations.

8.4.2 Overlap in roles of institutions:

The role of three bodies is very crucial. These are:

i. Municipality which is responsible for sanitation in the city,
ii. City Development Authority which regulates the new colonies.
iii. State Pollution Control Board, which is responsible for ensuring compliance by industry and other institutions of the standards, prescribed under the Environmental Protection Act for effluent, solid waste and air emissions.
iv. State Agencies - performing functions of municipal bodies relating to water and waste water.
v. District administration.

Many times there is an overlap in roles of several bodies with the result that the efficiency with which the function should be performed suffers. The State PMG should identify such areas of overlap and move the state Government to resolve such overlaps. The role of each institution involved needs to be very clearly specified.

In the chapter on collection of secondary data it has been mentioned which data should be collected so that the strengths and weaknesses of the ULB and other institutions working in the city are reflected. This needs to be analysed to identify the areas where remedial measures are needed.

The SPMG should solve any issues that may arise.

8.5 COST ESTIMATE OF PROJECT MANAGEMENT AND INSTITUTIONAL ARRANGEMENTS

The SPMG, which is the state implementing agency, may need financial support. Illustrative items for which funds may be required are mentioned in table 8.2 and table 8.3.

Table 8.2: Cost Estimate of Project Management and Institutional arrangements - State Level Implementing Agency

S. No.	Items	Cost (Rs. in Lakhs)
1.1	Infrastructure and equipment such as computers, CAD	
1.2	Hiring of professional	
1.3	Establishment expenses	
1.4	Project related expenses	
1.5	Miscellaneous items	
	Total	

Table 8.3: Cost Estimate of Project Management and Institutional Arrangements District/City Level Unit

S. No.	Items	Cost (Rs. in Lakhs)
2.1	Infrastructure and equipment such as computers, CAD	
2.2	Hiring of services	
2.3	Establishment expenses	
2.4	Data collection	
2.5	Survey & investigation	
2.6	Miscellaneous items	
	Total	

Project preparation and implementation cell for specific projects agency wise

An estimate of expenses required for each component on the above lines should be prepared.

CHAPTER 9: PERFORMANCE MONITORING

9.1 The programme aims at improving the water quality of river and sanitary conditions in the city. Benchmarks of water quality are already available for the designated best use. The success of the programme would be established if the benchmark water quality is achieved.

9.2 THIRD PARTY INSPECTION SYSTEM

A monitoring mechanism is to be put in place to monitor the performance of STPs and pumping stations and their impact on water quality of the river. A Third Party Inspection (TPI) system should be established for the project in each town. It will review and monitor the performance of the project through the entire life cycle of implementation on the basis of detailed onsite review, examination of appropriate documents and discussions with the EAs and other key stakeholders.

Engineering educational institutions available in the city or in the State or office of the State Pollution Control Board may be considered as appropriate agencies for this purpose.

9.3 MONITORING PERFORMANCE OF ASSETS AND OUTCOME OF THE PROJECT

A detailed plan of monitoring the performance of assets as well as the outcome of project, which is reflected in the river water quality, must be prepared covering, among other things, the name of the monitoring agency, parameters to be monitored and their frequencies and presented in the DPR. The NMCG will assign this work to reputed academic / R&D institutions and will bears the expenses. However, there is a need for a dedicated person to collect data from the monitoring institution, create data bases, study and analyse it to see if any corrective measure is required to be taken at the local level. Expenditure on this dedicated cell should be included in the cost estimates.

Directions have been issued by CPCB vide notification dated Mar 02, 2015 (Annexure V) for online monitoring of influent and effluents of highly polluting industries, CETPs etc. Such similar / suitable devices if installed on STPs dealing with municipal sewage as well would be helpful in proper interpretation of results and taking timely remedial measures on their performance.

CHAPTER 10: COMPLETION SCHEDULE

Completion schedule for every component scheme of the project should be prepared and should be watched by the executing agency. Generally completion schedules are prepared without considering the odds that would be faced during its implementation and hence most projects are delayed. Completion schedule should, therefore, be prepared on a realistic basis. It should be presented in the form of a PERT/CPM and Gantt chart for monitoring purposes.

Completion schedule should be accompanied by a quarterly physical and financial progress schedule. This should form the basis of monitoring of expenditure and obtaining grants from MoEF on a quarterly basis. Upon completion of the project, a completion report is submitted in a standard format. This format should be presented in the DPR and is given as Annexure –VI. Utilization certificates for the funds released by NMCG/MoWR, RD&GR shall be submitted in the formats given as Annexure VII.

CHAPTER 11: ENVIRONMENT IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PLAN

This chapter deals with the assessment of impact on Environment of l&D and STP schemes proposed and preparation of Impact Management Plan to minimize environmental impacts. For making such an assessment, baseline (pre-project) information about the components. that are expected to be affected either negatively or positively has to be gathered.

11.1 Components of Environment Affected

The baseline situation is that the drains carry sewage to the river thus adversely affecting its physical, chemical and biological parameters and adding, among other things, pathogens.

Thus drains carrying sewage potentially affects the environment. If the drains are intercepted and the water is treated in Sewage Treatment Plants to the desired standards before it is discharged into the river, the adverse impacts of these wastewaters on the river is eliminated and water becomes suitable for the uses corresponding to the water quality of the river achieved as a result of implementation of the project of I&D and Treatment of the sewage carried in the drains.

The following components are likely to be affected and the impact on them should be assessed:

i. Air
ii. Ground/ Surface water
iii. Soil

Methodology

The steps in studying environmental impacts of proposed project shall be:

- Phase-I Environmental Site Assessment of proposed project sites
- Alternative site assessment study
- Project feasibility study

From above studies, environmental issues of the related work can be known. The project feasibility report can come up with various kinds of pollution sources, nature and pathways of pollutants.

Data collection of secondary data OR baseline study for primary data can be carried out. Then environmental impact assessment on present baseline environment can be studied. The mitigation measures can be planned to minimize the impacts.

11.2 Impact Management Plan:

The I&D and STP projects have generally favourable impact on the components of social environment. If, however, some components are assessed to be adversely affected, a management plan must be prepared to keep the values of the component within acceptable limits. The following steps to be considered for impact management plan.

i. Baseline study of environmental parameters: Brief description of baseline environmental conditions (ambient air quality, surface and ground water quality, noise quality, ecological setting based on secondary data sources of recent origin of last 1-2 years or so). The baseline data for one week or so may be generated as site by appointing a NABL accredited laboratory

ii. Environmental impacts (a brief description) of the envisaged project on the present baseline environment during construction and operational period

iii. Environmental Management Plan (EMP) to be prepared to minimize the impacts and bring them to acceptable levels.

iv. EMP costs to be estimated for environment protection and safety principally during construction and operation period.

CHAPTER 12: GOVERNANCE AND ACCOUNTABILITY ACTION PLAN (GAAP)

The Governance and Accountability Action Plan (GAAP) is to minimize accountability risks to the NMCG Program. Specific arrangements shall be proposed to mitigate these risks and to ensure that funds are used effectively and efficiently. The main purpose of the GAAP is to ensure that the NMCG Program's objectives are achieved with avoidance of all kinds of internal/external risks. This GAAP summarizes the mitigation measures being taken as a part of program. The mitigation measures are grouped into three categories: (i) Implementation Arrangements; (ii) Transparency and Citizen Voice; and (iii) Grievance Redressal.

Following needs to be done for the GAAP:

i. **Disclosure and dissemination of information:** As per the Municipality Disclosure Act, RTI and NGRBA guidelines on stakeholders' consultation would be adhered for the purpose of information dissemination. The disclosure of information should be made on a regular basis to the public. This is to be carried out in close coordination with communication and public outreach activities.

ii. **Under RTI Act**, the disclosure applies to all public project related documents, including but not limited to project components and sub-components, cost estimates, procurement plans, details of tender notices, details of award of contracts and contract amounts, selection of consultants/contractors, and details of officials implementing the project.

iii. **Use of Social Audits**. Social Audit, a viable instrument of sustainable program delivery, is in fact People's Audit, which provides a succinct view of performance based on society's perceptions and analysis at large. Citizen's Monitoring Committee will perform Social Audit in a manner prescribed by the Government of India.

iv. **Adherence to the RTI Act.** In addition, in compliance with the requirements of the Right to Information (RTI) Act (2005), the project shall provide information voluntarily and on demand as prescribed by law. As per the RTI Act, the project will ensure proactive disclosure and sharing of information with key stakeholders, including with communities and beneficiaries.

v. **Grievance Redressal System:** The purpose of a robust and responsive grievance redressal system is to ensure that any query or complaint with regard to any aspect of project implementation and management is fairly heard and promptly addressed. The development of an integrated system will enable the integration of feedback from the public, effective handling of complaints, and immediate automatic updates on the status of response. A GR system will be established with Grievance Redressal Cells (GRCs), with necessary officers, officials and systems at the local EA level which will be integrated with other levels. Grievances may be submitted through various media, including in person, in written form to a noted address, through a toll free phone line or through direct calls to concerned officials, and online. All local contact information and options for complaint submission will be available on site on local information boards.

The estimated cost for the GAAP arrangements would be worked out to cover the following expenses during construction and O&M:

- On CMC's Social Audits, Information Cell

- Running the Grievance Redressal Cell

CHAPTER 13: COST ESTIMATES

Estimation of Cost of Some Items

Each of the following items has been treated as a component scheme of the project in the town. These items take care of the requirements of all the component schemes in the town.

i. Awareness generation and public participation
ii. Training, human resources development and capacity building
iii. Institutional development & strengthening
iv. Monitoring & evaluation

Based on survey and investigation, data collection and design criteria, detailed estimates may be prepared, as given in the respective chapter. The project cost may be provided in the format given in the table 13.1, under the following subheads for each scheme:

Table 13.1: Abstract of Cost of Works Proposed

(CW = Civil Works; EM = Electrical and Mechanical Works)

SN	Items	Quantities	Estimated Cost, Rs. lakh			Remarks
			CW	EM	Total	
1	2	3	4	5	6	7
A	**Items on which centage is admissible**					
1	**Interception of drains**					
2	**Diversion Sewers,**					
	Sewers by open trench method,					
	Sewers by trenchless method,					
	Sub Total Sewers,					
3	**Sewage Pumping Stations (SPS)**					
	MPS at -----					
	IPS at ----					
	Sub Total SPS					
4	**Rising Mains,**					
	From SPS at ----					
	From SPS at ----					
	Sub Total Rising Mains					
5	**STPs ,** including office building, lab & equipment, campus development, boundary wall, water supply, drainage, sewerage, internal & external electrification, SCADA and Online monitoring system etc.					
	----Mld, at -----					
	----Mld, at -----					
	Sub Total STPs					
6	Treated effluent disposal					
7	Reuse of treated effluent					

SN	Items	Quantities	Estimated Cost, Rs. lakh			Remarks
			CW	EM	Total	
8	Approach road and protection works, if any					
9	Special T&P					
10	Others (specify)					
	Sub Total (A) Basic Capital Cost					
B	**Centage**					
	Cost of project preparation @ 4% as per NGRBA guidelines (maximum)					
	Cost of project supervision @ 4% as per NGRBA guidelines (maximum)					
	Sub Total B					
C	**Items on which no centage is admissible**					
	O&M cost for 1st15 years					
	Power connection					
	Land acquisition					To be provided by State government
	Environmental Sanitation and Management Plan (ESAMP)					
	Communication & Public Outreach					
	Governance and Accountability Plan (GAPP)					
	Monitoring and Evaluation					
	Third Party Assurance and Quality Check					
	Cost of environmental clearances / permissions					
	Cost of annual fee for water and royalty on silt as applicable					
	Others (specify)					
	Sub Total C					
	Total Cost of project A+B+C					

On many occasions, land is to be acquired involving an elaborate procedure under the land acquisition act. Projects are often delayed on this account. Such situations must be avoided. As per the present policy, the cost of land for SPS/STP works is to be borne by the State Govt.

Cost estimates of other components should be based on the detailed bill of quantities, specifications of materials structures and rates as per the latest SORs. It is generally seen that latest and updated SORs are always not available for the city. This results in underestimation of cost involving revision in cost. It is necessary to note that NMCG does not entertain any revised cost estimate after the project is approved and revision in cost, if any, would have to be borne by the implementing agency only. Care should, therefore, be taken that estimates are prepared taking the following into consideration.

Non-schedule items should be estimated on the basis of the prevailing market cost and budgetary offers from 2 or 3 reputed firms. In case some sewers are proposed to be laid by trenchless technology, latest SOR approved by the respective state agency or Indian Society for Trenchless Technology may be adopted for working out estimates. Copies of quotations of Electro-Mechanical items should be provided in the DPR

Estimated cost of STP may also be worked out based on recently awarded cost of similar capacities of STPs (average cost of different STPs) based on conventional technologies in the concerned State. If the awarded cost is not available in the concerned State, the awarded cost in the neighbouring State may be adopted. Costs of STPs constructed elsewhere on latest effluent parameters should be given in support of estimated cost adopted in the DPR.

Contingencies are not permissible as a separate item and is covered under centage

The estimates should mention specifications of all proposed works and reference of SOR used for adopting the rates. All applicable cess / taxes / GST should be included in estimated costs of items.

It takes some time to complete the DPR and then submit it to NMCG through State Government and finally appraisal and approval of DPR in NMCG. Sometimes, when the project cost is high, the proposal may require approvals at higher levels in Government which is a time consuming process. Therefore, implementing agency should be able to foresee escalation, if any, in the cost on this account and should make appropriate provisions in the project cost accordingly.

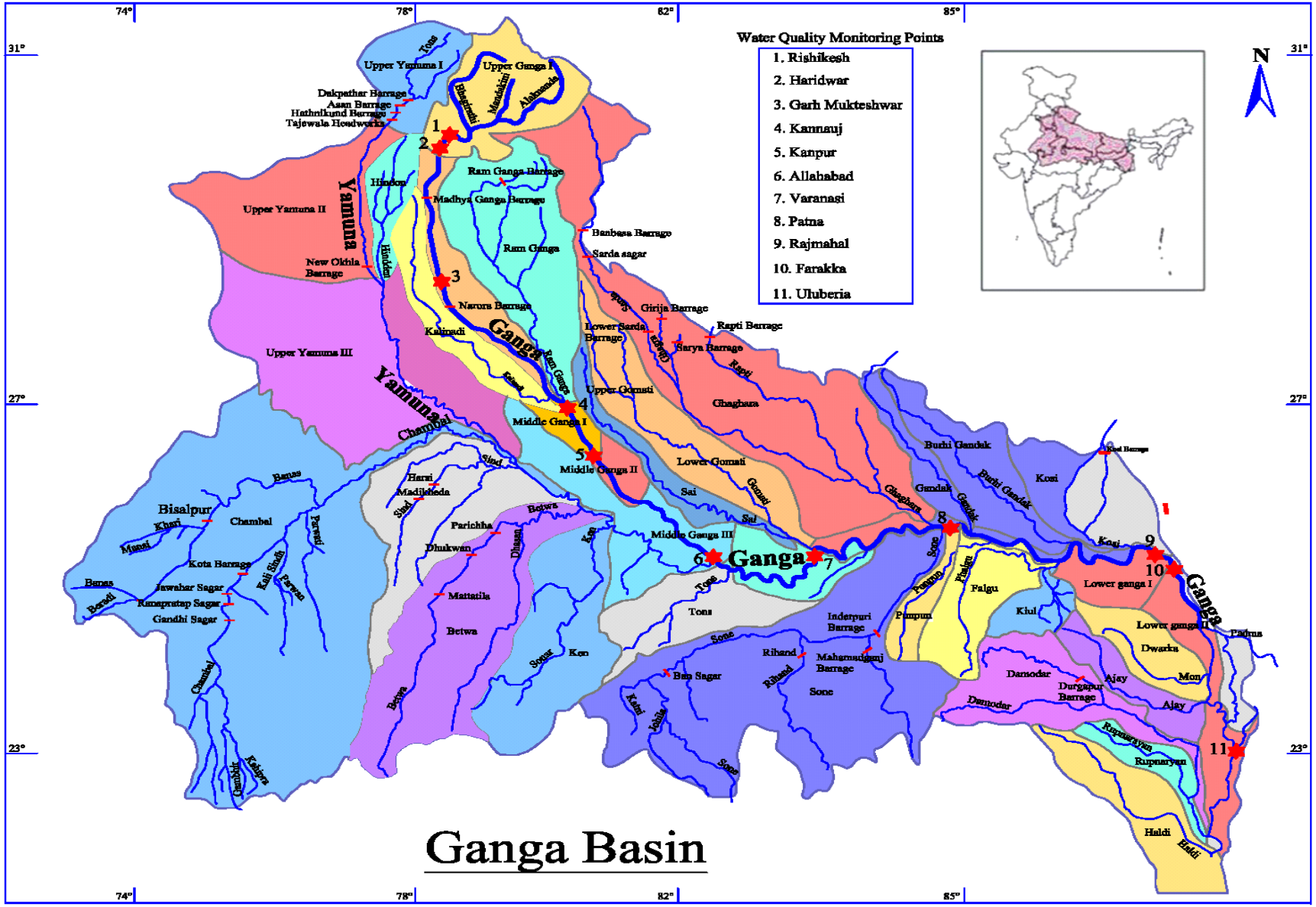
Bills of quantities and specifications must be presented in a separate volume.

For each major component, the estimated cost needs to be justified. For this purpose, it would be advisable to compare the cost estimate with that of a similar one approved earlier after necessary updating. This would help expediting approval in NMCG.

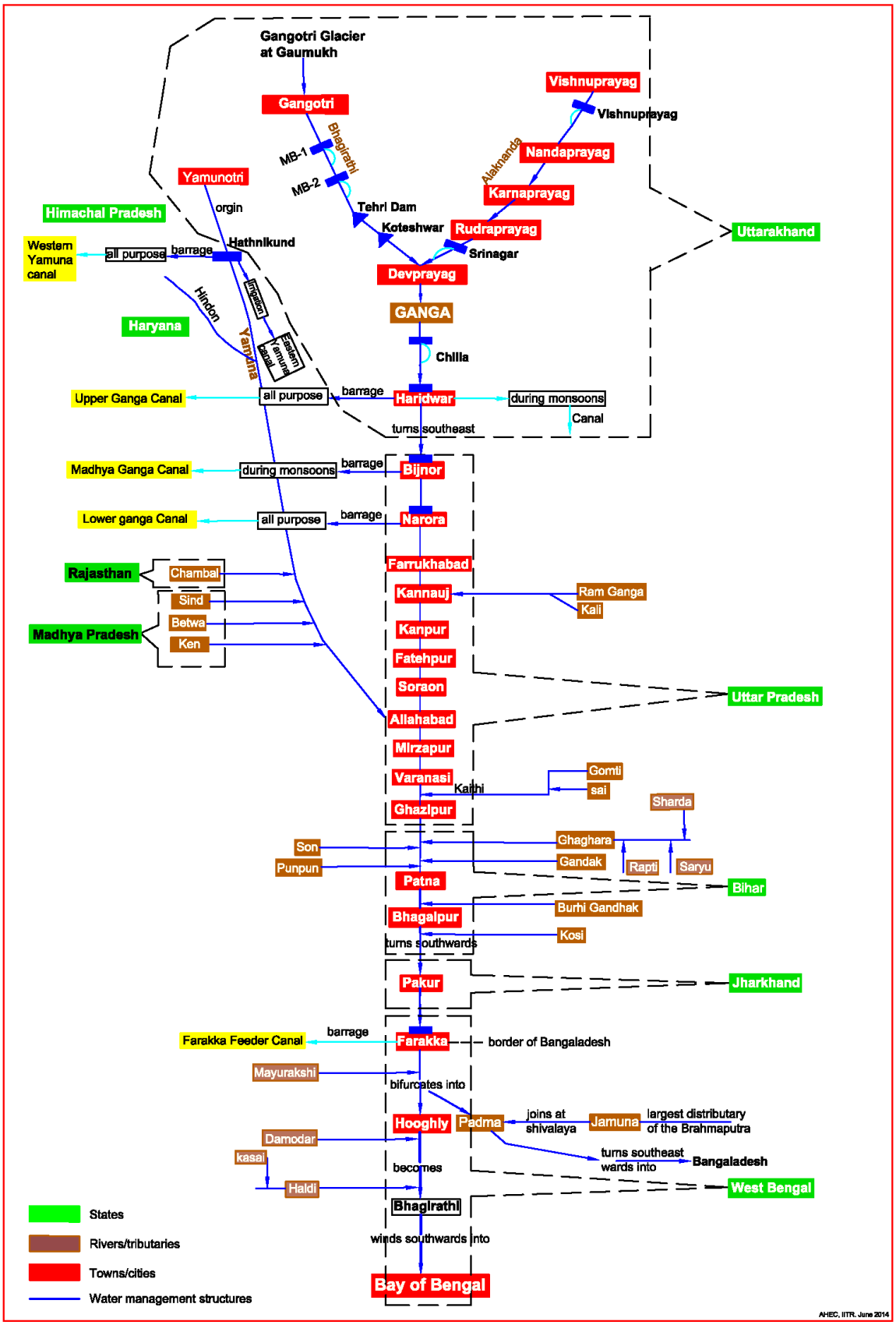
Necessary provision may be made in the estimate for Centage as approved by NMCG.

The DPR would also be used for preparation of Notice Inviting Tender (NIT) and tendering the project. It should, therefore, contain complete engineering drawings, longitudinal sections etc. of the proposal that would be needed for NIT as well as monitoring of project implementation.

Annexure – I: Map of the Ganga River Basin



Annexure – II: Line diagram of Ganga River



Annexure – III: Uniform Protocol on Water Quality Monitoring Order, 2005

MINISTRY OF ENVIRONMENT AND FORESTS

NOTIFICATION
New Delhi, the 17th June, 2005

S.O. 2151 – WHEREAS the Water Quality Assessment Authority (WQAA) was constituted by the Central Government vide Order No. S.O. 583 (E) dated the 29th May, 2001 and No. S.O. 635 (E) dated the 27th October, 2004 to exercise powers under section 5 of the Environment (Protection) Act, 1986 (29 of 1986) for issuing directions and for taking measures with respect to matters referred to in clauses (ix), (xi), (xii) and (xiii) of sub-section (2) of section 3 of the said Act and to standardize method(s) for water quality monitoring and to ensure quality of data generation for utilization thereof and certain other purposes;

AND WHEREAS it is necessary and expedient to evolve water quality assessment and monitoring protocol as directed by the Water Quality Assessment Authority in order to maintain uniformity in the procedure for water quality monitoring mechanism by all monitoring agencies, departments, Pollution Control Boards and such other agencies so that water related action plans may be drawn up on the basis of reliable data;

AND WHEREAS the uniform process on water quality monitoring shall provide frequency of monitoring, procedure for sampling, parameters for analysis, analytical techniques, quality assurance and quality control system, infrastructure requirement for laboratories, procedure for data processing, reporting and dissemination and such other matters as the Central Government deems necessary for the said purpose, both for surface and ground water;

AND WHEREAS due to the deterioration of the river water quality, health and livelihood of the downstream people are being severely affected and concerns are raised time and again;

AND WHEREAS the immediate maintenance and restoration of 'wholesomeness' of the river water quality is the mandate under the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974) and that of maintenance of the ground water quality by the Central Ground Water Authority constituted under the provisions of the Environment (Protection) Act, 1986;

AND WHEREAS sub-rule (4) of rule 5 of the Environment (Protection) Rules, 1986, provides that whenever it appears to the Central Government that it is in public interest to do so, it may dispense with the requirement of notice under clause(a) of sub-rule(3) of the said rule",

AND WHEREAS the Central Government is of the opinion that it is in public interest to dispense with the requirement of notice under clause (a) of sub-rule (3) of rule 5 of the said rules to issue the Order.

NOW, THEREFORE, in exercise of the powers conferred by section 3 of the Environment (Protection) Act, 1986, the Central Government hereby makes the following order, namely:-

1. Short title and commencement:-

a) This order may be called the Uniform Protocol on Water Quality Monitoring Order, 2005".
b) It shall come into force on the date of its publication in the Official Gazette.

2. Application:- It shall apply to all organizations, agencies and any other body monitoring surface and ground water quality for observance of uniform protocol on water quality monitoring.
3. Definitions:-

In this Order, unless the context otherwise requires –

I. "Agencies" means water quality monitoring agencies (government or non-government, local bodies) and other organizations including research and academic institutions involved in water quality monitoring of surface and ground waters;
II. "Authority" means the Water Quality Assessment Authority (WQAA) constituted under sub-sections (1) and (2) of section 3 of the Environment (Protection) Act, 1986;
III. "Baseline stations" means the monitoring location where there is no influence of human activities on water quality;
IV. "Flux stations or Impact stations" means the location for measuring the mass of particular pollutant on main river stem for measuring the extent of pollution due to human interference or geological feature at any point of time and is necessary for measuring impact of pollution control measures adopted;
V. "Monitoring" means standardized measurement of identified parameters in order to define status and trends of water quality;
VI. "Protocol" means a system of uniform water quality monitoring mechanism developed by the Water Quality Assessment Authority constituted under sub-sections (1) and (3) of section 3 of the Environment (Protection) Act, 1986;
VII. "Quality Assurance Programme" means a programme described in paragraph 12 of this Order.
VIII. "Trend station" means the monitoring location designed to show how a particular point on a watercourse varies over time due, normally, to the influence of man's activities.
IX. "Water quality monitoring network" means a systematic planning for collection, preservation and transportation, storage, analysis of water samples and dissemination of data for national water bodies restricted to surface and ground water in the country.

4. Monitoring station and frequency of sampling:-

1) The frequency of sampling in respect of surface water shall be as follows:-
a) all the stations shall be a combination of Baseline, Trend and Flux or Impact stations
b) the Baseline stations shall be monitored four times a year for perennial rivers and lakes and three to four times a year for seasonal rivers. Trend stations shall be monitored with an increased frequency of once in a month i.e. twelve times in a year. Flux or Impact stations shall be monitored twelve or twenty-four times in a year depending upon pollution potential or importance of water use.
c) all agencies shall follow the sampling frequency and parameters for analysis of surface water as mentioned in the Table – I given below:

Table – I Frequencies and parameters for analysis of surface water samples

1	2	3
Type of Station	**Frequency**	**Parameters**
Baseline	**Perennial rivers and lakes:** Four times a year (seasonal) **Seasonal rivers:** 3-4 times (at equal spacing) during flow period **Lakes:** 4 times a year (seasonal**)**	**A. Pre-monsoon: Once a year** Analyse 25 parameters as listed below: **a) General:** Colour, Odour, Temperature, pH, Electrical Conductivity (EC), Dissolved Oxygen (DO), Turbidity, Total Dissolved Solid (TDS) **b) Nutrients:** Ammoniacal Nitrogen (NH_4-N), Nitrite & Nitrate Nitrogen ($NO_2 + NO_3$) Total Phosphate (Total P) **c) Demand parameters:** Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) **d) Major ions:** Sodium (Na), Potassium (K), Calcium (Ca), Magnesium (Mg), Carbonate (CO_3) Bicarbonate (HCO_3 Chloride (CL), Sulphate (SO_4) **e) Other inorganic:** Fluoride (F), Boron (B) and other location specific parameter, if any **f) Microbiological:** Total coliform and Faecal Coliform B. **Rest of the year** (after the pre-monsoon sampling) at every three months interval Analyse 10 parameters: Colour, Odour, Temperature, pH, EC, DO, $NO_2 + NO_3$, BOD, Total coliform and Faecal Coliform

Trend or impact or flux	Once every month starting April-May (pre-monsoon) i.e. 12 times a year	**A. Pre-monsoon:** Analyse 25 parameters as listed for baseline monitoring **B. Other months:** Analyse 15 parameters as listed below **(a) General :** Colour, Odour, Temp, pH, EC, DO and Turbidity **(b) Nutrients :** NH_3 - N, NO_2 + NO_3, Total P **(c) Organic Matter :** BOD, COD **(d) Major ions :** Cl **(e) Microbiological:** Total and Faecal coliforms **C. Micropollutant:** Once in a year/pre monsoon. **a) Pesticides –** Alpha Benzenehexachloride (BHC), Beta BHC, Gama BHC (Lindane), OP-Dichlorodiphenyltrichloroethane (OP-DDT), PP-DDT, Alpha Endosulphan, Beta Endosulphan, Aldrin, Diedrin, Carbaryl (Carbamate), Malathian, Methyl Parathian, Anilophos, Chloropyriphos **b) Toxic Metals:-** Arsenic (As), Cadmium (Cd), Mercury (Hg), Zinc (Zn), Chromium (Cr), Lead (Pb) Nickel (Ni), Iron (Fe) (The parameters may be selected based on local needs)

Note:

I. The parameters mentioned in the above Table shall be the minimal requirement. This does not, however, restrict analysis of more parameters depending upon the specific requirements of the analyzing agency and its manpower availability.

II. For lakes or reservoirs, monitoring of additional parameters, like total Kjeldhal Nitrogen, Chlorophyll, total Plankton count and productivity, shall be included in the list of parameters.

III. If biomonitoring is done in river or lakes or reservoirs, additional specific parameters are to be considered.

2) Ground Water

The frequency of sampling in respect of ground water shall be as follows:

a. All stations shall be classified as Baseline stations
b. 20-25% of Baseline stations shall be classified as Trend stations where there is a perceived problem.
c. All agencies shall follow the sampling frequency and parameters for analysis of ground water as mentioned in the Table-2 given below:

5. Sample Collection

(1) The procedure for sample collection in respect of surface water shall be as under:

a. Samples for Baseline and Trend stations shall be collected from well-mixed section of the river or main stem 30 cm below the water surface using a Dissolved Oxygen (DO) sampler or weighted bottle.

b. Samples for impact stations shall be collected from the point of interest, such as bathing ghat, downstream of point discharge, water supply intakes and other sources.
c. The Dissolved Oxygen (DO) in the sample shall be fixed immediately after collection and Dissolved Oxygen (DO) analysis shall be done either in the field or in laboratory.

(2) The procedure for sample collection in respect of ground water shall be as under:

a) Open dug wells, which are not in use or have been abandoned, shall not be considered as water quality monitoring station. However, such well could be considered for water level monitoring.
b) Weighted sample bottle to collect sample from an open well about 30 cm below the surface of water may be used. The plastic bucket, which is likely to skim the surface layer only, shall not be used.
c) samples from the production tube wells shall be collected after running the well for about five minutes.
d) Non-production piezometers shall be purged using a submersible pump. The purged water volume shall equal 4 to 5 times the standing water volume, before sample is collected.
e) for bacteriological samples, when collected from tube wells or hand pump, the spout or outlet of the pump shall be sterilized under flame by spirit lamp before collection of sample in container.

Table – 2 Frequencies and parameters for analysis of Ground Water samples

1	2	3
Type of Station	**Frequency**	**Parameters**
Baseline	**Twice a year** (Pre and post monsoon season)	A. Pre and Post Monsoon Season: Analyse 20 parameters as listed below: a. General: Colour, Odour, Temperature, pH, EC, TDS b. Nutrients: NO_2 + NO_3, orthophosphate c. Demand Parameter: COD d. Major Ions: NA+, K +, Ca++, Mg++, CO_3^{--}, HCO_3^-; Cl, SO_4,$^{--}$%Na & SAR e. Other inorganics: F, B and other location-specific parameters, if any
Trend	**Twice a year (Pre and post monsoon)**	A. April-May: Analyse 20 parameters as listed for Baseline monitoring B. Other times: Analyse 14 parameters as listed below:- a) General: Colour, Odour, Temperature, EC, pH, TDS, %Na & SAR b) Nutrients: NO_2 + NO_3, orthophosphate c) Demand parameter: COD d) Major ions: Cl e) Other inorganics: F,B f) Microbiological: Total coliform and Faecal coliform C. Micropollutant (parameters may be selected based on local needs): a. Pesticides- Alpha BHC, Beta BHC, Gama BHC (Lindane), OP-DDT, PP-DDT, Alpha Endosulphan, Beta Endosulphan, Aldrin, Dieldrin, Carbaryl (Carbamate), Malathian, Methyl, Parathian, Anilophos, Chloropyriphos. b. Toxic Metals – As, Cd, Hg, Zn, Cr, Pb, Ni, Fe (Pesticides and Toxic metals may be analysed once a year in pre monsoon on selected locations)

Note:-

I. The parameters mentioned in the above Table shall be the minimal requirement. This does not, however, restrict analysis of more parameters depending upon the specific requirements of the analyzing agency and its manpower availability.

II. If chemical Oxygen Demand (COD) value exceeds 20 mg/l, the sample shall be analysed for Biochemical Oxygen Demand (BOD) also.

6. Sample preservation and transportation

1) The type of containers and sample preservation to be adopted shall be as mentioned in the Table-3 below:

Table – 3

1	2	3

Analysis	Container	Preservation
General	Glass, PE	4^0C, dark
BOD	Glass, PE	4^0C, dark
COD, NH_3, NO_2, NO_3	Glass, PE	H_2SO_4, PH<2
Coliform	Glass, PE, Sterilised	4^0C, dark
DO	BOD bottle	DO fixing chemicals
Fluoride	PE	None
P	Glass	None
Pesticides	Glass, Teflon	4^0C, dark
Toxic metals	Glass, PE	HNO_3, PH<2

2) Samples shall be transported to concerned laboratory as soon as possible, preferably within forty-eight hours of collection
3) Analysis for coliforms shall be started within twenty-four hours of collection of sample. If time is exceeded, it should be recorded with the result
4) Samples containing microgram / 1 metal level should be stored at 4^0C and analyzed as soon as possible. If the concentration is of mg /1 level, it can be stored for up to 6 months, except mercury, for which the limit is 5 weeks.
5) Sample Identification for the water sample analysis for surface and ground water samples shall be as mentioned in the Form-I and Form-II.

7. Sample records

1) Each laboratory shall have a bound register, which shall be used for registering samples as they are received. A format for sample receipt register is annexed as Form-III.

2) The Laboratory In-charge shall maintain a register for assignment of work to specific analyst.

8. Analytical techniques

Each agency shall follow the analytical techniques prescribed in the Standard Methods for Analysis of Water and Wastewater published by American Public Health Association (Latest Edition) or Bureau of Indian Standard(BIS) Methods for Testing Water and Wastewater-methods of sampling and testing (physical and chemical) (IS:3025)

9. Analysis records and data validation

A recommended format for recording data including all parameters except toxic metals and trace organics is enclosed as Form – IV. Report of heavy metals and trace organics as per Table 2 may be recorded separately. Validation check should be performed in the laboratory on completion of the analysis. The results of laboratory analyses shall be entered in the format provided in Form – II for validation.

10. Manpower requirements in laboratories

The manpower requirements shall be optimized by the concerned monitoring agencies in order to get the maximum utilization of mandays, for timely completion of analysis**.**

11. Data Processing, Reporting and Dissemination

Each monitoring agency shall process the analytical data and report the data after validation to the Data Centre at the Central Pollution Control Board. The Central Pollution Control Board shall store the data and disseminate through website or electronic mail to various users on demand.

12. Quality Assurance and Accreditation of Laboratories

The Quality Assurance Programme for the laboratories of various agencies shall contain a set of operating principles, written down and agreed upon by the organization, delineating specific functions and responsibilities of each person involved. Each laboratory of water quality monitoring agencies shall follow the guidelines of Quality Assurance Programme prescribed by their respective Central Laboratory or Headquarters and shall participate in Inter Laboratory Quality Assurance Programme like Proficiency Testing (PT) organized by them or any other agency on regular basis. The water quality laboratories shall seek recognition from the ministry of Environment and Forests, Government of India or accreditation from National Accreditation Board for Testing and Calibration Laboratories (NABL) under the Ministry of Science and Technology, Government of India

MINISTRY OF ENVIRONMENT AND FORESTS

NOTIFICATION

New Delhi, the 16th December, 2005

S.O.1799 (E) – Whereas by the notification of the Government of India in the Ministry of Environment and Forests, number S.O. 133 (E), dated the 4th February, 2003 (hereinafter referred to as the said notification), the Central Government notified Matheran and surrounding region in the State of Maharashtra as an Eco-sensitive Zone and imposed restrictions on industries, operations, processes and other developmental activities in the said region;

Now, therefore, in exercise of the powers conferred by Sub-section (1) read with clause (v) of Sub-section (2) of Section 3 of the Environment (Protection) Act, 1986 (29 of 1986) and rule 5 of the Environment (Protection) Rules, 1986, the Central Government hereby makes the following further amendments in the said notification, namely:-

In the said notification-

in paragraph 4, in sub-paragraph (n), after the words "in addition, one ambulance and one fire engine as stand by", the words "railways and ropeways" shall be inserted;

1. in Annexure – A, for the brackets, words and figure " (see section 2)", the brackets, words and figure "(see paragraph 2)", shall be substituted;
2. in Annexure – B, for the brackets, words and figure "(see section 2)", the brackets, words and figure "(see paragraph 2)", shall be substituted;
3. in Annexure – C, for the brackets, words and figure "(see section 2)", the brackets, words and figure "(see paragraph 2)", shall be substituted;
4. in Annexure – D
    a) for the brackets, words, figures and letters "[see Section 4(a)(iv)(c)]" the bracket, words, figures and letters "[see paragraph 4(a)(iv)(3)]" shall be substituted;
    b) in sub-heading 3, relating to Green Zone – 1, in item (j) of entry 3.1, after the words "small check dams for watershed management", the word "ropeways" shall be inserted;
    c) in sub-heading 4, relating to Urbanisable Zone-2,-
        I. in item (n) of entry 4.1, after the words "small check dams for watershed management", the word "ropeways." shall inserted;
        II. in entry 4.2, for the word "paragraph", the word 'entry' shall be substituted.

[F.No. J-20011/1/99-LA-III]
R. CHANDRAMOHAN, Jt. Secy.

Note: The principal notification was published in the Gazette of India, Extraordinary, vide Number S.O.133(E) dated the 4th February, 2003, and subsequently amended vide Numbers S.O. 83 (E) dated the 16th January, 2004.

Annexure –IV: Suggestive Structure of the DPRs

Chapters	Description
i.	Table of Contents
Ii	List of Abbreviations
Iii	Salient Features of the Project
Iv	Executive Summary / General Abstract of Cost
	PROJECT REPORT
1.1	**Authority for preparation of project**
1.2	**Brief Description of the project area**
	Brief history of the town
	Geographical location
	Climate
	Topography
	Administrative divisions
	Commercial aspects
	Industrial activities
	Educational activities
	Cultural activities
	Religious activities
	Socio –Economic status
	Town Management
	Soil characteristics and sub soil water level
	Drains – Total nos., nos. discharging into river(s), nos. intercepted
	City Sanitation Plan, if any – Date of preparation/sanction, copy of Executive Summary and abstract of cost estimate to be attached
	Master plan of development of the city, if any - Date of preparation/sanction, copy of Executive Summary and abstract of cost estimate to be attached
	Sewerage Master Plan, if any - Date of preparation/sanction, copy of Executive Summary and abstract of cost estimate to be attached
	Feasibility Report, if any - Date of preparation/sanction, copy of Executive Summary and abstract of cost estimate to be attached
	Agency responsible for execution and O&M of works, brief note on agencies
	Hrs. of availability of power at the sites of SPS / STPs
1.3	**Existing sewerage works**
	Existing, under execution, sanctioned but not yet started.
	Condition assessment report of existing sewers, SPS & STPs with details of CC TV survey, stating dia/length of sewers to be desilted, rehabilitated, abandoned (with reasons) etc.
	Proposed renovation, up gradation, augmentation etc. of the existing sewerage works
1.4	**River water quality**
	Water quality standards of river water quality

	Actual river water quality u/s, d/s, u/s of water supply intakes, other important places along with copies of test reports
1.5	**Population**
	Census population of the last 5 decades, area, no. of households, growth rate, density of population, slum population
	Past floating population data
	Population projections as per the City Master Plan
	Population projections for base year, 10, 15, 30 years – For permanent and floating population, along with basis of projected floating population
	Population Projections of each district in design years
1.6	**Water Supply**
	Recommended rates of water supply as per CPHEEO Manual on water supply
	Status of water supply
	Proposals for augmentation of water supply system
1.7	**Volume of Sewage Generation**
	Interception Factor
	Peak Factors
	Sewage flow calculations based on rate of water supply and projected population (including floating) in base, 10, 15, 30 years, including flow from private bore wells and infiltration of sub soil water
	Sewage flow actually measured in drains/sewers along with copies of reports of measurements
	Design sewage flows adopted along with comments on its normative and actual values
	Design sewage flows in each sewerage district as adopted
1.8	**Raw Sewage Quality**
	Test reports of raw sewage in drains for parameters as per guide lines
	Test reports of raw sewage in sewers for parameters as per guide lines
	Test reports of sewage flow in sewers from nearby town(s) having same rate of water supply and similar socioeconomic conditions
	Raw sewage quality assumed for design of STP(s) along with basis
1.9	**Treated Sewage Quality**
	Standards for treated sewage
	Summary of treated effluent quality of existing STPs for the last 2 years
2.0	**Interception Works of Drains**
2.1	**Sewer Network**
	Hydraulic Design of Sewer Network, District wise
	Design of sewer Bedding
	Life cycle cost analysis of pipes proposed in gravity sewers, as per NRCD, MoEF letter dt. July 8, 2002
	Report on condition assessment and integration of existing works

	Sewers by trenchless method
2.2	**Sewage Pumping Stations**
	Hydraulic Designs of Sewage Pumping Stations
	Design of capacities of Pumping Plants of sewage pumping stations
	Design of capacities of Generators
	Condition assessment and integration of existing SPS
2.3	**Rising Mains**
	Design of Economical sizes of Rising Mains
2.4	**Sewage Treatment Plants**
	Details of existing STPs – Capacities, year of construction, type, status
	Capacities of proposed STPs
	Characteristics of raw sewage on existing and proposed STPs
	Characteristics of treated effluent on existing and proposed STPs
	Disposal of treated effluent
	Existing and future plan of reuse / recycling of treated waste water from STPs to be given.
	Life Cycle Cost analysis for different technologies of treatment of waste
	Land available and required for STPs
	Electrical Load List of S.T.Ps
	Condition assessment and integration of existing STPs
	Production of biogas and its use for power generation
2.5	**Other provisions**
	Land available and required for various components
	Staff Quarters
	Permission from Forest, Railways, Telephone etc departments
	Special T&P
	Land cost in and around the town - copy of rates be attached
2.9	Electricity from solar and micro hydro
3.0	**Cost estimates**
3.1	**Operation and Maintenance**
	O&M cost for 15 years
	Annual O&M Cost of Works (component wise)
	Annual manpower cost
	Annual cost of power
	Annual expenditure on repairs and maintenance
	Staff required for maintenance
	Power required for maintenance
	O&M Recovery Plan for 15 years
	Economics
4.0	**Implementation Programme**
	PERT Chart
	Schedule of demand of funds
5.0	**Miscellaneous**

5.1	Environmental Sanitation and Management Plan (ESAMP)
5.2	Communication & Public Outreach
5.3	Governance and Accountability Action Plan (GAAP) and Grievance Redressal Mechanism (GRM)
5.4	Training, Human Resources Development and Capacity Building
5.6	Project Management and Institutional Development
5.7	Capacity of ULB – financial, material, human resources related to implement, operate and maintain the WWMS
	Proposed strengthening plan
5.8	Monitoring and Evaluation
5.9	Third Party Assurance and Quality Check
	ANNEXURES
	Data collected as mentioned in chapter 2
	Executive Summary of City Development Plan, as approved
	Executive Summary of City Sanitation Plan, as approved
	Executive Summary of FR of sewerage, as approved
	Approval of City Sanitation Plan by the State Government
	Approval of City Sanitation Plan by NMCG
	Approval of Feasibility Report of sewerage by the State Government
	Approval of Feasibility Report by NMCG
	Test Reports of River Water Quality, including those by CPCB, SPCB and other agencies
	Discharge measurement reports of discharge of drains
	Test reports of raw sewage in drains
	Test reports of raw sewage in sewers
	Test reports of sewage flow in sewers from nearby town(s)
	Test reports of treated effluent from existing STPs
	Rates of Land Acquisition in and around the town (copy of rates be attached in support)
	Sub Soil characteristics and sub soil water data
	Rates of PWD for reinstatement of roads
	Budgetary Offers of various components (separate cover, if voluminous)
9	**ESTIMATES**
	Drains
	Interception of drains and allied works
	Sewers
	Civil works of SPS
	EM works of SPS
	Rising mains
	STPs
	Electric Power Sub Station
	Staff Quarters
	Approach road
	Permission from Departments
	Shifting of Electric Cables, Lines etc./ Telephone Poles, Cables etc.
	Special T&P

	Land Acquisition
	Environmental Sanitation and Management Plan (ESAMP)
	Communication & Public Outreach
	Governance and Accountability Action Plan (GAAP) and Grievance Redressal Mechanism (GRM)
	Training, Human Resources Development and Capacity Building
	Project Management and Institutional Development
	Monitoring and Evaluation
	Third Party Assurance and Quality Check
	Unit Estimates
	Manhole, size wise
	Boundary Wall
	Steel Gate
	Gully Pits
	Roads
10	**DRAWINGS**
	General Drawings
1.	Map of the Country and State Showing the Location of the Town
2.	Map Showing Ganga River Basin and Location of Town
3.	Base map of Town (Road, Railway track, Wards, Slum and important landmarks etc.)
4.	Satellite Imagery of Town
5.	Land use Map/ Master Plan of Town (if any)
6.	Map Showing overall drainage and their Outfall Point related to Town
7.	Map of Town showing locations of industries, CETPs and points of, untreated / treated effluent outfalls of industries, etc.
8.	Map Showing Contours for Town
9.	Map Showing Existing Sewer Network for Town
	Proposed Drawings
10.	Key Plan of Proposed Scheme integrated with existing system along with GLs and ILs at critical points, drains, their points of outfall, proposed SPS, STPs (Capacity in MLD)
11.	L-sections of sewers to show GLs/ ILs/ dia / length / type of sewers, profile of ground and sewers.
12.	Location Map of Interception & Diversion of drain
13.	Map Showing Proposed Drains Interception and Diversion (I & D) Works
14.	Map Showing Proposed Fencing Stretches on various Drains (if considered)
15.	Location Map of SPSs/STPs as per actual site layout (showing lat/long, important landmarks and site surroundings).
16.	General Arrangement Drawing for Sewage Pumping Station
17.	Layout Plan of Proposed/Existing STP with unit sizing, specific modification requirement (if any), Road, Guardroom, Staff quarter, Solar Panel, Plantation etc.
18.	Hydraulic Flow Diagram for Proposed/Existing STP
19.	Plan and Profile of Treated Effluent Reuse Pipe Line
20.	Typical Details of Manhole (Various Sizes)
21.	Typical House Connecting Chamber
22.	Typical Sewer Bedding Details
23.	Typical Boundary Wall

24.	Typical Single Line Diagram for STP integrated with Solar Power (Electrical)
25.	Typical Single Line Diagram for SPS and MPS (Electrical)
26.	Typical Process and Instrumentation Diagram integrating with SCADA system
27.	Typical cross-sectional drawing of drains (Existing & Proposed)

Annexure – V: Directions issued by CPCB vide notification dated Mar 02, 2015 For On Line Monitoring of Influent and Effluent Quality of Highly Polluting Industries

SPEED POST

B-29016/04/06/PCI-I/ 7176-7216 March 02, 2015

To

The Chairman
(All SPCBs/PCCs)

SUB: DIRECTIONS UNDER SECTION 18(1)(b) OF THE WATER (PREVENTION & CONTROL OF POLLUTION) ACT, 1974 and THE AIR (PREVENTION & CONTROL OF POLLUTION) ACT, 1981 IN THE MATTER OF POLLUTION CONTROL IN 17 CATEGORY OF HIGHLY POLLUTING INDUSTRIES , CETPs AND COMMON HAZRDOUS WASTE & BIOMEDICAL WASTE INCINERATORS- REGARDING SELF MONITORING OF COMPLIANCE

WHEREAS, under Section 17 of the Water (Prevention & Control of Pollution) Act, 1974, and under Section 17 of the Air (Prevention & Control of Pollution) Act, 1981, one of the function of the State Pollution Control Boards(SPCBs)/Pollution Control Committees(PCCs) is to plan a comprehensive programme for the prevention, control or abatement of pollution of streams, wells and air pollution in the State/Union territory and to secure the execution thereof; and

WHEREAS, under section 16 of the Water (Prevention and Control of Pollution) Act, 1974 and under Section 16 of the Air (Prevention & Control of Pollution) Act, 1981, one of the functions of the Central Pollution Control Board (CPCB), constituted under Water (Prevention and Control of Pollution) Act, 1974 is to coordinate activities of the State Pollution Control Boards and Pollution Control Committees and to provide technical assistance and guidance to SPCBs / PCCs; and

WHEREAS, the SPCBs and PCCs are empowered to stipulate standards for discharge of environmental pollutants for various categories of industries and common effluent treatment plants (CETPs) , Common Hazardous waste and Biomedical waste incinerators even more stringent than those notified by the Central Government, under the Environmental (Protection) Act, 1986 and rules framed there under; and

WHEREAS, Pharmaceuticals, Chlor Alkali, Fertilizers, Oil Refinery, Dye and dye intermediate, Pesticides, Petrochemical, Large Power plants, Cement, Aluminium, Zinc, Copper, Iron & steel, Large Pulp & paper, Distillery, Sugar and Tannery industries located in States/UTs have been discharging environmental

pollutants directly or indirectly into the ambient air and water, which pose constant threat to cause adverse effect on the water and air quality ; and

WHEREAS, Common Hazardous waste and Biomedical waste incinerators and Common Effluent Treatment Plants(CETPs) located in States/UTs have been discharging environmental pollutants directly or indirectly into the ambient air and water; and

WHEREAS, the SPCBs and PCCs are also required to ensure installation and regular operation of the requisite pollution control facilities in the polluting industries; and

WHEREAS, there is need to inculcate habit of self monitoring mechanism within the industries for complying the prescribed standards and this can be achieved by the methods like installing online effluent and emission monitoring devices; and

WHEREAS, number of industries under 17 category which are operating in the state/UT have been identified can be suitably directed for installation and commissioning of online monitoring systems (emission and or effluent); and

WHEREAS, number of Common Hazardous waste and Biomedical waste incinerators and CETPs operating in the state/UT can also be considered for installation and commissioning of online monitoring systems (emission and or effluent);and

WHEREAS, for strengthening the monitoring and compliance through self regulatory mechanism ,online source and effluent monitoring systems need to be installed and operated by the developers and the industries on 'polluter pays principle' ;and

WHEREAS, some of the SPCBs have already given specific conditions in consent to operate of 17 categories of highly polluting industries/ and Common

Hazardous waste and Biomedical waste incinerators to install continuous emission and effluent monitoring systems; and

WHEREAS, it is envisaged in "National Environment Policy- 2006" that to strengthen the testing infrastructure and network for monitoring ambient environmental quality and progressively ensure real-time, and online availability of the monitoring data; and

WHEREAS, CPCB had earlier issued letter dated January 12,2011 to SPCBs /PCCs to direct all the 17 categories of highly polluting industries to install automatic air and water quality stations to monitor the ambient quality; and

WHEREAS ,it is becoming a need and necessity to regulate and minimize inspection of industries on routine basis and instead efforts need to be made to bring self discipline in the industries to exercise self monitoring & compliance and transmit data of effluent and emission compliance to SPCBs/PCCs and to CPCB on continuous basis; and

WHEREAS, there could be some time needed for getting such devices standardised and requiring confidence on data generated but needless to emphasize that efforts towards setting up to continuous monitoring devices is essential; and

WHEREAS, the ground truthing of the values indicated by the online devices need to be done before bringing them in public domain for proper interpretation and such measures need to be taken at the level of SPCBs/PCCs .And whereas for regulatory purposes and for purposes of actions to be taken against non complying industries /facilities, the existing methods of sampling, analysis and related procedures under the existing statutes need to be continued; and

WHEREAS, SPCBs and PCCS have prescribed standards for various parameters as per the notified standards under Environment(Protection) Act,1986

and the State Boards may refer to the parameters which should be monitored by installing continuous effluent and emission monitoring devices(Annexure -II);and

WHEREAS, continuous effluent and emission monitoring devices can be installed in those industries which are continuously letting out effluents and emissions out of their premises: and

WHEREAS following direction under Section 18(1)(b) of the Water (Prevention & Control of Pollution) Act, 1974, and 18(1)(b) of the Air (Prevention & Control of Pollution) Act, 1981 have been issued to all SPCBs/PCCs on 05.2014;

a) To Install online continuous Stack Emission Monitoring Systems (CSEMS) in 17 categories of highly polluting industries and in Common Hazardous waste and Biomedical waste incinerators for the parameters(industry/sector specific parameter) mentioned in the consent to operate/authorisation not later than by March 31,2015;
b) To install online effluent quality monitoring system at the outlet of effluent treatment plants of the 17 category industries and in CETPs for the measurement of the parameters(industry/sector specific parameter) like flow, pH, COD, BOD, TSS and for other consented parameters as per the guidelines provided; not later than by March 31, 2015;
c) To connect and upload the online emission and effluent monitoring data at SPCBs/PCCs and CPCB server in a time bound manner but not later than by March 31,2015;
d) To ensure regular maintenance and operation of the online system with temper proof mechanism having facilities for online calibration;
e) To submit bank guarantee of 25 % of the cost of online monitoring systems (emission and effluent whichever applicable) for ensuring timely installation of online monitoring systems within 90 days from the date of receipt of directions issued by SPCBs/PCCs to the industries;

WHEREAS In order to sensitize the issues among SPCBs/PCCs ,CPCB also highlighted the status of compliance of setting up online monitoring system in the conference of Chairman and Member Secretaries(February 21-22,2014 at

Bangalore and January 09,2015 at Chandigarh) at the National as well as Regional level on online monitoring system; and

WHEREAS CPCB has organized five interaction meets on 06/8/2014,19/09/2014,29/09/2014,8/10/2014 and 16/10/2014 respectively to have an interaction with SPCBs, representative of industries, industrial associations and instrument suppliers on online monitoring system; and

WHEREAS CPCB has already published a guidelines for online continuous monitoring system for effluents on 07.11.2014; and

WHEREAS a letter has been issued to all SPCBs/PCCs on October 31, 2014 and subsequent reminder sent on December 24,2014 to provide action taken report to CPCB in the format before January 10, 2015; and

Now, therefore, in exercise of the powers conferred under Section 18 (1) (b) of the Water (Prevention & Control of Pollution) Act, 1974, and 18 (1) (b) of the Air (Prevention & Control of Pollution) Act, 1981 and keeping in view strengthening of the monitoring mechanism for effective compliance through self regulatory mechanism, you are directed to

(i) All the industries will submit bank guarantee of 100 % of the cost of online monitoring systems (emission and effluent whichever applicable) for ensuring timely installation of online monitoring systems by 30.06.2015 and such bank guarantee will be discharged if they install the system before June 30,2015.

(ii) If the industries will not install the online monitoring system by June 30, 2015 their consent to operate of the industry shall be withdrawn and bank guarantee shall be forfeited.

(Shashi Shekhar)
Chairman

Copy to:

1. The Advisor(CP Division)
   Ministry of Environment, Forests and Climate Change
   Prithvi Wing, 2nd Floor, Room No. 216
   Indira Paryavaran Bhawan
   Aliganj, Jor Bagh Road
   New Delhi - 110003

2. I/C PCI-I,II,III and HWMD
3. All Zonal Officer ,CPCB
4. I/c IT Division, CPCB
5. I/c. ESS, CPCB

(A.B. Akolkar)
Member Secretary

Annexure – VI: Completion Report

(Part A)

(General Abstract of Cost)

1. Name of the scheme:
2. Sanctioned Amount:
3. Date of sanction:
4. Date of Scheduled start:
5. Date of actual start:
6. Date of Scheduled Completion:
7. Date of actual completion
8. Actual Expr.

Sl. No	Sub-head/ component	As per sanctioned Estimate			As executed			Variation		Reasons for Variation	Cost as per executed quantity & Rates as per sanctioned Estimate	Escalation Due to variation in quantity Col. 12 Col. 5	Escalation Due to price variation Col. 8-Col.5-Col. 13	Remarks
		Item	Qty	Amt.	Item	Qty	Amt.	Saving (+)	Excess (-)					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Certified (1) That there has been no material deviations from the sanctioned plans and specifications other than those approved by the competent authority.

(2) That the works have been completed as per specifications and completion drawings enclosed

(3) That the site has been cleared of all malba, rubbish and surplus materials, contractors' hutments and his materials etc.

COMPLETION REPORT (Part B)

Name of the Scheme: Details of variations in the scope of work

Component/Sub-head:

Sl. No	Description of item of work	As per sanctioned Estimate				As executed				Variation		Reasons for Variation	Cost as per executed quantity & Rates as per sanctioned Estimate	Escalation Due to variation in quantities col. 14- Col. 6.	Escalation Due to price variation Col. 10 - Col. 6 - Col. 15	Remarks
		Qty	Unit	Rate	Amt.	Qty	Unit	Rate	Amt.	Saving (+)	Excess (-)					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Annexure –VII: Utilisation Certificate

Ministry of Water Resources, River Development & Ganga Rejuvenation

UTILISATION CERTIFICATE

(To be sent in duplicate to the Ministry of Environment & Forests)
for the financial year (Form_____ to _____)

1. Title of the Project/Scheme:
2. Name of the Organisation:
3. Principal Investigator:

4. Ministry Of Environment And Forests letter No. and date of sanctioning the project :
5. Amount brought forward from the previous financial year quoting Ministry of Environment and Forests letter no. and date on which the authority to carry forward the said amount was given :
6. Amount received from Ministry of Environment & Forests, during the financial year (please give No. and date of sanctions Showing the amount paid)
7. Total amount that was available for expenditure (including commitment) incurred during the Financial Year (S. No. 5+S. No. 6)
8. Actual Expenditure (Excluding commitments) incurred during the financial year:
9. Unspent balance refunded if any (Please give details of cheque no. etc.)
10. Balance amount available at the end of the financial year:
11. Amount allowed to be carried forward to the next financial year vide letter no. and date:

Certified that the expenditure of Rs. _____ (Rupees _____) mentioned against column 8 was actually incurred on the Project / Scheme for the purpose for which it was sanctioned and balance amount is available on _____ .

(Signature of Principal Investigator)	(Signature of Registrar/ Accounts Officer)	(Signature of Head of the Organisation)

ACCEPTED AND COUNTERSIGNED
COMPETENT AUTHORITY
MINISTRY OF ENVIRONMENT AND FORESTS

Form of Utilisation Certificate

(Form GFR 19-A)
[See Rule 212(1)]

Name of the Organisation :

Financial Year :

S. No.	Ministry of Environment and Forests Sanction for Released Amount		
	Letter No.	Date	Amount (Rs. in Lakhs)
1.			

1. Certified that out of Rs. --------- of grants-in-aid sanctioned during the year ---------- in favour of ---------- under Ministry of Environment and Forests letter No. ---------- dated ---------- ,and Rs.----------on account of unspent balance of the previous year, a sum of Rs.---------- has been utilized during the period for purpose of "----------." for which it was sanctioned and that the balance of Rs—---------- remaining unutilized at the end of the year will be adjusted during ---------- towards the grants-in-aid payable during the next year ----------

2. Certified that I have satisfied myself that the conditions on which the grants-in-aid was sanctioned have been duly fulfilled and that I have exercised the following checks to see that the money was actually utilized for the purpose for which it was sanctioned.

Kinds of checks exercised

1.

2.

3.

4.

Signature ……..……..
Designation ……..……... Date ……..……..
Operating

Countersigned _____