



सत्यमेव जयते

**GUIDELINES**  
**FOR PREPARATION OF PROJECT REPORTS**  
**UNDER**  
**NATIONAL RIVER CONSERVATION PLAN**  
**AND**  
**NATIONAL GANGA RIVER BASIN AUTHORITY**



जहाँ है हरियाली ।  
वहाँ है सुरक्षली ॥

**Ministry of Environment & Forests**  
**National River Conservation Directorate**  
**New Delhi**

**December, 2010**



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## ABBREVIATIONS

ADP	:	Area Development Plan
ASP	:	Activated Sludge Plant
BGL	:	Below Ground Level
BHP	:	Break Horse Power
BOD	:	Biological Oxygen Demand
CDM	:	Clean Development Mechanism
CER	:	Certified Emission Reduction
COD	:	Chemical Oxygen Demand
CPCB	:	Central Pollution Control Board
CPHEEO	:	Central Public Health Environmental Engineering Organisation
CSP	:	City Sanitation Plan
CTC	:	Community Toilet Complex
CW	:	Civil Works
CWC	:	Central Water Commission
DA	:	Drainage Area
DBO	:	Design, Build & Operate
DG	:	Diesel Generator
DO	:	Dissolved Oxygen
DPR	:	Detailed Project Report
EM	:	Electrical and Mechanical Works
FAB	:	Fluidized Aerated Bed
FR	:	Feasibility Report
GAP	:	Ganga Action Plan
GIS	:	Geology Investigation Survey-Geographical Information System
GL	:	Ground Level
Goi	:	Government of India
GRP / DI	:	Glass Reinforced Plastic / Ductile Iron
HRD	:	Human Resource Development
HUDCO	:	Housing and Urban Development Corporation Ltd.
IPS	:	Intermediate Pumping Station
IWBC	:	Integrated Wood Based Crematoria
JNNURM	:	Jawahar Lal Nehru National Urban Renewable Mission
LCC	:	Life Cycle Cost
LCS	:	Low Cost Sanitation
MLD	:	Million Litres Per Day
MoA	:	Memorandum of Agreement
MoEF	:	Ministry of Environment and Forests, Govt. of India
MNRE	:	Ministry of New and Renewable Energy Sources, Govt. of India
MoUD	:	Ministry of Urban Development, Govt. of India
MPS	:	Main Pumping Station
MSW	:	Municipal Solid Waste

NGRBA	:	National Ganga River Basin Authority
NIT	:	Notice Inviting Tender
NRCD	:	National River Conservation Directorate
NRCP	:	National River Conservation Plan
O&M	:	Operation and Maintenance
PERT / CPM	:	Programe Evaluation Review Technique/ Ciritical Path Method
PHED	:	Public Health Engineering Department
PMU	:	Project Management Unit
PS	:	Pumping Station
SBR	:	Sequential Batch Reactor
SOR	:	Schedule of Rates
SPCB	:	State Pollution Control Board
SPMU	:	State Project Management Unit
SPS	:	Sewage Pumping Station
SS	:	Suspended Solids
STP	:	Sewerage Treatment Plant
SWM	:	Solid Waste Management
SWM	:	Sewerage Water Management
TF	:	Trickling Filter
TPI	:	Third Party Inspection
TSS	:	Total Suspended Solids
UASB	:	Upflow Anaerobic Sludge Blanket
UFW	:	Unaccounted for Water
UIDSSMT	:	Urban Infrastructure Development Scheme for small and Medium Towns
ULB	:	Urban Local Bodies

## SALIENT FEATURES OF GUIDELINES FOR PREPARATION OF REPORTS UNDER THE NGRBA/ NRCP

1. City Sanitation Plan (CSP) shall be the basis for planning and formulating projects. Therefore, preparation of city sanitation plans, wherever it doesn't exist, will be the first step. However, CSP shall be prepared on the basis of City Development Plan (CDP), if so drawn and finalized for the city.\
2. Holistic approach and provision of integrated sewer network up to house-property line in place of drain interception and diversion. This will ensure full coverage of the town and thereby transportation of entire sewage to treatment plants for optimal utilization.
3. Dovetailing with projects under JNNURM/UIDSSMT/ State Plan is compulsory. This will ensure optimal utilization of resources on priority basis.
4. Design, Build & Operate (DBO) model for efficient operation and maintenance (O & M) of River Conservation schemes.
5. First 5 years O & M cost to be in-built in the project cost. This will ensure unhindered O & M of assets which is necessary for achieving the river cleaning objectives. Next 10 years O & M cost to be also worked out with revenue generation plan. The O & M responsibility beyond 5th year will rest with the State Government/ ULB.
6. Stakeholder consultation at the stage of formulation and implementation of the project. This is to ensure active involvement of various stakeholders and the civil society to generate support and encourage ownership.
7. Signing of tripartite MoA among Government of India, State Government and ULB is mandatory. This will bind these three tiers of Government to ensure fulfillment of respective commitments in terms of release of funds, timely completion of projects, ensuring house connection to sewer and operation & maintenance of assets, etc.
8. Active association of ULBs in project formulation and siting of important infrastructures such as STP, PSs etc. This will ensure their co-operation in getting land in time which is crucial for timely completion of projects.
9. Dedicated Cell in States for implementation of projects. This will ensure fulltime deployment of adequate number of skilled technical personnel by the States which is critical for proper supervision, quality control, adherence to completion schedule and project cost control.
10. Appraisal of project proposals by independent Institution/Experts. This will enhance quality of DPR in addition to cost optimization. Any short comings in the planning and designing of the project will also be addressed through such appraisal.
11. Third Party Inspection (TPI) for implementation of projects is required. This will strengthen State Government agencies in maintaining the desired quality of work. Generally, States are not in a position to deploy adequate technical personnel for round the clock supervision of works and hence this will be an effective mechanism to ensure progress and quality of works.

12. Emphasis on recycling and reuse of treated sewage. Agricultural and industrial demand on fresh water is very high. On the other hand, drawling of fresh water from rivers for these purposes may also contribute to pollution as dilution reduces. Therefore, there should be an endeavor to maximize the use of treated sewage.
13. Degree of treatment linked to availability of fresh water in river. Instead of uniform level of treatment, the approach of varying level to be followed as water quality is directly linked with availability of fresh water in a particular stretch of river.
14. Use of digital maps, other 'information – communication technology' (ICT) tools and software for project planning and design. In order to improve scientific and engineering design and planning, good quality maps and computer aided design are necessary.
15. Coverage of schemes for management of Municipal Solid Waste affecting river water quality. Different types of solids and solid waste also contribute to river pollution significantly. Therefore, this activity will be taken up selectively under the program.
16. Priority to undertake River Conservation Projects for City/ Towns polluting river stretches identified by CPCB. The list of polluted stretches published by CPCB from time to time will primarily be the basis for selecting rivers and towns to be included under the program.
17. Adoption of innovative and best technology options for treatment of sewage. Technology selection is critical to technical and financial sustainability of assets created. Detailed and careful exercise may be undertaken for selection of the best option on a case to case basis. For this, life cycle study of technology options along with detailed analysis in respect of performance will be mandatory at FR stage.
18. DPR preparation to be preceded by Feasibility Report (FR). This will focus on option exploration and selection of locations for major infrastructure. This will also help reduce uncertainty in land acquisition and pre-emptively resolve other local issues, thus contributing to timely execution of project.

In addition, the following good practices will be promoted under the revised guidelines:

19. Incorporation of Rain water harvesting in community sanitation schemes.
20. Promotion of solar energy for community sanitation schemes.
21. Improved sanitation scheme based on higher user charges where applicable.
22. Up gradation of existing community sanitation and sewerage infrastructure.
23. Thrust on innovative River Front Development (RFD) Projects.
24. Introduction of “river festival” and “river runs” under the public participation, Information, Education & Communication (IEC) activities.
25. Design parameters of STP to be considered based on actual measurement and analysis.

# CHAPTER-1

## INTRODUCTION

### 1.1 BACKGROUND

- i. The Ministry of Environment and Forests (MoEF) has been implementing an ambitious programme of pollution abatement of rivers in India. It started in 1985 with the Ganga Action Plan (GAP) and gradually extended to other polluted rivers through National River Conservation Plan (NRCP). The current programmes covered under NRCP include works in 172 towns along polluted stretches of various rivers spread over 20 states. To give a fresh impetus to pollution abatement of River Ganga and its tributaries, a major initiative under the National Ganga River Basin Authority (NGRBA) has been started in 2010. The National River Conservation Plan Scheme is given as Annexure 1. The objectives, approach and functions of NGRBA are given as Annexure-2.
- ii. Given the size and scope covered under these programmes that involve a large number of agencies and individuals all over the country, it is necessary that proposals are prepared by the implementing agencies in the States to address the specific wastewater management problems to achieve the objectives of the programmes. This established the necessity of comprehensive guidelines that would not only help in addressing the various issues concerning the river pollution but also in expediting the decision making process.
- iii. The guidelines for preparation of DPRs, presently in force, were issued by NRCD in 2002. However, since then a number of developments have taken place and lessons have been learnt that necessitate the revision of guidelines on preparing the DPRs. The guidelines will help state agencies in preparing quality proposals to address river pollution problems in a holistic manner.

### 1.2 CHANGES OCCURRING SINCE THE GUIDELINES WERE ISSUED

Significant developments that have taken place are mentioned below.

#### 1.2.1 National Ganga River Basin Authority (NGRBA)

The Central Government has given Ganga the status of a 'National River' and has constituted a 'National Ganga River Basin Authority' (NGRBA) as an empowered planning, financing, monitoring and coordinating authority for the Ganga River with new institutional structures. The objective is to have the river basin as the unit of planning, a shift from town centric to river basin approach and to have a comprehensive response covering water quality and flow, sustainable access, environment management, prevention and control of pollution and food and energy security, in the form of a national mission. The World Bank is considering supporting a major investment under NGRBA.

#### 1.2.2 Identification of Polluted Stretches by CPCB

The Central Pollution Control Board (CPCB) has identified nearly 150 polluted stretches of rivers in the country that require pollution abatement programmes and the list is likely to be expanded, given the pace at which the country is growing. Once a town is selected for inclusion under the programme based on the CPCB criteria, DPRs are prepared town-wise. The selected towns are divided into various sewerage districts according to topography and slopes. DPRs of

various districts may be prepared and presented in different volumes. Similarly, DPRs of non-sewerage components like low cost sanitation, crematoria, river front development, for a town may again be prepared in different volumes. The underlying need is that a comprehensive DPR should conform to a city level sanitation plan that would help reduce the pollution of river to the desired level.

### 1.2.2 Innovative Initiatives of NRCD

Several initiatives have been taken by NRCD such as public consultation, signing of MoAs with states and urban local bodies (ULBs), inclusion of O&M expenditure for 5 years in the project cost etc.

### 1.2.3 Introduction and Coverage of JNNURM

The Ministry of Urban Development (MoUD) launched a new programme in the current Plan known as Jawaharlal Nehru National Urban Renewal Mission (JNNURM), which has many similar components but with divergent objectives. Also, MoUD has an ongoing programme of 'Urban Infrastructural Development Scheme in Small & Medium Towns (UIDSSMT) under which many of the schemes covered under the NRCP such as the schemes of wastewater management and solid waste management, are eligible for funding. These Schemes need integration and synchronisation with the programmes of MoEF aimed at improving the quality of waters of rivers.

### 1.2.4 International Funding

International Funding Institutions such as the World Bank have pledged supporting the NGRBA programme.

### 1.2.5 Review of pollution abatement projects in the Ganga Basin

The World Bank in a study to review pollution abatement projects in the Ganga Basin, has identified deficiencies needing attention and corrective action. AHEC in IIT Roorkee has also been examining DPRs received by the NRCD for funding and found areas where improvements are needed. A gist of the deficiencies is given below:

- i. Identification and understanding of problems and their causes is often inadequate.
- ii. In the DPRs, targets are expressed as physical outputs or assets to be created. The outcome should conform to performance and bench marking of assets through O&M.
- iii. Several factors such as capital cost, technology, cost of O&M and its recovery, ability and capacity to execute the project, social and environmental consequences need to be kept in consideration while selecting the most appropriate and maintainable option out of a number of possible solutions.
- iv. The DPR often does not contain detailed information and analysis of existing assets and their condition, options considered, justification of the proposed solution.
- v. Survey and investigation done based on which the DPRs are prepared, need improvement.
- vi. A number of aspects such as implementation of projects, their management and O&M arrangements, financial strength of the Urban Local Bodies or of the State Government,



- infrastructure available such as availability of electricity to run the facilities created and desirable institutional actions required are not reflected properly.
- vii. Involvement of stake holders and civil society in the projects needs to be emphasised.
  - viii. Often, the quality of survey and investigation is poor.
  - ix. The DPRs stress more on cost estimates than being a document that would emphasise and analyse the problem with clarity, come out with solutions and then select the most cost effective option to achieve the desired outcome, keeping in view the capacities of the institutions and social and financial concerns and interests of other stake holders.
  - x. The Urban Local Bodies are generally not regarded as the primary stake holder.
  - xi. The team that is entrusted with the preparation of the DPR consists mainly of engineers. Professionals with expertise in financial, economic and social matters are also to be associated. Since the pollution abatement project affects every resident of the town and, indeed of the basin, it is necessary to ensure that there is consensus about and involvement with the pollution abatement projects and the project addresses the felt needs of the plural society that we have in our towns. Activities such as social surveys, programmes to secure stakeholder participation have to be undertaken. Likewise economic informationa technology and financial issues are of concern to every resident. To deal with these aspects it is desirable to associate persons who specialise in social sciences with the team that prepares the projects.
  - xii. Preparation of the DPR is generally done by lower level of engineering staff and is not properly supervised.
  - xiii. In cases where Consultants are appointed to prepare DPRs, they are not necessarily highly skilled. Too much independence is given, their work is unsupervised and often quality checks are not undertaken.
  - xiv. In cost estimates, a provision to encourage innovation and flexibility to the bidder to quote alternative items may be provided.
  - xv. House connections to ensure flows in the sewer system may have to be provided.
  - xvi. As the mission Clean Ganga stipulates that no untreated sewage and industrial waste water would be allowed to be discharged into the river Ganga beyond 2020, the DPRs of projects in the Ganga basin are to be proposed, based on comprehensive planning of a city, including isolated clusters.

### 1.2.6 Preparation of Project Reports

Presently the DPRs are submitted without any CSP and Feasibility Reports. This practice has several disadvantages as mentioned below:

#### i. Absence of Integrated Approach

The Schemes proposed are independent and disparate and do not get integrated into a plan of area development. Many components Schemes of Pollution Abatement of Rivers will fit into such a plan. For example, river front development, setting up crematoria, plantation and community toilet complexes can smoothly merge in a river bank area development plan.

#### ii. Exploration of Options

Direct preparation of DPR may result in not properly exploring options to find solutions for the identified problem in a cost effective and sustainable manner and ignoring socio-economic and

institutional factors.

iii. Identification of Agencies for Schemes

In the absence of a feasibility report identification of agencies that are best suited to handle a particular scheme was not necessarily well thought out and reasoned giving rise to the possibility of mismatch.

### 1.3 REVISION OF GUIDELINES – SALIENT FEATURES

In light of the above background and developments, a need for revision of guidelines of 2002 has arisen and accordingly guidelines have been revised.

While many provisions of the earlier guidelines are still valid there is a need for change in others. Salient features of the revised guidelines are given below.

#### 1.3.1 Adoption of Holistic Approach

So far the focus was on interception and diversion of drains and installation of STPs. It did not ensure that all the wastewater generated was taken to and treated in the STPs. A holistic approach in preparing pollution abatement projects is now to be adopted. It will include river basin approach and provision of an integrated sewer network up to the house property line. Slums and individual houses having no space for House Hold (HH) installation of toilets shall be covered through community toilets. The new approach will ensure full coverage of the city and thereby transportation of entire sewage to STPs for optimal treatment and utilisation.

#### 1.3.2 Identification of Polluted Stretches

The Central Pollution Control Board (CPCB) has identified nearly 150 polluted stretches of rivers in the country that require pollution abatement programmes and the list is likely to be expanded, given the pace at which the country is growing. Towns that need to be covered under the NRCP are to be identified on the basis of these polluted stretches.

#### 1.3.3 Multi Stage Preparation of Project for the Selected Town

- i. For the selected town it will be helpful if a plan was prepared in which all sources of pollution in the town were identified to achieve the outcome of improved water quality of rivers and environmental improvement. It should include all needed schemes - both that are funded by the NRCD and others that are not funded by it but are eligible for funding under the Schemes of other Ministries / Departments. This plan is called the City Sanitation Plan, which will form the bedrock of planning and formulating projects. Its preparation has been included as a necessary first stage.
- ii. For sewerage schemes that offer a number of options and whose cost is high, it will be mandatory to prepare a feasibility report in which all available options are evaluated and the optimal option is selected. For the selected option the DPR would be prepared. For non-sewerage schemes DPRs are to be prepared straight away based on the city sanitation plan.

- iii. Thus, these guidelines provide for a three stage preparation of projects relating to sewerage schemes and two stage preparation projects for non-sewerage schemes for pollution abatement of the river
  - a) City sanitation plan
  - b) Feasibility report and
  - c) Detailed project report.

In order to save time, effort and expenditure, for preparing the city sanitation plan and the feasibility report, secondary data – data that is already available - should be used. However, if it is felt that it is necessary to have some data for preparing these reports and it is not available, it should be generated.

#### 1.3.4 Dovetailing and Synchronisation with projects under JNNURM/ UIDSSMT/State Plan

It has been made obligatory that projects proposed or approved under schemes such as JNNURM, UIDSSMT or state plan are dovetailed and synchronized with the projects proposed under NRCP/NGRBA. It will ensure optimal utilization of resources on priority basis.

#### 1.3.5 Institutional Arrangements and Implementation Mechanism

A number of activities, some of which are mentioned below, need to be undertaken and for each there should be an institutional arrangement from the State Government, down to the ULB, to discharge responsibility for the component schemes.

- i. Identifying polluted stretches of the river and sources of pollution in the state.
- ii. Identifying causes of pollution and towns that are responsible for pollution in the river.
- iii. Awareness generation and involve stake holders at various levels.
- iv. Preparation of projects
- v. Implementation and third party inspection
- vi. Supervision, guidance, quality control, adherence to completion schedule and project cost control
- vii. O&M
- viii. Monitoring and evaluation

To ensure that the above functions are performed efficiently and effectively, dedicated cells are necessary in the states. Accordingly, a State Project Management Unit (SPMU) has been suggested in the state government with representation of the concerned departments. In the states within the Ganga basin SPMU may be appointed by the State Ganga River Conservation Authority. In other states, the government in the department of Urban Administration may appoint the SPMU. The executive arm will be the state implementing agency, the organization which deals with projects related to water and waste water in urban areas.

At the level of the district or the town where actual projects are implemented there is a PMU with the DM/DC/Collector or the President of the District Planning Committee or the Mayor/President of the ULB as its chief and representatives of the ULB and departments who are to handle the schemes under the NRCP.

It is necessary to secure active association of the ULB in project formulation, siting of and

getting land for important infrastructure such as sewage pumping stations and STPs, which is crucial for timely completion of projects and their O&M.

### **1.3.6 Inclusion of Tributaries in NRCP**

Tributaries may have a significant impact on the quality and quantity of water and on aquatic life. If tributaries render the river water polluted, pollution abatement works for these rivers can be proposed.

### **1.3.7 Revision of Standards of Treated Wastewater**

In critical stretches of Ganga river standards of STP effluents have been revised.

### **1.3.8 Inclusion of branch and lateral sewers and house connections up to the property line**

Under NRCP branch and lateral sewers and house connections up to the property line are not eligible for financial assistance from the NRCD. However, NGRBA guidelines provide for the Ganga basin that apart from conveying sewers, pumping stations and STPs, these items should also be included in projects in unsewered areas to make the city fully sewerage.

### **1.3.9 Renovation, up gradation and modernization of existing projects.**

Some components of existing projects have outlived their design periods. On the one hand, their performance, mainly that of STPs would have deteriorated and, on the other, specifications of treated effluents have been raised. Therefore, there is a need to provide for renovation, up gradation and modernization of such projects.

### **1.3.10 Projects needed in view of emergence of new colonies and expansion of old towns/cities**

In several towns haphazard growth has taken place without any matching arrangements for disposal of wastewater. New projects of sewage management are required for such areas.

### **1.3.11 Community Toilet Complexes**

Rainwater harvesting and promotion of solar energy are to be incorporated in the community toilet complexes. At commercial locations toilet complexes may be set up with higher specifications for highend users on higher user charges basis. The up gradation of existing CTCs is to be explored and provision to be made for the same.

### **1.3.12 Catchment Area Treatment to check the flow of silt and nutrients**

For a river, the quantity and quality of its discharge is a function of rainfall and land use in the catchment. Silt, nutrients and agricultural runoff are its major pollutants. Both for securing flow in the river system and for maintaining quality, proper land use and measures to protect the catchment are necessary.

### **1.3.13 Works to secure environmental flow**

It is well known that aquatic life in river systems cannot be sustained unless flows unique to biodiversity in sections of rivers are maintained, especially in periods of low flow. Several

measures may need to be taken to achieve this objective, including the following

- i. Reducing abstraction of water from the river
- ii. Reuse and recycling of wastewater including discharge back to the river
- iii. Increasing efficiency of use of water in irrigation, domestic consumption and industry
- iv. Catchment area treatment to increase base flow and check the flow of silt and nutrients to the river
- v. Augmenting flow in the river
- vi. Rain Water harvesting for ground water recharge

#### 1.3.14 Recycle and Reuse of Wastewater

Agricultural, industrial and domestic demand of fresh water is very high. On the other hand, drawl of fresh water from the river for these purposes reduces availability of water in the river for dilution. Recycling and reuse should either be for non-domestic municipal uses or for specific irrigation and industrial purpose. Therefore, innovativeness in design of STPs should be encouraged so that the treated sewage can be used to meet such demand on case to case basis.

Presently under the NRCP, schemes for catchment area treatment, works to secure environmental flow are not eligible for funding. However, there are Schemes of other ministries under which these schemes could qualify for funding. Hence preparation of such schemes will help in taking advantage of programmes of other ministries and their agencies. However, a judicious view on discharging back to river or for reuse may have to be taken depending upon river flow

#### 1.3.15 Degrees of Treatment Linked to Availability of Fresh Water in the River

The level of treatment and the quality of effluent of the STP should be determined, taking into account the quantity and quality of fresh water available in the river for dilution so that after mixing of effluent the quality of river water satisfies the prescribed standards for the best designated use. Therefore, instead of a uniform level of treatment the approach of varying level should be followed. There should also be emphasis on augmenting flow in the river.

#### 1.3.16 Preparation of FRs and DPRs

The state project management unit may identify the specific agency that will deal with a particular source of pollution. A suggestive list of agencies that may deal with different types of schemes is provided in the chapter on project management and institutional issues. These agencies will prepare FRs and DPRs of schemes assigned to them. Their FRs and DPRs should be put together in to an integrated project. Since they may be examined by different officers, they need to be in different volumes – one volume for one scheme.

In order to improve scientific and engineering designs and planning the following are necessary:

- i. Good quality digital maps on GIS platform
- ii. Softwares for project planning and design.
- iii. Suitably educated, trained and experienced manpower with necessary professional expertise.

### 1.3.16.1 Sewer System

The sewer districts should be so configured that long trunk mains and number of pumping stations are reduced to the minimum. For this purpose options of centralised and decentralised systems should be worked out and evaluated.

### 1.3.16.2 Sewage Treatment Plants

The NRCD has published a document in 2009 “Compendium of Treatment Technologies” in which the technologies have been evaluated on

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

Depending on the desired water quality of the effluent of the STP, scope of recycling/reuse, land requirement vis-a-vis availability, availability of electricity, funds available, and technology that appears feasible should be selected using the matrix given in compendium of treatment technologies (<http://moef.nic.in/modules/recent-initiatives/NGRBA/Final%20Compendium.pdf>).

The STPs are to be designed on the basis of actual measurement of waste water flow in drains and projecting the same as per the design period of the component.

### 1.3.16.3 Appraisal of Projects:

Projects submitted for financial assistance to the NRCD/NGRBA or other funding agencies are liable to be appraised by independent institutes/experts. This will enhance quality of DPRs in addition to cost optimisation. Any likely loopholes in planning and designing of projects will also be plugged through such appraisals.

### 1.3.17 Flow Chart

A flow chart has been introduced in the guidelines which mention processes involved in the preparation of the DPR and the time expected to be taken in each. In other words it mentions the main activities of the agencies/institutions involved in the preparation of the project reports and the time likely to be taken in each activity. The Flow Chart is attached as Figure 1 in chapter 22.

### 1.3.18 Public Awareness and Public Participation

Stakeholder consultation at the stage of formulation of CSP and of Feasibility Report of the project has been provided to ensure active involvement of various stake holders and the civil society to generate support as well as belongingness and ownership of assets. Much greater involvement of stakeholders and their ownership of the project is called for. The revised guidelines deal with this issue. Introduction of “river festivals” and “river runs”, under public participation activities, have also been included. DPRs of component Schemes do not have provision for this item. For each component scheme, a plan of public awareness and public

participation should be made, expenditure of which should be met from this allocation.

### **1.3.19 HRD and Capacity Building**

Emphasis has been laid on education in various domains of knowledge, the required training and experience, capacity building in all organisations associated with the river conservation programme.

Particular attention should be given to capacity building and HRD in ULBs to enhance their technical and financial capability in the implementation and O&M of projects, as they are to finally take over the assets. So, their capacity building will boost the success of the programme.

DPRs of component schemes do not have provision for this item. For each component Scheme, a plan of HRD and capacity building should be made, expenditure of which should be met from this allocation.

### **1.3.20 Operation and Maintenance**

Funds required for operation and maintenance for the first 5 years is required to be inbuilt in the project cost to overcome initial hindrances likely to be faced by ULBs/ States. It will ensure unhindered O&M of assets, which is necessary for achieving the improvement in the river water quality.

### **1.3.21 Memorandum of Agreement (MoA)**

There is to be a tripartite MoA among ULB, State Government and the MoEF that provides a framework of commitments by all stake holders for successful implementation of the programme and proper O&M of assets. A copy of the MoA is given as Annexure 4.

### **1.3.22 Monitoring and Evaluation:**

Provision for third party inspection has been made to strengthen capacity of the state government and state implementing agency to monitor the physical progress of projects during preconstruction, construction, commissioning and trial run and post construction. A copy of the relevant notification is attached as Annexure 5.

The DPRs of component schemes do not have provision for this item. For each component scheme, a plan of monitoring and evaluation should be made expenditure of which should be met from this allocation.

### **1.3.23 Flexibility in the methodology of preparation of CSP, FR AND DPRs**

These guidelines provide a broad frame work of and the methodology of preparing the city sanitation plan, feasibility report and the DPR. Circumstances may vary from place to place and for a given river and a source of pollution. Therefore, various activities contained in these guidelines should be carried out in a manner that is best suited to the local conditions within the broad framework of these guidelines.

### 1.3.24 Inclusion of Schemes for Management of Municipal Solid Waste affecting river water quality

Different types of solids and solid waste may also contribute directly to river pollution in a significant manner. Therefore, one of the component schemes should include measures for dealing with that part of solid waste that directly contributes to river pollution.

### 1.4 CENTAGE ON PROJECT COST

According to the present practice, a centage of 8% of the project cost is admissible. This issue has been examined with reference to the practice followed by CPWD (Reference of CPWD Works Manual 2007 <http://cpwd.gov.in/newsitem/latestnews/pdf/Final-WorksManual.pdf>). It is proposed to revise the centage as given in the table below:

**Table 1.1: Table showing details of Centage**

S. No.	Item	Provision by NRCD/MOEF	Provisions in CPWD manual	Recommended percentage <sup>+</sup>
1	2	3	4	5
<b>I</b>	<b>Preliminary (Enabling Works)</b>			
	Preliminary work :- surveys, investigations, report preparation, tender documents, hiring specialist, training, education, capacity building, computer software & hardware, computer consumables	3.00	charged as a separate item	3.00
<b>II</b>	<b>Establishment &amp; Supervision</b>	-	<b>6.50</b>	<b>6.75</b>
<b>III</b>	<b>Special T&amp;P</b>	<b>1.00</b>	<b>*0.50</b>	<b>1.00</b>
<b>IV</b>	<b>Audit &amp; account Charges</b>	1.00	0.25	0.25
<b>V</b>	<b>Contingency</b>	3.00	Charged directly to works under each item of works and is 3%	3.00
	<b>Total</b>	<b>8.00</b>		<b>14.00+</b>

\*The indicated rates of tools and plants are exclusive of the cost of special tools and plants, the cost of which will be charged to the estimates of the works.

+ Subject to the approval of NRCD



## 1.5 ADDITIONAL FEATURES

River Ganga has been given the status of National River and the National Ganga River Basin Authority has been constituted. The Authority has both regulatory and development functions. The Authority is to take measures for effective abatement of pollution and conservation of the river Ganga in keeping with sustainable development needs including activities such as development of a river basin management plan, maintenance of minimum ecological flows in the river Ganga, among others.

Basin management plan of River Ganga is currently being developed. Specific features of projects that will come up in the basin, as distinct from those under the NRCP, will be known only after the Basin Management Plan has been prepared, has been considered by the NGRBA and new guidelines are issued. Till then these guidelines will apply to projects in the Ganga basin also.

Based on Ganga River Basin Management Plan, certain additional features may have to be adopted in these guidelines in due course.

## CHAPTER - 2

# COLLECTION OF DATA

### 2.1 INTRODUCTION

As stated in Introduction, preparation of Detailed Project Report for pollution abatement is a three step process, namely, City Sanitation Plan (CSP), Feasibility Report (FR), followed by the Detailed Project Report (DPR). This chapter deals with collection of data required for preparing all these reports. Some states have already started preparing CSPs. Where available, these CSPs should be used. If necessary, they may be updated and if there are any gaps in relation to the river pollution abatement works, these should be filled up.

Preparation of CSP is to precede the FR and is to be the basis for preparing the DPR. It follows, therefore, that it should be prepared on the basis of available data (Primary / Secondary Data) that has been generated by the concerned agencies and primary data may also be required. Feasibility Report will identify the problem of pollution, develop and evaluate the various options and select the best that is cost effective and sustainable and produces the intended outcome.

After selection of a city on the basis of data collection, it is necessary to prepare a CSP, FR of sewerage schemes and then a DPR. The DPRs of non-sewerage schemes can be prepared straight after the preparation of CSP. For preparing the DPR, additional data may be needed, which may have to be generated by undertaking suitable survey and investigation (primary data).

In this chapter, the guidelines deal with collection of primary and secondary data.

### 2.2 DATA REQUIRED AT DIFFERENT LEVELS

The data needs to be gathered at several levels as below:

- i. Drainage basin of the river, in which polluted stretches have been identified and in respect of which the pollution abatement project is to be prepared. This will help to identify the priority for taking up pollution abatement works to improve the river water quality.
- ii. The town which is causing pollution of the river and for which an integrated project is to be prepared for abatement of pollution from waste water and solid waste. A town may have to be divided into a number of sewerage districts for getting optimal results and data gathered should meet this need. In case some data mentioned below is not available, it may be stated at the appropriate place. However, DPR should integrate all the data provided by agencies concerned for pollution abatement.

### 2.3 DATA RELATED TO DRAINAGE BASIN

It is beneficial for the planner to have an understanding of the river basin as every activity undertaken at any point in the basin has implications for the river as a whole, though more often on the downstream side. It is, therefore, necessary to identify activities and their impact on the river. Relevant data must be collected and analysed so as to assign priority to towns for taking up pollution abatement works. Data that needs to be collected is mentioned below.

While information on catchment may be beneficial to assess the overall pollution load, the DPR may focus on information pertaining to the area within the municipal boundary of the town.

### 2.3.1 Drainage Basin Map

A map of the basin on 1:50,000 scale SOI topographical sheet showing the following features:

- a) Drainage map marking the catchments of
  - i. Tributaries,
  - ii. Main stem and
  - iii. Existing water bodies
- b) Cities / Town in the basin with
  - i. River water quality being below the desired level
  - ii. Cities with cultural, social and tourism importance
- c) Recent Land Use, if available, from State Remote Sensing Centre
  - i. Agriculture,
  - ii. Forests,
  - iii. Mining
  - iv. Industrial areas
- d) Sites from where samples for testing water quality were drawn by the CPCB/SPCB.
- e) Sites of abstraction of water - dams and diversion works
- f) River gauging sites
- g) Flood plain
- h) Identified river fronts needing development and management and removal of encroachment.

### 2.3.2 Geography

- i. Latitude, Longitude of the town
- ii. Physical features and natural resources
- iii. General topography
- iv. Any other important information

### 2.3.3 Climate

- i. Rainfall:
  - Average annual rain fall
  - Average rainfall during monsoon
  - Maximum rainfall in a day
  - Number of rainy days
- ii. Temperature:
  - Maximum and minimum in
  - Summer
  - Monsoon,

Winter.

### 2.3.4 Population

It should include towns

- i. With significant population causing pollution
- ii. Where river water quality is below that prescribed for the Best Designated use.
- iii. With cultural, social and tourism importance

Information may be presented in the table below

**Table 2.1: Table showing population of Towns in the River Basin**

Town	Male	Female	Total
Urban			
Town 1			
Town 2			
Town 'n'			
Rural			

### 2.3.5 Cultural and religious significance of the river, its basin and cities located on its bank

Briefly describe significance of the river, the basin and cities on its bank so as to bring out the importance of conservation of the river and reasons why it should be protected from the pollution caused by the waste water of major cities.

### 2.3.6 Hydrological

Hydrological data as below

- i. Discharge figures of river, tributaries and streams.
- ii. Average dry weather flow in the river. These may be obtained either from CWC or Irrigation Departments. Where such data is not available, efforts may be made to assess the flow on the basis of river cross-section/ wetted perimeter, depth, velocity etc.
- iii. Storage capacities of dams, barrages, etc. if any
- iv. Discharge capacity of diversion works
- v. Quantity of water abstracted at various sites for irrigation, industry, human consumption, particularly up stream of the town concerned.
- vi. Morphology and hydrology of the river.
- vii. Quantity of ground water abstracted within the town.
- viii. Ground water levels in different blocks.

### 2.3.7 Industrial Waste

Information about industrial effluent may be provided in the following table

**Table 2.2: Information about Industrial Effluents**

Areas	Quantity of water used mld	Effluent Generated mld	Industrial effluent satisfies standards Yes/ No	Proper Industrial SWM –Yes/No
*Industrial Area				
*Major Industrial Units				
*Grossly polluting units				
*Mining Areas				
Others				
Total				

\*In case of more than one area/unit give information in additional rows unit wise

### 2.3.8 Sampling Locations for River Water Quality

Water quality data at following locations may be obtained

- At confluence of major tributaries, upstream and down stream, as is available with SPCB / CPCB
- At points where industrial effluent is discharged in to the river or streams in the basin
- At each city –upstream and downstream of the city, and
- At other important locations of the river such as bathing ghats.

### 2.3.9 Polluted stretches of rivers in the States/NGRBA:

List of polluted stretches published by the CPCB may form the basis for selection of town / river (Annexure 6).

In case CPCB data is not available in respect of any city but it is felt that the river water quality is unacceptable, water quality may be tested and if found unsatisfactory, pollution abatement project may be prepared in accordance with these guidelines.

**Table 2.3 Designated-Best-Use Class of water Criteria**

Source: CPCB

Designated Best Use	Class of Water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	<ol style="list-style-type: none"> <li>Total coliforms organism MPN/ 100ml shall be 50 or less</li> <li>pH between 6.5 and 8.5</li> <li>Dissolved oxygen 6mg/l or more</li> <li>Biochemical oxygen demand 5 days 20°C 2mg/l or less</li> </ol>
Out door bathing	B	<ol style="list-style-type: none"> <li>*1. Total coliforms organism MPN/100 ml shall be 500 or less</li> <li>pH between 6.5 and 8.5</li> <li>Dissolved oxygen 5mg/l or more</li> <li>Biochemical oxygen demand 5 days 20°C 3mg/l or less</li> </ol>

Designated Best Use	Class of Water	Criteria
Drinking water source after conventional treatment and disinfection	<b>C</b>	<ol style="list-style-type: none"> <li>1. Total coliforms organism MPN/100 ml shall be 5000 or less</li> <li>2. pH between 6 to 9</li> <li>3. Dissolved oxygen 4mg/l or more</li> <li>4. Biochemical oxygen demand 5 days 20oC 3mg/l or less</li> </ol>
Propagation of Wild life and Fisheries	<b>D</b>	<ol style="list-style-type: none"> <li>1. pH between 6.5 to 8.5</li> <li>2. Dissolved oxygen 4mg/l or more</li> <li>3. Free ammonia (as N) 1.2 mg/l or less</li> </ol>
Irrigation, Industrial Cooling, Controlled Waste disposal	<b>E</b>	<ol style="list-style-type: none"> <li>1. pH between 6.0 to 8.5</li> <li>2. Electrical conductivity at 25oC micro mhos/cm Max.2250</li> <li>3. Sodium absorption Ratio Max. 26</li> <li>4. Boron Max. 2mg/l</li> </ol>

\*The NRCD norms are: Fecal coliform < 500 MPN/100ml (desirable), 2500MPN/100ml (max permissible)

### 2.3.10 Biological Parameters

As far as possible information on biological indicators may be provided.

## 2.4 TOWN RELATED DATA

### 2.4.1 Maps Related to City

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

- i. Important land marks of the city
- ii. Rivers and their flood plains
- iii. Other water bodies
- iv. River banks where solid waste is dumped
- v. Drains, and their respective outfalls and catchments (drainage areas)
- vi. Streets and surface / underground 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. Water supply system – Including intake points and ground water.
- xv. Places used for open defecation
- xvi. Community toilets
- xvii. Sewers in each drainage area with diameters and invert levels with junctions of sewers, if existing.
- xviii. STPs and sewage pumping stations, if existing.
- xix. Crematoria

- xx. River front (ghats) developed in the past
- xxi. Sites on river banks for cattle wallowing, dhobi ghats, washing of motor vehicles and carcasses are dumped
- xxii. Garbage dumping sites including land fills
- xxiii. Bio-medical waste treatment facilities
- xxiv. Ground levels and contours
- xxv. Pollution abatement works carried out in the past

#### 2.4.2 Land Use, Contour, Drainage and Other Thematic Maps

The themes related to which the maps should be prepared are mentioned in the previous section. At the stage of preparing FR, the maps of SOI, ULB and State Remote Sensing Agency may be used. However, at the stage of DPR, it may be useful to use most recent satellite imagery, data and maps. Contour maps at appropriate interval will be needed for which survey may have to be done.

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

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.

Latest preparation tools/software like GIS, CAD, satellite imageries etc. may be used for preparation of maps. 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 finalising appropriate sewerage routes without disturbing other civic utilities.

#### 2.4.4 Population of the Town

Population of the town should be provided in the following tables

**Table 2.4 Population of the town during the last five 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						

**Table 2.5 Ward wise details may be provided in the following table**

Ward no		1971	1981	1991	2001	2011
1	Population					
	No of houses					
2	Population					
	No of houses					
n	Population					
	No of houses					

**Table 2.6 Slums population and households in each ward Latest census**

Ward No	Slum no.	Slum name	Population in the latest census	No of households	Mode of Water supplied Piped, hand pump, none	Toilets or Open defecation	Drain into which waste water flows
1							
n							

#### 2.4.5 Status of Wastewater Management Works Undertaken or Already Implemented in the Past

In the past some works related to pollution abatement and management of waste water may have been implemented, for which the following details may be collected.

- i. Year of installation/commissioning
- ii. Designed capacity/performance
- iii. Present Performance and O&M details
- iv. Details of existing sewered areas along with branch, lateral and trunk sewers
- v. Sewage Treatment Plants
- vi. Year of installation/commissioning
- vii. Designed capacity

Unsewered areas housing low-income groups are serviced by 'pit latrines' or septic tanks at individual household/ community levels. Overflows from septic tanks are discharged into the river through open drains. These areas are to be marked on the map. These facilities are to be synchronised / dovetailed with the proposed scheme

#### 2.4.6 Status of River

- i. Purposes for which river water is being used
  - a. Drinking
  - b. Irrigation
  - c. Industry
  - d. Navigation
- ii. Water Quality

The programme aims at improving the river water quality to the desirable standards. CPCB has



classified all inland waters in five categories according to the designated best use class. The designated best use as well as actual quality of river water should be reported. For actual baseline data, water quality should be analysed at upstream and downstream points of the city as also downstream points of major outfalls. Water quality analysis should take into account all the parameters prescribed by CPCB/SPCB in their formats. This 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 of water quality should be from completely mixed zone to represent accurate impact

Water quality of the river and drains may be presented in tables such as given below:

**Table 2.7: Water quality of River / Drain**

Parameters	Result									
	Upstream		Downstream		Out fall 1		Out fall 2		Outfall n	
	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range	Avg.	Range
pH										
SS (mg/l)										
TDS (mg/l)										
BOD (mg/l)										
COD (mg/l)										
Cl (mg/l)										
Total coliform, MPN/100 ml										
Fecal coliform, MPN/100 ml										
*Saprobity index										
#Diversity Index										
@P/R Ratio										
Fish etc										

\*Saprobity Index: Numerical estimation of pollution of organic matter, from 0–4.

#Diversity Index: Diversity index is a statistic which is intended to measure the biodiversity of an ecosystem.

@P/R Ratio: **production/respiration ratio (P/R ratio)** The relationship between gross production and total community respiration. Where P/R = 1 a steady-state community results. If P/R is persistently greater or less than 1 then organic matter either accumulates or is depleted respectively

#### 2.4.7 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.

#### 2.4.8 General Information

- 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. Master plan of development of the city, Obtain if there is one.
- xi. City development plan or city sanitation plan prepared under JNNURM, if it has been prepared, should be obtained.
- xii. Project reports of development works in the city executed, under execution and proposed for future in the following sectors should be obtained.
- xiii. Slum population and their development/rehabilitation plan.
- xiv. Present sewerage management and SWM system.

#### 2.4.9 Discharge carried by drains and Water Quality

A note on the number of drains, state of drains, discharge carried by them, along with the location points of outfall water should be prepared. Discharge in these drains should be measured in dry weather and their water quality (nine sewerage parameters viz., pH, temperature, conductivity, DO, nitrite and nitrate nitrogen, BOD, fecal and total coliform and any other parameter considered significant for the city) should be tested in dry weather.

Samples for testing water quality should be composite and flow proportional taken once a week for diurnal variation on hourly basis. Considering a four-week month, three samples are to be taken on weekdays, whereas the fourth sample is to be taken 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. Actual present flows should be measured at the point of outfall into the water body, which could be either through open drains or pumping stations.

This information may be provided in the following table:

**Table 2.8: Discharge Carried by Drains**

Drain no.	Drain name	Starting point	Outfall point	Length, km	Measured flow	Population
1						
2						
n						

**Table 2.9: Waste water characteristics of Drains.**

Parameters	Monitoring Sites of Drains								
	1	2	3	4	5	6	7	8	9
pH									
TSS (mg/l)									
VolatileSS (mg/l)									
BOD (mg/l)									
COD (mg/l)									
Cl (mg/l)									
Nitrogen mg/l									
Phosphorus mg/l									
Fecal ColiformMPN/100ml									

### 2.4.10 Water Supply

Sources of present supply of water should be provided in the table below

**Table 2.10: Status of Water Supply**

#### i. Present Status

Sources of Water Supply	Quantity				
	Drainage Area 1	Drainage Area 2		Drainage Area n	Future Projection
River (Describe source)					
Tubewells (mention nos. and average depth of tubewells in the area)					
Hand Pumps					
Others (mention)					
Total					
Present population					
Population covered by water supply					
Per capita water supply					
Present hours of water supply					

#### ii. Plans for Augmentation of Water Supply

Approved plans, if any, for augmentation of water supply in the future JNNURM or State Plan, should be indicated so that these are appropriately considered for designing Sewerage systems and STPs. The following information may be provided.

**Table 2.11 Plans for Augmentation of Water Supply**

Drainage Area	Name of project	Date of sanction	Date of completion	Quantity of water	Future Projection for water requirement

### 2.4.11 Present Waste Water Disposal Systems

**Table 2.12: Details of Present Waste Water Disposal System**

Waste Water Disposal	Quantity			Impact	Plan for renovation
	DA 1	DA 2	DA n		
Sewers without STP Km					
Sewers with STP Km					
Houses connected to sewers (Number)					
Houses not connected (Numbers)					
Septic tanks (Numbers)					
Community Toilets (No)					
Places of open defecation(No)					

\*DA stands for Drainage Area

**Table 2.13 State of Sewer System (Drainage Area Wise)**

DA	Particulars	Operational Yes or No	Qty. kms	Date of installation	Condition of assets	Operating agency
	Sewers					
	Intermediate sewage pumping stations					
	Main pumping stations					
	STPs / Location					
	Location / Installed Capacity, mld / Process					
	Others, if any					

\*DA stands for Drainage Area

**Table 2.14: Details of existing STPs**

S.No	STP	DA1	DA2	DAn
1	Location (DA or ward)			
2	Operational Yes or No			
3	Process			
4	Installed Capacity, mld			
5	Current Capacity, mld			
6	<b>Wastewater influent design Parameters</b>			
	BOD, mg/l			
	TSS, mg/l			
	Fecal coliform			
7	<b>Effluent wastewater design Parameters</b>			
	BOD, mg/l			
	TSS, mg/l			
	Fecal coliform			

S.No	STP	DA1	DA2	DAn
8	<b>Influent wastewater actual Parameters</b>			
	BOD, mg/l			
	TSS, mg/l			
	Fecal coliform			
9	<b>Treated water Parameters</b>			
	BOD, mg/l			
	TSS, mg/l			
	Fecal coliform			
	Over all 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			

Procedure laid down in Compendium of Sewage Treatment, Published by NRCD may be used (<http://moef.nic.in/modules/recent-initiatives/NGRBA/Final%20Compendium.pdf>)

#### i. Accompanying Information

The above table should be accompanied with notes covering the following points

- i. Any important aspects not covered in the table
- ii. Localities/wards covered with 'pit latrines'/ septic tanks with number of houses and population covered
- iii. Localities/wards covered with sewer- system from the street to the drains and finally to the river.
- iv. No of houses connected to the sewer system
- v. No of houses not connected to the sewer system
- vi. State of maintenance of the sewer system-every component of the system including sewers, pumping stations – electromechanical equipment , civil works - should be commented on, including date of installation, designed capacity, performance, need to repair, renovate, modernise, increase capacity, replace.
- vii. STPs – their location, capacities, year of installation, designed and current performance, need to repair, renovate, modernise, increase capacity, replace any component or the system as a whole, their impact on river water quality and O&M details.
- viii. Description and state of maintenance of each major component of the system in localities not having toilets
- ix. State of Public toilets and the works required to be done to bring them to a state where they can perform their expected functions
- x. Localities that do not have domestic / community toilets, thus leading to open defecation. Remedial measures required.
- xi. Details of private housing projects with sewerage facilities

## 2.5 NON POINT SOURCES

### 2.5.1 Community Toilet Complexes

The following information be compiled drainage area wise in the table below

**Table 2.15 Details of Existing Toilets Facilities**

Drainage Area Name	Dwelling units without toilets	Community Toilet complexes		Dwelling units with dry pit latrine	Dwelling units with septic tanks	Dwelling units with access to sewer	
		Number	Toilet seat numbers			Connected to sewer	Not connected

For gathering the above information, a survey may be undertaken.

Details of activities already taken up under similar sanitation programme of the Social Welfare Department and other state agencies

Impact of existing sanitation works may be worked out on the basis of

Number of persons using it daily

Discharge points

User charges collected daily etc.

### 2.5.2 Crematoria

The following information may be provided

**Table 2.16: Details of Existing Crematoria and Projections**

Drainage Area	No of crematoria complexes		No of bodies cremated daily	Projection for additional requirement
	Wood based	Electric		

Impact of cremation on saving in wood requirement be worked out on the basis of bodies cremated in the existing crematoria.

### 2.5.3 Dairies

**Table 2.17: Details of Dairies**

Drainage Area	Total no of cattle	No of big dairies	No of cattle in big dairies	*Quantity of excreta D.M.
1				
2				
N				

\*D.M stands for dry matter in excreta @ 5 kg per head

- i. Quantification of dairy waste
- ii. Present locations and disposal points to be marked on the city plan

#### 2.5.4 Dhobi Ghats

- i. Number locations to be marked on the city plan
- ii. Number of dhobis in each ghat,
- iii. Details of alternate sites, if proposed

#### 2.5.5 Motor Garages

The information to be collected for each drainage area or ward

- i. number and their locations on the city map
- ii. quantification of washing from garages
- iii. average number of vehicles being washed per day
- iv. disposal sites of washing may be marked on the city map
- v. sites reserved for the activity in the Master Plan

#### 2.5.6 Cattle wallowing

**Table 2.18 Details of Cattle Wallowing**

Location Name	No of cattle that wallow	Remarks

#### 2.5.7 Carcass Disposal

**Table 2.19: Details of Carcasses disposed of**

Location Name	No of carcasses disposed of/day	Remarks

Location wise number of carcasses disposed of per day

Sites reserved for carcass disposal.

Prior to taking up any project for river conservation, both cattle wallowing and carcass disposal in the river must be banned.

#### 2.5.8 River front facilities

- i. Identification of river ghats being used for bathing.
- ii. Status of existing bathing ghats
- iii. Requirement of new bathing ghats
- iv. Impact of existing ghats be worked out

### 2.5.9 Solid Waste Management

- i. Ward wise solid waste generation and disposal, brief description of the system including information such as-
  - Quantity generated
  - Number of bins installed
  - Number of collection sites
  - Number and type of transport vehicles for collection and their capacity per day
  - No of disposal sites
- ii. State of maintenance of the system.
- iii. Details of land fills / compost /incineration plants etc.
- iv. Dumping of solid waste in the river be banned by local authority before taking up any project of MSW management.

#### 2.5.9.1 Bio-Medical Waste Treatment Facilities

**Table 2.20: Bio-Medical Waste Treatment Facilities – Existing**

Plants	Location	Capacity	Actual Waste Treated	Remarks

**Table 2.21: Bio-Medical Waste Treatment Facilities- Proposed**

Plants	Location	Capacity	Actual Waste Treated	Remarks - Whether Site reserved

#### 2.1.1 Afforestation

River banks prone to soil erosion may be identified and plotted on the map. Species that will thrive and serve the aesthetic and environmental purposes may be identified in consultation with social forestry officers.

### 2.6 INSTITUTIONAL DETAILS

The institutions performing functions of providing services and performing development functions may be provided in the table given below.



**Table 2.22: Institutional Responsibilities for Civic Services**

Service	Name of institution given responsibility for		
	Planning and design	Construction	O&M
Water supply			
Disposal of wastewater			
House Hold Sanitation			
Solid Waste Management			
Supply of electricity			

## 2.7 STATE OF (ULB – URBAN LOCAL BODY) MUNICIPALITY / MUNICIPAL CORPORATION

This should be provided for the last completed financial year

- i. Municipal government's own resources
- ii. State government grants and loans
- iii. Funding from financing institutions
- iv. Funding from capital market
- v. Central government grants
- vi. Private sector participation
- vii. Cost recovery of services supplied to the people
- viii. Availability of electricity in hours per day during Apr – June, July to September, Oct- Dec, Jan to March

## 2.8 INDUSTRIAL WASTE WITHIN MUNICIPAL LIMITS AND WHOSE EFFLUENT REACHES THE RIVER

Data on grossly polluting industry along with the monitoring plan of SPCB should be presented in the DPR. It would be desirable to mention what data should be incorporated in the DPR Industrial estates – water used, effluent generated, treatment plants installed with their capacities. Solid Waste Generated.

Industrial effluent- sources of generation:

**Table 2.23: Details of industrial Effluent**

DA	Industrial Estate/ Isolated Unit	Grossly polluting or not	Effluent Generated	ETP installed	Capacity	Solid waste Generated	Treatment Facility with capacity
1							
n							

## 2.9 ADDITIONAL DATA REQUIRED FOR COASTAL CITIES

Following data should also be gathered for coastal cities:

- i. Tidal incursion and mangroves
- ii. Coast line

- iii. Coastal district management plan
- iv. Drain wise municipal wards with their areas and population
- v. Salt water intrusion

## 2.10 SOURCE 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. To the extent it is available with him information related to the river for which the project is proposed to be formulated should be incorporated in the FR or CSP.
- 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. Proposed components along with existing works, if any, are to be shown on maps with different colours and legends.
- xii. CGWB / State GWBs; State UDD; NIC cell at State / District level; PHED/Water & Sewerage Board/Authority

## CHAPTER - 3

# SELECTION OF CITY FOR POLLUTION ABATEMENT PROJECT & PREPARATION OF CITY SANITATION PLAN

### 3.1 SELECTION OF TOWNS/CITIES FOR PROJECTS UNDER NRCP/NGRBA

Based on data collected regarding polluted stretches of rivers in accordance with guidelines in Chapter 2 and the information available from CPCB and other agencies, the basin and the river should be briefly described with emphasis on the uses of the river, abstraction of water from it, and change in water quality as the river progresses on its journey. On these stretches a list of towns where the water quality for bathing is (BOD > 3mg/l, DO < 5 mg/l and Fecal coliform > MPN 2500) i.e., worse than the prescribed limits should be prepared. The greater the pollution at a location, higher should be the order in the list of priority. In these towns pollution abatement works under the NRCP should be proposed. However, for NGBRA, all mainstream Ganga towns with significant sewage generation that joins the river will be eligible in accordance with mission clean Ganga.

The Nodal Department of the State Government will prepare and submit projects under river conservation programme.

### 3.2 CITY SANITATION PLAN (CSP)

#### 3.2.1 Objectives of City Sanitation Plan

The objective of preparing city sanitation plan is to formulate in consultation with the local body and other stakeholders, in sectors of wastewater and solid waste management: vision and goal in 5 years, 10 years, 15 years and 30 years and for that purpose to prepare a compendium of schemes necessary to convert the polluted stretch of the river in the state to a stretch of the river having the desired quality of water. CSP should also be linked with CDP, if any, to ensure simultaneous infrastructural growth of the city.

- (a) to give an introduction of the river and its basin in the State,
- (b) to identify all sources of significant pollution of the river in the stretch within the state that needs to be controlled to improve the water quality,
- (c) Identify sources of pollution located in the city/town
- (d) Identify component schemes of a project whose implementation will improve its water quality to the desired level and improve the environment. More specifically, the CSP will help to achieve the following objectives:
  - i. Identify and non-point sources of pollution of the river in a town
  - ii. Assess how the pollution of the river affects the stakeholders.
  - iii. Identify the outcome that the stakeholders expect from the pollution abatement project.
  - iv. Identify the pollution abatement schemes, called Component Schemes, and measures that should be taken to address the issue of pollution and achieve the objective of the improvement of the river water quality to the desired level. Identify for each component scheme the agency that should be given responsibility to handle it and sources of funding.

### 3.2.2 City Sanitation Plan to contain All Schemes Considered Necessary to improve water quality of the river

For many cities city development plans or city sanitation plans have been prepared. Under these plans some works may have been proposed or implemented. They should be taken in to account while preparing the city sanitation plan for pollution abatement of the river.

Schemes to deal with certain kinds of pollution are not funded by the NRCD. These schemes, for example, include solid waste management, industrial effluent and industrial solid waste, biomedical waste and catchment area treatment. Safe disposal of industrial and biochemical waste is legal obligation on those who generate such waste. Schemes for management of solid waste may be eligible for funding under schemes of the Ministry of Urban Development. Therefore, all schemes necessary for reducing pollution of the river whether they are fundable by NRCD or any other ministry or agency should be included in the city sanitation plan. The schemes that are fundable by the NRCD are given below.

### 3.3 TYPES OF SCHEMES FUNDED BY NRCD

The Schemes eligible for funding under the NRCP include

- i. Sewerage schemes
- ii. Non-sewerage schemes
- iii. Other schemes

#### 3.3.1 Sewerage Schemes

Schemes needed for transporting waste water from the source of its generation to the sewage treatment plants namely

- i. Interception and diversion of waste water flowing in to the river
- ii. Treatment of wastewater

#### 3.3.2 Non-Sewerage Schemes

- i. Community toilets for residents who do not have toilets in their own homes.
- ii. Crematoria to check pollution from immersion of partially burnt human bodies.
- iii. River front development to prevent people from using the banks for easing themselves and for beautification
- iv. Management of such solid waste as directly pollutes the river water.
- v. Schemes to check pollution of rivers cattle wallowing, dhobi ghats and washing of motor vehicles.

#### 3.3.3 Other Schemes Related to Pollution Abatement Programme

- i. Human Resource Development, capacity building, training and research in river conservation
- ii. Public awareness and public participation
- iii. Other miscellaneous works depending on the location specific conditions including interface with the human population

### 3.3.4 Schemes that are funded by other ministries/ Departments/ Agencies

- i. Schemes to check pollution from solid waste, carcass disposal
- ii. Plantation to check soil erosion of banks and improve environment
- iii. Schemes to check pollution from dairies, carcass disposal and other waste

## 3.4 CONTENTS OF CITY SANITATION REPORT

### a) Data

It should contain maps and all secondary data and mentioned in chapter 2 relating to

- i. River basin and
- ii. Town proposed to be covered in the NRCP.

### b) Estimation of pollution source wise and proposed schemes

The following information should be included, source of pollution wise:

- i. Every source of pollution should be identified.
- ii. The extent of pollution that it causes should be identified to the extent possible.
- iii. Approach to dealing with the source of pollution
- iv. The degree to which the pollution from the source needs to be controlled
- v. The agency to which the responsibility to prepare the project report of the scheme and subsequently implement has been allocated.
  - Implementing agency
  - ULB
  - Agency other than the above two
- vi. The details of the scheme including the system and its components proposed to be installed
- vii. If the scheme is eligible for funding by NRCD. the kind of Scheme to which it belongs
  - Sewerage schemes
  - Non sewerage schemes
  - Other schemes
- viii. If the scheme is not eligible for funding, the potential agency that may fund the project
- ix. The impact the implementation of the scheme is likely to make on the river water quality i.e., the improvement expected from the implementation of each scheme.
- x. Broad cost of the scheme

**Note:** Guidelines on preparing DPRs on various sources of pollution are contained in various chapters of these guidelines. For preparing the details of schemes to be provided in the city sanitation plan, to the extent possible, based on available data, the needed details should be worked out.

## 3.5 ABSTRACT OF SCHEMES

An abstract of schemes included in the CSP should be presented in the following tables.

**Table 3.1 Schemes within the area of responsibility of government or public agencies**

Name of Scheme	Implementing Agency	Likely Agency	Funding
Interception and diversion of waste water	PHED or any other agency implementing such projects in the State	NRCD	
Sewage treatment	Do	NRCD	
Community toilet complexes	ULB	NRCD	
Crematoria	ULB	NRCD	
Municipal solid waste directly polluting river water	ULB	NRCD	
Other municipal solid waste management	ULB	MOUD	
Dairies	ULB	MOUD and MNRE (energy generation)	
Other non-point sources e.g., washing vehicles, dhobi ghats etc	ULB	MOUD	
River front development	Irrigation/water resources	NRCD	

**Table 3.2 pollution that needs to be curbed through regulation and development**

Type of pollution	Regulating Agency	Development Work
Industrial effluent	SPCB	Common effluent treatment plants
Industrial solid waste	SPCB	Encourage them to create disposal facility
Bio-medical waste	SPCB	Promote establishment of facility to dispose of bio-medical waste
Open defecation	ULB	Establish community toilet complexes
Dairy waste	ULB	Promote establishment of dairies at proper locations with facility to generate energy and compost
Washing vehicles, dhobi ghats etc	ULB	Create alternative facilities

### 3.6 APPROVAL OF CITY SANITATION PLAN

The PMU in the district or the concerned city should submit the CSP to the SPMU who will forward it to the NRCD. This plan, as approved, should form the basis of preparation of feasibility report of sewerage schemes and the DPRs of non sewerage and other schemes.

## CHAPTER - 4

# PREPARATION OF FEASIBILITY REPORT OF SEWERAGE SCHEMES

**4.1** It has already been stated in chapter 1 that for non sewerage schemes, feasibility reports (fr) are not required and the DPRs may be prepared after the CSP has been approved. For sewerage schemes, feasibility reports need to be prepared for which the guidelines are given below.

### **4.2 OBJECTIVES OF FEASIBILITY REPORT (FR)**

The objective of preparing a feasibility report is to identify, from amongst a number of feasible options, sewerage scheme of a project whose implementation will reduce pollution of the river and improve its water quality to the desired level. More specifically, the feasibility report will help to achieve the following objectives:

- i. Identify all point sources of pollution of the river in a city
- ii. Assess how the pollution of the river affects the stakeholders. .
- iii. Work out details of all feasible alternative systems to address the issue of pollution and achieve the objective of improvement of river water quality. The alternatives are worked out to the level of detail that enables the comparative evaluation of alternatives and identification of the optimal system.
- iv. FR would facilitate to prepare a workable or implementable plan.
- v. All possible hindrances such as from public resistance, siting of major industries, environment and social concerns may be eliminated through option analysis at FR stage.

### **4.3 DEVELOPING OPTIONS FOR SEWERAGE SCHEMES**

The approach should be based on centralised as well as decentralised collection and treatment of sewage.

#### **4.3.1 Utilising an existing system**

In drainage areas and districts where there is an existing system of waste water management, which appears capable of being repaired, refurbished, upgraded and modernised, the feasibility of augmenting to a degree that the waste water satisfies the prescribed standards by the time it reaches the river should be examined. Every component of the system should be evaluated as to its designed performance, present performance, designed capacity and present capacity and useful life left. If it is found that the system can be brought to a satisfactory state and will be sustainable, items of work that are needed should be identified and details worked out and costs estimated.

#### **4.3.2 Covering the Area With Sewer Network**

Under this system the drainage district is covered with sewers and every house is connected to the sewers.

- i. Centralised System  
The wastewater is conveyed to a centralised STP 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

ii. Decentralised System

Waste water of each sewerage district is carried in sewers or in drains or partly in sewers and partly in drains to a treatment plant designed for that district which constitutes a decentralised treatment system. In the decentralised approach, the Sewerage District could be small envisaging collection, treatment and disposal of wastewater in the neighbourhood itself involving smaller quantity of wastewater.

A decentralised system could result in drastically curtailing the length and diameters of trunk sewers, in reduction of depth at which the sewers should be laid and in reducing the number of places where IPS should be installed. This may reduce the capital cost.

#### 4.3.3 Using Open Drains in Areas Having Septic Tanks

Some Drainage Areas may have septic tanks. The effluent from the septic tank is partially treated and could satisfy conditions for being permitted to flow in open drains. Further conveyance and treatment is open to options as below:

- i. It can be allowed to flow from open street drains to storm water drains. Before drains joins the river, the waste water can be taken to a STP for being treated.
- ii. A network of sewers is laid so that effluent from septic tanks and other waste water is carried in them to a STP for treatment.
- iii. For drainage areas that do not have septic tanks, sewers will need to be laid and houses connected to carry wastewater through a hierarchy of drains to a STP. It has then to be handled as discussed above.

4.3.4 The status of wastewater management system in the city may be presented in the following table. Where necessary a note stating the status of the component, its performance against the designed performance and whether it should be repaired, refurbished or modernised, should be appended.

**Table 4.1: Existing Status of Waste Water Management**

Sewage Districts	Drainage Area Name and number of drains in the district	Sewerage Districts covered with sewers and STP		Sewerage Districts Not Covered With Sewer and STP		Remarks
		State of Sewers	State of STP	Septic Tank	Discharge of waste water in street drains	

#### 4.4 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 utilisation of assets, a modular approach may be followed for these facilities.



The year of expected commissioning of the project shall be taken as the base year for design of various components of all projects. Design periods of various components may be adopted as given below:

**Table 4.2: Design Periods**

S. No.	Component	Design Period (Yrs)	Remarks
1	Land acquisition	30	Land will be required to add STP modules later. Accordingly, land should be acquired
2	Sewerage Network	30	
3	Pumping Stations - civil works	30	Cost of civil works is economical for full design period.
4	Pumps & Machineries	15	Considering modular approach
5	STP	10	Construction may be done with a modular approach in a phased manner as the population grows.
6	Rising mains	30	In case of low velocities, dual rising mains to be examined
7	Effluent disposal & Utilities	30	Provision of design capacities in the initial stages itself is economical

## 4.5 FUTURE POPULATION

### 4.5.1 Design Population

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

### 4.5.2 Population Projections

For each sewerage district, population should be collected from census records for the years 1971, 1981, 1991, 2001, 2011. In case ULBs are established after 1971, respective rural population of the geographical boundary of the ULB should be considered for this purpose.

The base year shall be taken as year of completion of the project. 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:

- (i) Arithmetical increase method
- (ii) Incremental increase method
- (iii) Geometrical increase method
- (iv) Simple graphical projection method
- (v) Semi-Log graphical method
- (vi) Ratio method
- (vii) Land use and future density method - This shall also 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 giving proper justification for the same.

#### 4.6 SEWERAGE MASTER PLANNING / SEWERAGE DISTRICTS

Master plan of the city shall be prepared for sewerage, if not prepared earlier. Considering the topography and geographical features, ridge lines, alignment of drains, railway tracks, major roads, national highways, encroachments, quicker construction and commissioning of works and availability of land for SPS and STP etc., the whole city shall be divided into a number of sewerage districts. Attempt should be made to avoid long sewers, as sewers will not be required to be laid at large depths and also intermediate pumping stations would be avoided or reduced. To the extent possible, pumping should be avoided. This may entail a larger number of small STPs as against large STPs but fewer in number.

The design of works in these districts shall be carried out in an integrated manner taking into consideration the most optimum options from techno-economic perspective with respect to interception of waste water, alignment of sewers, sewage pumping stations and sewage treatment plants etc. Topography of the area, gradient, obstructions, etc. shall be taken into account while planning the interception and diversion of waste water of the contributory areas.

#### 4.7 RATE OF WATER SUPPLY

According to the guidelines of Government of India, which are applicable all over the country, following water supply rates are to be adopted.

**Table 4.3: Recommended Per Capita Water Supply Levels for Designing Schemes**

S. No.	Classification of cities	Recommended Maximum Water Supply Levels (lpcd)
1	Cities 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.
4. However, the actual rate of supply of water should be supported with availability of water in the town.

#### 4.8 STATUS OF EXISTING WATER SUPPLY

It shall be ensured that the existing water supply or under execution, has the potential to meet the water demand of the projected design population at the rate specified in the above table. DPR shall not be approved unless assurance to this effect is received.

#### 4.9 PER CAPITA SEWAGE FLOW

The observed dry weather flow reaching the sewer system is less than that of the per capita water consumption due to loss of some water in leakage and evaporation. Generally, 80% of water supply is expected to reach the sewer system. For calculating the water consumed, the ground water extracted should also be added to the piped water supply.

#### 4.10 GROUND WATER INFILTRATION

As per guidelines laid down by GoI, suggested estimates for ground water infiltration for sewers laid below ground water table are:

**Table 4.4 Ground Water Infiltration**

Infiltration	Minimum	Maximum
Liters/km/d	500	5000

With improved standards of workmanship and quality and availability of various construction aids, these values should tend towards the minimum, rather than the maximum. These values should not mean any relaxation on the water tightness test requirements.

#### 4.11 RIVER WATER QUALITY

##### 4.11.1 Water Quality Standards for Rivers

Water Quality Standards for rivers as per CPCB classification of Designated Best Use criteria of rivers for bathing are as given below:

**Table 4.5 Water Quality Standards for Rivers**

Parameters	Standards
pH	6.5 to 8.5
BOD	3 (mg/l) or less
DO	5 mg/l or more
<i>Fecal coliform</i>	
Desireable	500 (MPN/100 ml)
Maxm. permissible	2500 (MPN/100 ml)

##### 4.11.2 Actual Water Quality of the River

Chemical quality of water of river u/s and d/s of the city, as monitored during investigations, shall be commented upon and tabulated as given below :

Name of Monitoring Agency:

Date of monitoring:

Place of monitoring

**Table 4.6 Actual Water Quality of the River**

Parameters	U/S of city	D/S of city
pH		
BOD (mg/l)		
DO (mg/l)		
Fecal coliform (MPN/100 ml)		

Comments on river water quality on the basis of the above shall be given.

### 1.1.1 Provisions for River Ganga

River Ganga has been given the status of the National River and the National River Ganga River Basin Authority (NGRBA) has been set up. The NGRBA is an empowered planning, financing, monitoring and coordinating authority for the River Ganga for effective abatement of pollution and conservation of River Ganga in keeping with sustainable development needs.

A River Ganga Basin Management Plan is being developed involving exhaustive studies in the entire basin. Works in the River Ganga basin will need to be taken up in accordance with those proposed in the management plan.

However, in the meanwhile, effluent standards have been made more stringent, for critical stretches of River Ganga, by the Ministry of Environment, Government of India on 3.2.2010 as in the table given below (Copy of OM dt. 3.2.10 attached as Annexure 3)

**Table 4.7: Effluent Standards prescribed by NRCD, Ministry of Environment, Government of India:**

Parameters	Units	Effluent Standards for discharge into water bodies		Effluent Standards for discharge on land
		Existing Standards	Standards revised on 3.2.10 (Annexure 3)	
pH		5.5-9.0		
BOD	mg/l	30	20	100
TSS	mg/l	50	30	200
Fecal coliforms	MPN/100 ml	Desirable– 1,000 Permissible– 10,000		Desirable – 1,000 Permissible – 10,000

### 4.12 QUANTITY OF WASTE WATER

For sewers, a 30-year design perspective is proposed. Actual flows measured through field investigations should be projected for this period. Similarly, for STPs and pumping stations, flows should be projected taking into consideration the population of the respective design period. The figure arrived at, following the method given in paragraph 6.7, should be adopted if there is discrepancy between the two projections.

## 4.13 SEWAGE TREATMENT PLANTS

### 4.13.1 Technology

In the NRCD 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. Annualised cost has also been worked out.

This compendium may also 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.

### 4.13.2 Options for locating STPs

- (i) The following options have to be generally considered for locating STPs:
  - (a) One, with a decentralised approach, which would envisage collection, treatment and disposal of wastewater in the neighborhood itself.
  - (b) The second option involves conveying the collected wastewater to a centralised STP from where it could be suitably disposed of into the river or used for irrigation.
  - (c) Locating the STP further away where land at lower rates is available and inexpensive technology can be adopted
- (ii) All options have to be analysed in the right perspective taking into consideration capital and recurring costs and views of stakeholders. Proper justification should be presented in the DPR for the selected option.

## 4.14 WORKING OUT 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 intermediate pumping stations and sewage treatment plants. In the above referred Compendium, the land required for treatment plants has been given. It should be used to estimate the land required for STPs. Land required for IPS should also be worked out.

## 4.15 RESOURCE RECOVERY

Water is scarce. To the extent possible after use it should be reused or recycled to the extent it is feasible. If it is not feasible other methods of resource recovery are

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

#### 4.16 SELECTION OF BEST OPTION

The best option is to be selected as per component wise details of various feasible options.

#### 4.17 COST ESTIMATES

At the stage of preparing feasibility report, detailed designing may not be possible for want of relevant data. Quotations for supply of bought out items such as STP, pumps and motors, sewer pipes should be obtained from reputed suppliers. The cost of other items as are on the schedule of rates of the concerned works department of the state should be used to work out cost.

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 DG set will need to be operated can be known.

#### 4.18 LIFE CYCLE COST

The most cost effective and feasible option may be selected through their life cycle cost analysis. 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.)

#### 4.19 FACTORS IN SELECTION OF SYSTEM OF WASTE WATER MANAGEMENT

Factors which affect the selection of system are given below:

- i. Feasibility of utilising an existing wastewater management 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 capacity of the ULB – financial, material, human resource related to implement, operate and maintain and manage the pollution abatement
  - vi. The ability and willingness of the people to meet their obligations to sustain the system etc.
  - vii. Over the life cycle of the system, the net present value of annual costs 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.

#### **4.20 PREPARING DRAWINGS**

Drawings of works proposed should be incorporated in the feasibility report.

# CHAPTER - 5

## DETAILED PROJECT REPORTS OF SEWERAGE SCHEMES

### 5.1 GENERAL

The Feasibility Report would have selected the most suitable system for pollution abatement. Design of the selected system and its components should be done following these guidelines.

NGRBA guidelines provide for the River Ganga basin, that apart from conveying sewers, pumping stations and STPs, these items should also be included in projects in unsewered areas to make the city fully sewerage. Under NRCP also, branch and lateral sewers and house connections up to the property land are to be proposed to ensure comprehensive coverage.

DPR shall be prepared on the basis of detailed survey, investigation & engineering design.

Designs of all these facilities should be based on standard procedures laid down in CPHEEO manual (<http://urbanindia.nic.in/publicinfo/manual.htm>). In the event of absence of guideline in the manual on a particular aspect, BIS codes, standard books, state / CPWD manuals may be followed

Selection of pipe materials like GRP / DI etc shall be as per site conditions. Basis for selection of gravity sewer/rising main shall be provided in the DPR.

Existing sewerage works should be dovetailed with the proposed scheme.

Provision of dedicated feeders for SPS and STPs is essential to ensure round the clock operation. The DPR should contain details of such feeders like length of the cable from the power source, specifications of transformers and estimated cost. NRCD would not consider funding proposals which do not comply with this requirement.

### 5.2 Improving an Existing System

If a decision is taken to improve an existing system of waste water management by repairing, refurbishing, upgrading and / or modernizing, the items of work that are needed should be identified and the details worked out and costs estimated.

### 5.3 Design Parameters Covered in Chapter on Feasibility Report

Details of the following items have been given in Chapter on "Preparation of Feasibility Report of Sewerage Schemes" and, therefore, are not being repeated here:

- i. Design Periods
- ii. Future Population & Population Projections
- iii. Sewerage Master Planning / Zoning
- iv. Rate Of Water Supply
- v. Status Of Existing Water Supply
- vi. Per Capita Sewage Flow
- vii. Ground Water Infiltration
- viii. River Water Quality
  - a) Water Quality Standards For Rivers



b) Actual Water Quality Of The River

#### 5.4 QUANTITY OF WASTE WATER

For sewers, a 30-year design perspective is proposed. Actual flows measured through field investigations should be projected for this period. Similarly for STPs and pumping stations, flows should be projected taking into consideration population of the respective design period. The figure arrived at, following the method given in paragraph 4.9, should be adopted if there is discrepancy between the two projections.

There should be permanent arrangement for measuring discharge in drains.

#### 5.5 SEWAGE QUALITY FOR STP DESIGN

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.

Parameters for the quality of wastewater (Values of BOD and SS) shall be adopted on the basis of actual quality of wastewater incoming at STPs / sewage pumping stations under O&M in the town / other towns in the vicinity, under similar situation. Such laboratory reports shall form part of DPR.

#### 5.6 SEWERS

Layouts of sewerage mains or sub-mains should be prepared maintaining minimum depths and shortest flow distances with laterals proposed in the DPRs. Gravity flows must be preferred over pumping mains as far as possible to minimize pumping costs.

- a) Sewers shall be designed crown meeting crown. Drops shall be avoided at junction points.
- b) The plans should show basic details such as GLs, contours, major drains, their points of outfall, diameter and invert levels of sewers provided, specially at junction points.
- c) Layout of trunk sewer should be properly highlighted and be shown bold on the plans and the design chart.
- d) Type of subsoil strata up to sewer invert level, subsoil water table data and type of road surface over the proposed sewer alignments shall be mentioned in the L-section of the proposed sewer.
- e) Wherever it is not possible to generate self-cleansing velocity, flushing of sewer lines should be carried out at regular intervals. The requirement and number of flushing vans available with the O&M agency may be reviewed and provision for the same, if required, may be made in the estimate to be submitted.
- f) Suitable bedding should be provided below sewers to safeguard them against possible settlement, as per the guide lines suggested in the Manual on Sewerage & Sewage Treatment of CPHEEO.
- g) Soil investigation and test bores should be carried out at suitable intervals along the

- alignment of sewers to ascertain the type of soil at different depths and behaviour of the ground water table and bearing capacity of the soil. The design of bedding may be done based on actual ground conditions.
- h) Minimum depth of buried sewer shall be designed considering future rolling / point loads on city roads.
  - i) Where sewers are proposed to be laid below sub-soil water table, justification for the same and the precautionary measures to be taken during laying of sewers shall be mentioned in the DPR.
  - j) In case proposed sewer/rising main is crossing railway line/Highway and their bridges, copies of their permission and estimates for the same shall be annexed with the DPR.
  - k) A plan of action for giving sewer connections year wise during the implementation period of the work shall be prepared and a suitable provision be made in the byelaws to enforce compulsory sewer connections and user charges on the beneficiaries. The DPR may be prepared to achieve 100 % house connections for the present population within the project implementation period. This is necessary to assure flows in the sewer network and optimum utilisation of STP capacity.
  - l) Provision may be made in the DPR for house connections from the property lines up to the sewers including cutting and reinstatement of roads. This will also eliminate cutting of roads from time to time.
  - m) Suitable sewage cess / tariff / tax and sewer connection fee may be imposed on the beneficiaries to recover at least the O&M cost of the project to start with. However, full cost recovery at the earliest should be aimed at. ULBs may consider suitable incentive programs to encourage people to opt for sewer connection, e.g. property tax rebate for 'one-time' sewer connection by individuals. Besides, non-willing households, particularly having septic tank facilities may be penalized for discharging septic tank effluents in open drains / not constructing soak pit at prescribed distance from water source, water supply pipelines etc.
  - n) Design criteria as stipulated in CPHEEO Manual (<http://urbanindia.nic.in/publicinfo/manual.htm>) may be followed.

## 5.7 SEWAGE PUMPING STATIONS

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.

Submersible sewage pumps are now available and being extensively used, which are more economic in terms of both capital and running cost besides being operation friendly.

The following configuration of sewage pumps may be adopted:

**Table 5.1: Configuration of Sewage Pumps**

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) 2 nos.
	Non Peak Flow pumps	(including 1 standby)
Where rising main is short and static head is dominant	Peak Flow/4 pumps	6 nos. (including 2 standby)

Accordingly size of the sump may be configured

- 5.7.1** Hydraulic retention time shall be taken as 3.75 minutes of design peak flow for design of sump. Pump should be designed on self priming mode.
- 5.7.2** Size of sump of the pumping station shall be checked with the pump manufacturer for adequacy and so mentioned in the DPR.
- 5.7.3** Provision of control and panel room shall be made in the DPR as per specifications of the State Electricity Board.
- 5.7.4** To ensure constant running of pumping stations, diesel operated generating sets may be proposed at each pumping station, if dedicated feeder line is not available.

## **5.8 RISING MAINS**

- 5.8.1** Most economical size of rising main is to be determined by comparing the capitalized cost of different pipe sizes. However, size of pipe selected should be such that self-cleansing velocity is attained at least during peak hours.
- 5.8.2** Surge/water hammer analysis shall be calculated and made a part of the DPR.
- 5.8.3** Design of thrust/anchor blocks shall be done and made a part of the DPR.
- 5.8.4** 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.

## **5.9 SEWAGE TREATMENT PLANT (S) (STP)**

### **5.9.1 Technology**

The choice of technology option for sewage treatment is of great importance. The NRCD has published in 2009, "Compendium on Sewage Treatment Technologies". Among other things (<http://moef.nic.in/modules/recent-initiatives/NGRBA/Final%20Compendium.pdf>), this document throws light on performance levels and O&M costs of various technologies being tried out presently by various authorities.

Techno-economic evaluation should be carried out through life cycle cost analysis of these options. 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.

### 5.9.2 Discharge of treated effluent

STP projects are to be formulated taking in to account recycling / reuse of effluent for irrigation, industrial purposes etc. The option of discharging the STP effluent into the river should also be considered.

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

### 5.9.3 Options for locating STPs

- (i) The following options have to be generally considered for locating STPs:
  - (a) One, with a decentralised approach, which would envisage collection, treatment and disposal of wastewater in the neighborhood itself.
  - (b) The second option involves conveying the collected wastewater to a centralised STP from where it could be suitably disposed of into the river or used for irrigation.
  - (c) Locating the STP further away where land at lower rates is available and inexpensive technology can be adopted
- (ii) All options have to be analysed in the right perspective taking into consideration capital and recurring costs and views of stakeholders. Proper justification should be presented in the DPR for the selected option.
- (iii) The proposed sites should be marked on the map.
- (iv) The notification dated 14th September 2006 of MoEF makes EIA mandatory for new township projects of certain categories. This provision must be complied with for new colonies under advice of NRCD.

Also, it should be ensured that land would be acquired within a reasonable time.

### 5.10 RESISTANCE FROM HOUSE OWNERS

A problem that is likely to be faced in respect of branch/lateral sewers is the resistance from house owners who already have septic tanks and may not be inclined to make fresh investment for house connections. Public resistance is also likely in respect of sewerage routes and STP locations. All these issues need to be addressed through public education, awareness and participation at the required stage of the project. To encourage house owners to take house connections, the ULB may consider offering beneficiary-friendly payment terms and onetime incentive, as prescribed in clause 5.6 (i).

### 5.11 DEDICATED FEEDERS AND GENERATORS

Availability of uninterrupted power for continuous operation of pumping stations and STPs needs to be ensured. Diesel generation sets have not helped the situation due to high cost of operation. Provision of dedicated feeders for PSs and STPs is 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.

### 5.12 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.

### 5.13 PERFORMANCE PARAMETERS

There should be performance parameters of each project component i.e., primary, secondary and tertiary treatment and the system as a whole so that the effectiveness can be monitored and evaluated.

Sub-system alternatives for major components such as sewage and MSW 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.

### 5.14 COST ESTIMATES

Based on survey and investigation, data collection and design criteria, detailed estimates may be prepared, under the following subheads:

(CW Stands for Civil Works)

(EM Stands for Electrical and Mechanical Works)

**Table 5.2: Cost Estimates of Land Acquisition for Sewerage Schemes**

S. No.	Items	Amount, Rs lacs		Total
		CW	EM	
1	2	3	4	5
1	Estimate of cost of land acquisition for construction of STPs including approach road			
2	Estimate of cost of land acquisition for construction of MPS including approach road			
3	Estimate of cost of land acquisition for construction of IPS including approach road			
4	Estimate of cost of land acquisition for laying of sewer lines			
5	Estimate of cost of land acquisition for laying of rising mains			
6	Estimate of cost of land acquisition for construction of effluent channels of STPs			
7	Estimate of cost of land acquisition for other miscellaneous purposes			
	Grand Total			

**Table 5.3: Estimate of Cost of Sewerage Works – District Wise (Including Sewers, Rising Mains, IPS, MPS & STPs)**

S. No.	Items	Amount, Rs lacs		
		CW	EM	Total
1	2	3	4	5
	<b>Estimate of cost for sewer lines, sewage pumping stations and sewage treatment plants</b>			
	Estimate of cost for sewer lines			
	Estimate of cost of MPS			
	Estimate of cost of IPSs			
	Estimate of cost of rising main of MPS			
	Estimate of cost of rising main of IPS			
	Estimate of cost of Renovation and Replacement of Sewers & Manholes			
	Estimate of cost of Renovation and Replacement of Sewers & Manholes			
	Estimate of cost of STP (----mld)			
	Estimate of cost of renovation / upgradation of existing STP (----mld)			
	<b>Grand Total</b>			
	<b>Details of measurements</b>			
	<b>Sewers</b>			
	Details of earth work, Timbering, Road Cutting & Reinstatement of Roads in sewer work etc.			
	Details of average depth of sewers & Excavation in sewer work			
	Details of length of sewers at different depths			
	Details of length of sewers under sub-soil water			
	Details of Bedding in sewer work			
	Details of different types of Manholes and Sewer Connecting Chambers			
	Other items			
	<b>Sewage Pumping Stations</b>			
	IPS			
	MPS			
	<b>Sewage Treatment Plants</b>			
	STP at ---			
	<b>Rising Mains</b>			
	For MPS at ---			
	For IPS at ---			
	<b>Other items, if any</b>			

**Table 5.4 Estimate of Cost of Sewer Lines in Zone ---**

S. No.	Items	Qty.	Cost Rs. Lacs		
			CW	EM	Total
1	2	3	4	5	6
	Sewer lines of dia ----mm to --mm, including cutting of roads, temporary reinstatement of roads				
	Manholes, sewer connecting chambers etc				
	Permanent reinstatement of roads				
	Shifting of telephone, electric & other cables/lines,				
	Shifting and reinstatement of house water supply and sewer connections				
	Crossing of railway tracks etc.				
	Other miscellaneous works (mention)				

**Table 5.5: Estimate of Cost of MPS / IPS**

S. No.	Items	Qty.	Cost Rs. Lacs		
			CW	EM	Total
1	2	3	4	5	6
	MPS / IPS				
	Rising mains of MPS/IPS (dia/length/type)				
	Diesel generators				
	Fire fighting equipments				
	Special T&P, spares etc.				
	Boundary wall, Steel gate etc. around the campus				
	Electrification within campus				
	Roads, drainage and culverts etc within campus				
	Water Supply arrangement within campus				
	Plantation and Development of campus				
	Other items				
	<b>Grand Total</b>				

Note: Separate table be prepared for each MPS/IPS

**Table 5.6 Details of Sewage Pumping Stations**

S. No.	Location of MPS/IPS	Size	Depth of floor BGL, m	Avg. Design discharge, mld

**Table 5.7: Details of Pumping Plants**

S. No.	Location of MPS/IPS	No. of pumps	Type of pumps	Head*BHP of each	Other details

**Table 5.8: Details of Generators**

S. No.	Location of MPS/IPS	No. of Generators	Generator capacity in KVA	Other details
	<b>Grand Total</b>			

**Table 5.9: Estimate of Cost of Sewage Treatment Plant at -----**

S. No.	Items	Qty.	Cost Rs. Lacs		
			CW	EM	Total
1	2	3	4	5	6
	STP (mld)				
	Rising main from STP to carry treated effluent (dia/length/type)				
	Channel to carry treated effluent				
	Laboratory cum office building				
	Staff quarters for STP				
	Office Furniture				
	Lab Equipment,				
	Fire fighting equipment				
	Special T&P				
	Boundary wall, Steel gate etc. around STP campus				
	Electrification within STP / MPS campus				
	Roads, drainage and culverts etc within STP / MPS campus				
	Water Supply arrangement in STP / MPS campus				
	Plantation and Development of STP / MPS campus				
	Other items				
	GT				

**Table 5.10: Estimate of cost of Laboratory cum Office Building**

Item	Unit	Quantity	Plinth area	Rate of construction	Amount
1	2	3	4	5	6
Laboratory cum Office Building					

**Table 5.11: Estimate of Cost of Staff Quarters Required for STP (--- mld)/MPS/ IPS**

S. No.	Staff for which staff qtrs are admissible as per NRCD norms		Type of the Staff Quarter to be provided, as per NRCD norms	Plinth area of each quarter, as per NRCD norms, sqm	Rate of construction, Rs. Per sqm	Amount, Rs lacs
	Staff	Nos.				
1	2	3	4	5	6	7
	<b>Grand Total</b>					



**Table 5.12: Detail of Rising Mains**

S. No.	Location of MPS / IPS / STP	Discharge point	Dia, mm	Length, m	Type	Other details
	<b>Grand Total</b>					

**Table 5.13: Estimate of Cost of Land Acquisition**

S. No.	Land required for	Size of plot reqd, m <sup>2</sup>	Area reqd, ha	Rate of land, Rs lacs/hect	Amount required, Rs lacs	Remarks
1	2	3	4	5	6	7
	IPS at ---					
	Approach road for IPS					
	MPS at ----					
	Approach road for MPS					
	STP at ---					
	Approach road for STP					
	Effluent channel					
	Sewage Farm Channel					
	Sewer lines					
	Rising mains					
	Others					
	<b>Grand Total</b>					

# CHAPTER - 6

## OPERATION AND MAINTENANCE OF SEWERAGE SCHEMES

### 6.1 CRITICALITY OF O&M

Operation and maintenance of assets has emerged as a major concern in the success of this programme. NRCDC has decided that funds for O&M for a period of 5 years initially, would be shared in the ratio of 70:30 between the centre and the State Government. Next 10 years O & M cost should also be worked out with revenue generation plan. The O & M responsibility beyond 5th 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.

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 total component-wise funds needed for O&M and how and wherefrom these would be provided.

If the O&M is done departmentally, there will be requirement of staff. Annexure – 7

- (i) Norms of staff for
  - a. Pumping stations
  - b. Sewage treatment plants
- (ii) Norms of covered areas for different categories of residential accommodation (Area as per CPWD norms)
- (iii) Guide Lines For Staff Quarters

Given the provision of 5 years O&M expenditure in the project cost, outsourcing of O&M for this period to the contractor who supplied the plant would seem to be obvious. The contractor must be asked to offer performance guarantees through proper O&M to achieve the outcomes.

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

### 6.2 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<sub>2</sub>, 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.

It is necessary for the local bodies to enlarge the property tax base and utilise 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. Also the ULB is required to fulfill all commitment as per tripartite MoA (Annexure 5).

### 6.3 COST ESTIMATES FOR O&M

Various components on which expenditure is likely to be incurred are given in the following tables. Estimate of expenditure for each item may be prepared by the implementing agency.

**Table 6.1: Abstract of Annual O&M Cost of Sewerage and Sewage Treatment Works**

Rs. In lacs

Districts	Sewer lines	MPS, IPS	STP(s)	Total
District I				
<b>Grand Total</b>				

**Table 6.2: Cost of Annual Operation & Maintenance of Sewer Lines**

Rs in lacs

District	Estimated Cost of Sewer Lines	Annual Repairs of Sewer Lines @ 0.25%
I		
<b>Grand Total</b>		

**Table 6.3: Cost of Annual Operation and Maintenance of Sewage Pumping Stations**

Rs. in Lacs

SPS Estd./ Cost	Annual repairs of C.W. @ 1.5%	Annual repairs of E/M works @ 3%	Staff	Electric Power	DG Sets	Grand Total
1	2	3	4	5	6	7
<b>MPS-1</b>						
CW, ----Rs. lacs						
E/M, ----Rs. lacs						
<b>IPS 1</b>						
CW, ----Rs. lacs						
E/M, ----Rs. lacs						
<b>Grand Total</b>						

C.W. - Civil Works

E/M - Electrical / Mechanical Works

**Table 6.4: Requirement of Staff on MPS / IPS for O&M**

District	I	II				
Installed Capacity, HP	----HP	----HP				
Staff						

**Table 6.5: Estimate of Staff Required for Annual Maintenance MPS/IPS**

S. No.	Staff	Nos	Salary/Month in Lac	Month	Annual; cost Rs. In Lacs
1					
2					
3					
	<b>Total maintenance charges</b>				

**Table 6.6: Estimate of Annual O&M of MPS/IPS**

S. No.	Item	Annual Cost (Rs. In Lacs)
1	Staff	
2	Electric Consumption for running the MPS/IPS	
3	DG set	
	<b>Total Annual Cost</b>	

**Table 6.7: Estimate of Annual Electric Consumption for Running Sewage Pumps MPS/IPS**

Period of running/ no. of Pumps *	Capacity of Installation KVA		Electric Consumption				Annual Cost of Electric Consumption ***
	Each Pump	All Pumps	Other Loads	Total Load in KVA	Total Load in KW	No. of Hours Run	
Peak (---- Pumps)							
Non Peak (---- Pumps)							
Avg (---- Pumps)							
<b>Grand Total</b>							

**Note :-**

- (i) -- pumps shall run during peak period of -- hours. (-- hours by Electric and -hours by D.G)
- (ii) -- pumps shall run during Average period of -- hours.
- (iii) -- pump shall run during Non Peak period of --- hours.
- (iv) 2 Rate of power = Rs. --/unit

**Table 6.8: Estimate of Annual Maintenance of D.G. Sets – MPS /IPS**

S. No.	Item	Detail
1.	Capacity of D. G. Set.	
2.	Quantity installed	
3.	Running hours considered per day	
4.	Diesel consumed in hr.	
5.	Annual consumption of diesel	
6.	Annual consumption of Mobile oil ( @ 5% of diesel consumed )	
7.	Cost of diesel at Rs. --- Per lit.	
8.	Cost of Mobil oil at Rs. --- Per lit	
9.	Operator required – at the rate Rs. ---- pm	
10.	<b>Total of Sl. 7,8 &amp; 9</b>	

**Table 6.9: Cost of Annual Operation & Maintenance of STPs**

STP/Est'd Cost	Annual repairs		Staff	Power	Chemical			Total Cost
	CW@ 1.5%	EM@ 3%			Chlorines	Polymer	Sub Total	
STP I CW ---- EM ---- (---- Mld)								
<b>Grand Total</b>								

**Note:**

1. Cost of electricity considered @ Rs. --- per kwh
2. Cost of Chlorine gas considered @ Rs. -- per kg
3. Cost of polymer considered @ Rs. --- per kg
4. CW: Civil Works
5. EM: Electrical and Mechanical Works

**Table 6.10: Requirement of Personnel for STPs**

Designation	Salary (P.M)	1 (---mld)									
<b>Total</b>											

**Table 6.11: Electrical Load List S.T.P**

Equipment	kW	Total Drives	Connected Load kW	Drives operating	Operating Load kW

**O&M RECOVERY PLAN**

S. No.	Description	Year		
		Base Yr	Mid design period	Design yr.
1	2	3	4	5
1	Population			
2	Annual recurring expenditure on O&M (Rs. In Lacs)			
3	Per capita cost of the O&M expenses (Rs.)			
4	Number of house holds (considering 5 members in a family)			

**O&M RECOVERY PLAN**

S. No.	Description	Year		
		Base Yr	Mid design period	Design yr.
1	2	3	4	5
5	Approximate Number of households taking private connections (---%, ---%, ---% of total households in year 2013, 2028, 2043)			
6	Monthly Rental Value per House			
7	Annual Rental Value per House			
8	Annual Rental Value of House in Rs. (Item no.5 x 7)			
9	<b>Anticipated annual income(Rs.)</b>			
10	Annual Income from sewer connections @ (i) Rs. ----- per connection			
(ii)	From domestic sewer charges(---% Sewer Tax on row. 8)			
(iii)	From STP by sale of sludge			
(iv)	From others (specify)			
11	<b>Total anticipated annual income(Rs.)</b>			
	<b>(Say Rs. In lacs)</b>			
12	<b>Total annual recurring expenditure</b>			
	<b>Profit/Loss(+/-)</b>			

# CHAPTER - 7

## COMMUNITY SANITATION SCHEME

### 7.1 INTRODUCTION

The problem of open defecation in the project town needs to be addressed through the community sanitation scheme. The scheme is also to tackle the sanitation problem in a decentralized manner in unsewered areas. The coverage may also be extended to crowded/public places and pilgrim centres etc.

The target areas where such projects would be required are (a) jhuggi-jhopri clusters, (b) unauthorized/unapproved colonies and (c) public places like railway stations, bus stands, courts, religious places etc.

The studies pertaining to community sanitation may be carried out by the ULB or through an organization which has experience of working in providing community sanitation facilities. In most cities deficiency of toilets in slums has been noticed. It is, therefore, proper for the ULB to set up community toilet complexes to address the problem of community sanitation.

### 7.2 PREPARING A SCHEME OF COMMUNITY TOILET COMPLEXES

#### 7.2.1 Collection of Available Data

The following information may be obtained from records of the ULB, ward wise or drainage area wise, as it may be available

- Floating and permanent population,
- Present status of sanitation.
- Availability and status of individual toilets.
- Number of houses without toilets.
- Locations where community toilets are required for community/ tourists/ floating population.
- Willingness of householders to construct and pay for construction of toilets.

From municipal records information about the status of existing community toilet complexes (CTCs) in public places within limits of the ULB may be obtained. The information may be tabulated as below.

- (i) Name and location
- (ii) Number of seats (male + female)
- (iii) Maintenance agency
- (iv) Average Number of users/day
- (v) User charges
- (vi) O&M problems and source of funding
- (vii) Source of water supply
- (viii) Mode of disposal of wastewater
- (ix) Biogas generation, if any
- (x) Status of community toilets.



Location of existing facilities should be marked on the digitized map. Photographs showing the status of cleanliness and hygiene of CTCs should also be presented.

### 7.3 SURVEY

- (i) Provision and location of new facilities must be supported by survey of target areas.
- (ii) Survey should be detailed or sample depending on the number and size of slums, unauthorised colonies and public places. If it is decided to conduct sample survey size of the sample should be decided. Normally, 15% of population should be enough
- (iii) Surveys should be structured to cover all the three categories viz. jhuggi-jhopri clusters, unauthorised colonies and public places.
- (iv) Current population living in target areas needing toilet facilities should be assessed realistically. In respect of public places, data of floating population should be obtained from local authorities and reported in the DPR. If not available, this data must be generated through quick surveys.
- (v) Separate questionnaires should be developed for each category and circulated amongst prospective beneficiaries to elicit their views on the project. The data, among other things, should be generated on such aspects as whether the beneficiaries need such facility in their area and are ready to pay user charges.
- (vi) The questionnaire should specifically target female users to elicit their commitment to use the facility once available. This opportunity must be utilised to educate the beneficiaries through questionnaire about the health hazards of open defecation and its impact on river pollution.
- (vii) The data generated from field investigations should be analysed and reported in the DPR. Keeping in view the existing facilities, if any, need for new projects should be established only on the basis of the above data. According to existing norms, provision of one seat for 50 users is taken for community toilets. The size of toilet blocks should be finalised on this norm.
- (viii) Surveys and stakeholders' consultations are specialised and time-consuming activities expertise for which may not be available in-house with the implementing agency.
- (ix) There are a number of reputed NGOs, Community Based Organisations (CBOs) and social organisations, which are taking up such projects on turnkey basis including O&M. Such agencies only would be suitable for conducting surveys and stakeholder's consultations and thereafter preparing sustainable proposals and operating them on BOT basis.
- (x) Developing or promoting a CBO from the target area itself for this purpose should be preferred, as these organisations would have the sense of ownership of the project. Their establishment cost would also be comparatively lower than others. Please see box below.
- (xi) Depending on its actual needs, it would be advisable for the implementing agency to appoint such agency(s) to implement the CTC projects and to make them sustainable. Complete details of the organisation selected for implementing the project with their past experience should be presented in the DPR.
- (xii) Present arrangement of water supply to target areas, quantity supplied per person per day and source of water supply should be provided in the DPR and indicated on maps. This information is necessary for designing toilet facilities.

- (xiii) Availability of the nearest sewer line, if any, to which wastewater generated from the facility could be connected should be indicated on maps.
- (xiv) Once the scope of work is defined, the location of the facility should be finalised in consultation with the local body and implementing agency. Availability of suitable land as near as possible to the target population should be examined in consultation with the land owning authority. These must be plotted clearly on the map.
- (xv) Surveys and field investigations must be supervised at various milestones at senior levels in the implementing agency to ensure quality DPRs. This exercise may take some time but would eventually be beneficial in improving sustainability of the programme.

#### 7.4 SAMPLE SURVEY

If the number of slums and unauthorised colonies and population to be covered is very large and complete survey will be expensive and time consuming, sample survey of 15% households of each slum and unauthorised colony should be carried out.

#### 7.5 INFORMATION AVAILABLE FROM SURVEY

- a) Number of persons per family.
- b) Education level of head of families
- c) Occupation (head of families):
- d) Character of houses: The distribution of houses in terms of type of construction is as below:  
Pucca, semi puccca, kutcha, huts
- e) Percentage of houses having electricity:
- f) Percentage of houses having water supply:
- g) Percentage of houses having latrine connected to sewer / attached to septic tank with soak pit / without soak pit / pit latrine, and percentage of slum population resorting to open defecation.
- h) Percentage of people willing to pay for using community toilet:
- i) Number of authorized and unauthorized slums.
- j) Number of slums having sewers
- k) Number of slums having septic tank facility of the effluent from septic tank to flow through open drains.

#### 7.6 LOCATION OF COMMUNITY TOILETS

Based on the outcome of field survey, sites for new public toilets should be identified. The should be so selected as to minimize likely nuisance to the neighbourhood. It should be connected to the sewer line wherever possible. The sites should be discussed with the residents of area who will use them.

#### 7.7 DESIGN CONSIDERATIONS

##### 7.7.1 Size

- i. The size of toilet blocks may vary from 5, 10 to 15 and 20 seats depending upon the space available and number of users.

- ii. Guidelines for plinth area for these types of CTC units will be as given below:

**Table 7.1 : Plinth Area of Community Toilets**

S. NO.	Type	Maximum Plinth Area (sq.m.)
1	10 seated	80
2	15 seated	125
3	20 seated	150

- iii. The above areas are proposed maintaining for cleanliness and hygienic conditions in the complex and to make it environment and user friendly.
- iv. The size may be adopted as under with a tolerance of (+) or (-) 10%.

**Table 7.2 : Size of Different Units of Community Toilets**

S. No.	Component	Size (sq. m.)
1.	Water Closet	0.9 x 1.2
2.	Bath room	1.2 x 1.5
3.	caretaker room	3.0 x 3.0
4.	Counter	3.0 x 1.2

- v. A complex should have separate blocks for males and females.
- vi. For all types of CTC blocks, two urinal for gents, two bathrooms, one each for ladies and gents, one caretaker room and one counter should be provided.
- vii. Besides toilets, urinal facilities shall also be provided. Squatting and standing urinals shall be provided for males, whereas females will use toilets for urination.
- viii. Washbasins shall be provided with mirrors in both the blocks.

### WC Enclosure

- (a) Doorframes of size 0.75 x 1.8 m could be fabricated out of pressed MS/GI sheet or other economic yet durable materials. Brass materials shall not be used at any place.
- (b) These are pour and flush type toilets designed to use less water, say 1-1.5 litres, for each flushing. The WC pans should be compatible to this design.

In general good quality fixtures, floors and better specifications should be proposed to maintain cleanliness. Ordinary glazed tiles or mosaic tiles may be provided up to 1 metre high skirting level. Floor shall be of P.C.C. Doors with PVC may be proposed as wooden doors are costly and steel doors get corroded. Shutter of the door shall be 1.5 feet less than the height. For proper ventilation, pre-cast RCC jali should be used. Toilets may have architectural features to give a pleasing look.

- (c) One western type WC may be provided in each block for males and females.

### 7.7.2 Water Supply

- (a) If piped water supply is available in the area it must be utilised to meet the water needs of the toilet complex. However, if no such source is available, provision of a suitable electric pump operated bore well should be made.

- (b) A water tap may be provided in each WC enclosure keeping in view the local requirement/practice. The taps should be self-closing type of CI material to avoid wastage of water. An overhead storage tank should be provided with capacities @ 400 litres/seat as given below:

**Table 7.3 : Capacity of Storage Tanks for Community Toilets**

S. No.	Type	Maximum Capacity
1	10 Seater	4000 litres
2	15 Seater	6000 litres
3	20 Seater	8000 litres

- (c) Arrangement for rain water harvesting may be made.  
 (d) Solar photovoltaic cells may be installed and safety of the component may be ensured.  
 (e) The structure should have provision for sufficient daylight entry through walls / roofs and higher degree circulation of air through natural ventilation system.

### 7.7.3 Wastewater Disposal System

Connecting wastewater to a nearby sewer line, if any, should be preferred. If it is not possible, CTC units should be provided with a septic tank followed by a soak pit. In that case a comparison between the cost of sewer line and septic tank etc. should be carried out and least cost option should be selected. In the case of soak pit option, its location must be at a safe distance from a groundwater source / water supply pipeline in the area, if any.

### 7.7.4 Bio Gas

- (a) Community Toilet Complexes should have a good potential to generate biogas which can be a source of revenue. Biogas produced from public toilet complexes is being utilized for different purposes e.g. cooking, lighting, electricity generation. The Ministry of Non-Conventional Energy Sources (MNES), Government of India provides subsidy for the construction of such biogas plants through its different state agencies. Wherever feasible, biogas generation package should be proposed. Biogas may be used for lighting of the complex and cooking in the caretaker's room. This would offset the electricity cost otherwise incurred on lighting.
- (b) Detailed engineering and drawings along with bills of quantities, specifications, cross sections etc. must form part of the DPR.
- (c) Bills of quantities, specifications, cross-sections etc. should be presented in a separate volume.

In this regard help of NGO and MNRE may be taken.

## 7.8 OPERATION AND MAINTENANCE

- (i) Operation and maintenance should be accorded priority for sustaining CTC projects.  
 (ii) The requirement of funds for O&M should be assessed on a realistic basis.  
 (iii) Expenditure on O&M would comprise (a) cost of electricity and water consumption, (b) salary of caretaker, sweeper etc, (c) cost of consumables like soap, detergents,

- deodorants etc. and (c) repairs and maintenance.
- (iv) Revenue generated from user charges and biogas generation, if any, should be assessed again on a realistic basis. In Jhuggi-jhompri clusters instead of charging fee from individuals, family pass system with a reasonable monthly charge would be desirable.
  - (v) The net deficit or surplus for O&M must be indicated.
  - (vi) Maintenance of cleanliness and hygiene is the key for sustaining such projects. This must be kept in view while assessing the project economics.
  - (vii) O&M should be on long term and DBO model / basis where the operator would be authorised to collect user charges.

### 7.9 PUBLIC PARTICIPATION

- (i) Public participation through education and awareness is a key parameter to achieve sustainability.
- (ii) The NGO or CBO engaged for implementation and O&M of CTCs should organise education and awareness programmes for target groups round the year in pre and post commissioning stages.
- (iii) Among other things, the focus of the programme should be to dispel health hazards due to the practice of open defecation as also its impact on river pollution.

### 7.10 COST ESTIMATES

- (i) Cost estimates of other components should be prepared in standard formats. These should be based on the detailed bill of quantities, specification of materials, structures and rates as per the latest SORs.
- (ii) Bill of quantities, specifications and drawings must be presented in a separate volume.
- (iv) The DPR would also be used for preparation of NIT and tendering the project. It should, therefore, contain every thing including complete engineering drawings, longitudinal sections etc. or any other detail that would be required for NIT as well as monitoring of project implementation.

**Table 7.4: Cost of constructing new Community Toilet complexes and renovating existing community toilet complexes**

S. No.	Details	Amount (Rs. In lacs)	Annexure for Detailing
1.	New community toilet complexes in public places		
2.	New community toilet complexes in slum areas		
3.	Renovation of existing community toilet complexes		
4.	Where required, land acquisition		
5.	O&M Cost for 5 years		
	<b>Grand Total</b>		

**Table 7.5: Cost of community toilet complex at public places**

S. No.	Name of the Public Place	Toilet Complex (no. of seats)	Amount (Rs. In lacs)
1.			
2.			
3.			
4.			
n			

**Table 7.6: Cost of community toilet complexes in slum areas**

S. No.	Name of the Slum	Toilet Complex (no. of seats)	Amount (Rs. In lacs)
1.			
2.			
3.			
4.			
n			

**Table 7.7: Cost of renovation of existing toilet complexes**

S. No.	Name of Complex	Amount (Rs. in lacs)			
		Basic cost	Contingency 3% on col. 3	Implementation charges @ 15% on Col. 3+4	Total cost (Col. 3+4+5)
1.					
2.					
3.					
4.					
n					

**7.11 Completion Schedule**

It should be presented in the form of a PERT/CPM chart for monitoring purposes.

**7.12 OPERATION AND MAINTENANCE**

As mentioned O&M should be on DBO basis for a period of 5 years.

**7.13 PERFORMANCE MONITORING**

Utilisation performance of CTCs should be monitored on a regular basis and bottlenecks if any should be addressed well in time. For this purpose, a monitoring mechanism through an independent agency must be put in place.

#### **7.14 Agency to Prepare and Implement Project**

The agency to prepare and implement the project may be decided by the ULB and the State Government.

#### **7.15 Awareness Generation and Public Participation**

This is the most important component of CTC. There have been many examples of Community Toilet Complexes not being used. It is, therefore, most important that effective campaign for awareness generation and securing public participation precede implementation and the community of local users have a say in the preparation of the plan and management of the facility after its comes up, even if it is constructed and managed by specialised agency or NGO.

#### **7.16 Amendment in Municipal Rules & Regulations**

The existing laws, rules, regulations and bye-laws governing sanitation are required to be amended to prohibit open defecation and make it obligatory to use sanitary toilets. It is necessary to operate and maintain them properly so that people are attracted to use them and environmental degradation and pollution of water bodies is prevented.

Mere provision in the Municipal/Local Authority Act or framing of bye-laws will not solve the problem. The Local Authority should enforce them strictly and defaulters should be dealt with severely.

#### **7.17 Provision for Improved Toilet Complexes.**

There may be a demand for improved toilet facility especially in commercial areas. This may prove to be a potential source of revenue earning through higher user charges. Such facility may be provided on need based manner and financial viability in terms of user charges.

# CHAPTER - 8

## CREMATORIA

### 8.1 INTRODUCTION

Cremation grounds are generally located on the banks of rivers. Ash and other wastes generated from such cremation grounds are disposed off into the river resulting in their pollution. Thus, cremation grounds have been identified as one of the sources of pollution under river cleaning programmes of MoEF.

The focus of MoEF is not only on minimizing river pollution from this source but also to protect and conserve valuable forest resource by upgrading the existing cremation grounds or supporting new ones with cleaner technologies and higher combustion efficiency having public acceptance.

### 8.2 METHODS OF CREMATION

The following three methods are used for cremating dead bodies:

- (i) Conventional method
  - (a) This method has been in use from time immemorial. In this mode cremation is done on an open platform by burning wood. On an average, about 400 kg of wood is consumed per cremation. Projections based on the data of census of India –2001 indicate that about 4.15 million tonnes of wood equivalent to 50-60 million trees, is consumed every year in cremating dead bodies. Considering 20% ash in wood, nearly 8.5 lakh tonnes of ash generated from the process find its way into the river annually.
  - (b) With the increasing cost and dwindling sources of wood, people below poverty line may resort to dumping dead bodies directly into rivers.
  - (c) Another adverse impact of this method on environment is in terms of emission of greenhouse gas – CO<sub>2</sub> in significant quantities from wood burning. It is estimated that about 8 million tonnes of CO<sub>2</sub> is emitted annually from this operation.
- (ii) Electric or Gas Based Crematoria  
Electric crematorium (EC) is a cleaner alternative of cremation. But the proposal for EC should be prepared based on demand from the stakeholders including civil society
- (iii) Improved Wood Based Crematoria

As the name suggests, Improved Wood Based Crematoria (IWC) operate in a traditional manner on wood only and is capable of saving wood upto 50-60 % as compared to the conventional method. In IWC, cremation is done on a specially designed elevated pyre equipped with a hood and chimney to improve combustion efficiency and minimize wastage of heat, which makes it a fuel-efficient system. It enables users to perform all-important rituals associated with the cremation process. Thus, besides being environment-friendly and fuel-efficient IWC is a user acceptable method.



### 8.3 DETAILED PROJECT REPORT

An executive summary of the project covering its salient features and abstract of project cost should be given in the DPR.

A checklist of important items of the project in the prescribed format as given at Annexure 11 should be attached immediately after the executive summary.

#### 8.3.1 Baseline Status

The following information should be provided:

- (i) Total population of the city as well as that of the target users – this should include floating population also for religious cities like Varanasi, Allahabad etc.
- (ii) Details and current status of each of the existing cremation grounds in the following table:
  - (a) Name of cremation ground
    - Number of platforms
    - Average Number of cremations/day
    - Average wood consumption/cremation
    - Sale price of wood
    - Whether any subsidy provided for wood by the local body
    - Average time taken in each cremation
    - Blockage of platform after each cremation to facilitate ash collection
    - Operating agency
    - Expenditure on O&M/year
  - (d) IWCs, if any,
    - Number of Platforms
    - Year of installation
    - Average Number of cremations/day
    - Average wood consumption/cremation
    - Sale price of wood
    - Whether any subsidy provided for wood by the local body
    - Average time taken in each cremation
    - Blockage of platform after each cremation to facilitate ash collection
    - Operating agency
    - Expenditure on O&M/year
  - (e) Electric/ rematoria, if any
    - Number of furnaces
    - Year of installation
    - Average Number of cremations/day
    - User fee charged/cremation
    - Average time taken in each cremation
    - Operating agency
    - Average electricity outage/day
    - Expenditure on O&M/year

## 8.4 FIELD INVESTIGATIONS

The proposal may comprise either new facility or upgradation of existing facility or a combination of both.

## 8.5 DESIGN AND OTHER CONSIDERATIONS

Projects of electric/gas based crematoria should have the following components:

- (A) Electric
- (a) Furnace
- (i) Furnace with appurtenant components with specifications as given below.
  - (ii) The number of furnaces should be decided on the basis of expected cremation load assessed through field investigations.
    - Furnace having power rating of 51 KW
    - Transformer-150 KVA
    - LT Panel, HT switchgear,
    - Heating elements
    - Chimney – 30 m long as per norms of SPCB/CPCB
    - Blower of 2800 rpm and 10 HP motor for flue gases
    - Fresh air blower with servo motors
    - Door motor for door lifting
    - Charging trolley
    - Pollution control equipment for cleaning flue gases like cyclone separator, water spray tank and slurry tank
- (b) Building
- (i) Provision of a proper sized building should be made for housing cremation furnace including sitting space for mourners, toilets, washrooms, drinking water etc.
  - (ii) Even if only one furnace is proposed, provision of building should be made for two furnaces keeping in view the future load.
  - (iii) The optimum size for housing two furnaces and other facilities is 30 m x 20 m
- (B) Gas
- (a) Furnace

Gas based crematoria may be operated on either CNG or LPG. Gas furnace with appurtenant components should have the following specifications.

Like electric crematoria, the number of furnaces should be decided on the basis of expected cremation load assessed through field investigations.

Furnace:	With necessary burners generally four burners are provided in each furnace
Fuel:	CNG or LPG
Ignition:	Direct spark ignition 7300-volt ignition transformer
Motor:	3450-220 V-2.4 A
Blower:	2800 rpm and 10 HP motor for flue gases
Chimney:	30 m long as per norms of SPCB/CPCB

Fresh air blower: with servo motors

Door motor for door lifting

Charging trolley

Pollution control equipment for cleaning flue gases like cyclone separator, water spray tank and slurry tank

(b) Building

Provision of building would be the same as in the case of electric crematoria mentioned above.

### 8.5.1 Improved Wood Based Crematoria (IWCs)

Proposal for new cremation grounds

(a) A new cremation ground should comprise the following components:

- (i) Pyres with shed, tray, hood and chimney and necessary civil work.
- (ii) A prayer-cum-assembly hall
- (iii) A godown for storing wood
- (iv) A room for care taker
- (v) Provision of toilets and washrooms
- (vi) Lighting arrangements
- (vii) Matching landscape

(b) No of pyres/platforms should be decided on the basis of data generated from baseline status and field investigations. However, it should not be less than two in any case to allow situations of bunching.

(c) Pyre, tray, hood and chimney should have the following specifications:

Platform for pyre:	7 m x 6 m including pathways and drainage for washings
Pyre:	2 m long x 1 m wide and 1 m high
Tray:	2.2 m long x 0.8 m wide. For each pyre 4 trays and a rack to hold these trays till ashes are collected
Hood:	2.5 m long and 1.25 m wide x 1 m high in taper and three side folding flaps
Chimney:	11 m long as meeting SPCB/CPCB norms

(d) Platform should be made with standard/economic materials to provide better aesthetics and longer life. Provision of a bathing platform (for dead body) should also be made.

(e) Pyre, tray, hood and chimney should be made of heat, corrosion and thermal shock resistant materials to withstand temperature up to 900 C and to provide at least 5 years maintenance free operation. This is necessary as local bodies are generally cash strapped and cremation grounds attract low priority for them.

(f) Prayer-cum-assembly hall with proper benches for sitting of mourners should be of 10 m x 6 m to accommodate at least 100 persons.

(g) The size of godown for storing wood will depend on the estimated requirement. It should be enough to store at least 3 months stock.

(h) Caretaker room-cum office should be of 4 mx 3 m size.

- (i) Toilets, washrooms and source of drinking water should be of matching requirement. Similarly adequate lighting arrangements should be provided.
- (j) Provision of minimum landscaping equivalent to 5 % of the cost of civil work (maximum) with greenery and flowerbeds etc should be provided. This is necessary for improving the aesthetics and providing soothing environment for the mourners.
- (k) Estimates of civil work should be based on the latest SOR applicable for the city. Estimates of non-schedule items should be based on lowest of the three quotations obtained from prospective suppliers.

### 8.5.2 Proposal for Up gradation of Existing Cremation Ground

- (a) For upgradation proposals, generally pyres, trays, hood and chimneys with appurtenant civil work may be considered.
- (b) For inclusion of additional items, if any, referred to for the new cremation grounds proper justification should be provided.

## 8.6 LANDSCAPING AND ARCHITECTURE

Considering the sensitivity of the site, attempt should be made to develop the premises with compatible landscaping and architecture for better environment and aesthetics.

## 8.7 OPERATION AND MAINTENANCE

Charges are levied on use of crematoria. An estimate should be made and incorporated in the project cost.

All projects should have built-in components of 5 years O&M.

## 8.8 COST ESTIMATE

The equipment for electrical and gas based crematoria is supplied on a turnkey basis. Quotations from the suppliers should be obtained alongwith the requirements of land, civil, electrical and mechanical works. Based on this information cost estimates should be prepared and presented in the form given in the table below.

**Table 8.1: Cost Estimate of Crematoria**

S. No.	Name of Locality	Details of Item	Quantity	Cost/unit, Rs.	Total Cost, lacs
1.		Wood based crematoria			
2.		Electrical crematoria			
3.		Gas based crematoria			
4		Land acquisition cost			
		O&M Cost			
		<b>Grand Total</b>			

## CHAPTER - 9

### ADDRESSING OTHER SOURCES OF POLLUTION

#### 9.1 DAIRIES

The proposal may be prepared taking in to account the existing dairies in the town / city and their size etc to prevent disposal of excreta and urine into the river. Dairy is an industry and this item would not be eligible for funding by the NRCD.

#### 9.2 DHOBI GHATS, GARAGES & CATTLE WALLOWING

The ULB should identify and take into account all dhobis (washermen) washing clothes, garages washing vehicles in the river, places with numbers of cattle wallowing in the river while preparing the proposal. Based on the information, facilities need to be created.

#### 9.3 CARCASS DISPOSAL

Safe facility to dispose of carcass needs to be created by the ULB.

#### 9.4 OPERATION AND MAINTENANCE

In respect to dairies, the owners should meet their own cost. The waste generated in dairies is a source of energy and compost. It should not need any financial support from the urban local body for operation and maintenance. Other sources of pollution covered above may involve expenditure for operation and maintenance. An estimate needs to be made and incorporated in the cost estimate for a period of 5 years.

#### 9.5 COST ESTIMATES

All the schemes in this chapter are to be prepared, implemented and maintained by the ULB. The schemes need to be framed in consultation with appropriate experts. Many of these items are covered in the chapter on solid waste management. The extent to which the information about cost estimates is available there it can be picked up. This aspect is therefore, not being covered here.

# CHAPTER - 10

## RIVER FRONT DEVELOPMENT

### 10.1 INTRODUCTION

Rivers in India are considered holy and there is religious significance attached to them. The banks of the rivers where they bathe need to be kept in good shape. In order to reach the benefits of rivers to the society, the programme may support River Front Development (RFD) to enhance aesthetics and environmental conditions along the banks. This can be achieved by undertaking RFD activities. RFD can be integrated with schemes like community toilet complexes, crematoria and plantation to make an area development scheme.

### 10.2 BASELINE STATUS

The following information should be provided:

- (i) Total population of the city as well as that of the target users for individual RFD works. This should include floating population for religious cities like Varanasi, Allahabad etc. that assembles on important occasions.
- (ii) Details and current status of the existing RFD works and the problems faced in their O&M.

### 10.3 DESIGN CRITERIA

Type A – Area Development Plans (ADP) would apply to sub-projects where larger river front stretches say 1-2 km long and 30-40 m wide are involved.

Facades of RFD works must be match with the cultural, religious and heritage value of the place.

Given the meandering characteristic of most rivers, one of the essential requirements should be the availability of water along the bank round the year.

The local bodies concerned are also to ensure that materials like municipal solid waste (MSW) and other wastes of any other kind are not allowed to be dumped on or near the riverbank. Separate guidelines are available for management of MSW.

Consultations with stakeholders are essential to assess the needs of the people based on which, components of ADP would be finalized. The underlying need is that an ADP should facilitate an interface between the community and the river.

The following components must be considered for developing an ADP:

- (i) Provision of platforms and steps leading to the river to facilitate a safe approach
- (ii) Changing rooms for males and females
- (iii) Toilet, washroom and drinking water facilities at the ghats. It is also necessary to provide toilet facilities for the floating population assembling at such congregations. Provision of mobile toilets may be one of the ways to address this problem.
- (iv) Adequate number of benches for sitting of people
- (v) Lighting and landscaping of area with fountains, flowerbeds etc.
- (vi) Development of approach roads, parking lots to facilitate easy access of beneficiaries

- (vii) Provision of commercial activities like kiosks for sale of eatables, boating etc. These facilities should operate on pay-and use/eat basis and, therefore, are expected to be self-sustaining.
- (viii) Given the size of congregations and diversity of the people assembling there suitable platforms for holding cultural and recreational programmes must be considered.

#### **Type B - Improvement of small ghats.**

- (i) Like ADP, development of small ghats should comprise components like platforms and steps, changing rooms, toilets, washrooms and drinking water facilities, lighting, sitting space and matching landscape.
- (ii) All these facilities should be finalized in consultation with stakeholders.

### **10.4 OPERATION AND MAINTENANCE**

Like other works, operation and maintenance and lack of public participation have emerged as major bottlenecks in sustaining RFD works.

The ULB needs to estimate the expenditure on operation and maintenance and incorporate in this cost estimates.

With the new guidelines of NRCD all projects should have built-in components of 5 years O&M and necessary public education and awareness.

For ADPs provision of user fee must be considered to recover O & M costs to the extent possible. Suitable levies should also be charged from commercial activities to generate revenue to meet O&M expenditure.

Public awareness programmes oriented towards educating people on how to maintain the river and its fronts should be organized round the year and more so during large congregations.

The net deficit in O&M should be estimated on a realistic basis after discounting the above income, which should form part of the project cost.

Being a specialised area only organisations with at least 5 years experience in the construction and maintenance of such assets should be shortlisted for implementation of these projects on turnkey/ BOT basis.

### **10.5 COST ESTIMATES**

The scope of work covered under RFD sub-projects can not be uniform and would vary from place to place according to the needs of the people.

Estimates for all civil works must be prepared according to the latest applicable SoRs to avoid cost overrun.

Non-schedule items must be based on prevalent market rates obtained through quotations, which should be attached to the DPR.

Detailed bill of quantities, drawings and specifications of different components compatible to NITs for tendering the works should be provided in a separate volume.

An executive summary and abstract of cost should form part of the DPR to facilitate expeditious approvals.

**Table 10.1: Cost estimate of River Front Development**

S. No.	Item	Quantity	Cost (Rs. in lacs)
1	Provision of platforms and steps leading to the river to facilitate a safe approach		
2	Changing rooms for males and females		
3	Toilet, washroom and drinking water facilities at the ghats. It is also necessary to provide toilet facilities for the floating population assembling at such congregations. Provision of mobile toilets may be one of the ways to address this problem.		
4	Adequate number of benches for sitting of people		
5	Lighting and matching landscape including items like fountains, flowerbeds etc.		
6	Development of approach roads, parking lots to facilitate easy access of beneficiaries		
7	Provision of commercial activities like kiosks for sale of eatables, boating etc. These facilities should operate on pay-and use/eat basis and, therefore, are expected to be self-sustaining.		
8	Given the size of congregations and diversity of the people assembling there suitable platforms for holding cultural and recreational programmes must be considered.		
9	Operation and Maintenance		
10	Cost of land		
	<b>Grand Total</b>		



# CHAPTER - 11

## SOLID WASTE MANAGEMENT PREPARATION OF FEASIBILITY REPORT

### 11.1 NEED FOR PREPARING THE FEASIBILITY REPORT OF SOLID WASTE MANAGEMENT

The solid waste stored or dumped within a city, particularly on the bank of a river gets dumped into the river and pollutes it. Unless it is managed properly it constitutes public health hazard and spoils the environment and aesthetics of the town.

Every Urban Local Body should have proper arrangement to deal with solid waste generated in the town. Augmenting, operating and maintaining solid waste management system in a sustainable manner by urban local bodies would require considerable capital investment, introduction of latest environment friendly and cost effective technologies, Public-Private Partnerships (PPP) and introduction of appropriate waste management operation and maintenance practices. The ULB may prefer to remove all fixed bins / vats and install portable / movable bins and well-designed transfer stations to provide the city aesthetics at its best possible condition. It is, therefore, necessary to prepare a project for proper management of solid waste.

### 11.2 RULES OF MUNICIPAL SOLID WASTE MANAGEMENT 2000

The Ministry of Environment and Forests has issued rules for Municipal Solid Wastes (Management and Handling) Rules, 1999 published in Sept 2000 (<http://envfor.nic.in/legis/hsm/mswmhr.html>). The Ministry of Urban Development has published a Manual on Municipal Solid Waste Management 2000 (<http://urbanindia.nic.in/publicinfo/manual.htm>). The guidelines in this manual should be followed in preparing the CSP and, FR of Solid Waste Management.

### 11.3 THE FEASIBILITY REPORT OF SWM TO BE PREPARED BY THE ULB

The ULB may prepare FR and after its approval, DPR may be prepared for SWM in the town. Such FR / DPR shall be prepared considering dovetailing of funds under JNNURM / UIDSSST and after integration and synchronisation with the programmes of MoEF under NGRBA / NRCP.

### 11.4 DATA FOR FR OF SWM SCHEME

For preparing the FR and the DPR, data collected against chapters 2 may also be used for preparation of the reports for SWM.

### 11.5 THE PLANNING PROCESS

Involving people in the preparation of Feasibility Report is required to spread the awareness of the problem and to generate interest, among the stakeholders, in solving the problem.

Initial basic step is to collect and analyze data. After the data has been collected, feasible solution, from among those considered, should be selected by considering technical, economic, social and other factors.

## 11.6 DESIGN PERIOD

Municipal Solid Waste Management involves activities associated with generation & segregation at source, storage, collection, transfer and transport (with segregation option), processing, recovery and disposal of solid waste, which is environmentally compatible adopting principles of waste minimization / source reduction, material recycling, waste processing (energy & material recovery) & waste transformation .

Design life of land fill area should be typically for the range of 10 to 25 years.

While preparing a municipal solid waste management plan, the following design period (time-frame) involving all such activities as stated above should be decided depending upon the necessity of solid waste management plan:

- (i) Short-term plan 2-5 years
- (ii) Medium-term plan 5-15 years
- (iii) Long-term plan 15-25 years

## 11.7 COMPOSITION OF SOLID WASTE

Household waste, mostly generated from kitchen and other domestic activities, is the major part of MSW, which includes both bio- degradables and non-biodegradables.

### 11.7.1 Composition of Wastes

The composition of Municipal waste is as below:

- i. Domestic / Residential
- ii. Institutional
- iii. Commercial
- iv. Garbage (animal & vegetable wastes form market, hotel, restaurants and food stall)
- v. Rubbish
- vi. Ashes
- vii. Street sweeping
- viii. Construction & demolition wastes
- ix. Bulky wastes
- x. Hazardous (I/c bio-medical & industrial) wastes

The data on quality and quantity of the waste, by category, can be lumped together and used.

In the country per capita waste generation varies between 0.2 Kg to 0.6 Kg per day in cities with population ranging from 1.0 lakh to 50 lakh. Estimation of future population, as detailed in chapter-4 should be followed for assessing the quantum of MSW in short, medium & long term plan periods. However in the absence of sufficient data, an assessment may be made in the township taking into account increasing per capita waste generation of about 1.3% per year, and growth of urban population between 3% and 3.5% per annum, yearly increase in the overall quantity of solid waste in the cities is about 5%.

## 11.8 WASTE CHARACTERISTICS

For preparing the DPR the physical and chemical characteristics of waste need to be determined after testing. Such laboratory reports shall form part of the DPR. For preparing FR, the average values may be adopted based on results of the testing done in other cities of the State. The parameters on which data may be obtained are as follows:

### 11.8.1 Physical Characteristics

- a) Per capita solid waste generation
- b) Biodegradable quantity of waste
- c) Non-biodegradable quantity of waste
- d) Moisture content (% by weight)
- e) Average ash content and
- f) Calorific value of waste
- g) Quantity and type of recyclable waste
- h) Density (Kg/M<sup>3</sup>) & composition of waste

### 11.8.2 Chemical Characteristics

- a) Organic matter (%)
- b) NPK values (%)
- c) C/N ratio
- d) Calorific value (Kcal/Kg)

Chemical characteristics of MSW may be given in a table as annexure of the DPR.

## 11.9 SYSTEM DESIGN OF SOLID WASTE MANAGEMENT

### 11.9.1 Approach

The approach to solid waste management focuses on:

- i. Segregation of waste at source into biodegradable, non-biodegradable waste categories
- ii. Appropriate waste collection (both door to door & community bin system) and storage
- iii. Primary and secondary transport of the waste to transfer stations (TS) and or disposal site.
- iv. Processing and treatment of the MSW for recovery of material & energy.
- v. Minimizing the waste to be disposed through sanitary land filling.
- vi. Public – Private partnership for economic sustainability and proper handling and management of waste.
- vii. Decentralized / centralized processing of biodegradable waste to compost to utilize its nutrient value
- viii. Revenue earning from recyclable / reusable waste with the involvement of scavengers (above the age of 18 years), NGOs / CBOs:
- ix. The management of SWM can be divided into four functional units
  - Segregation at source, collection and storage at source
  - Transfer and transport
  - Processing and treatment

### Disposal

Details of the above items and costs should be worked out in accordance with CPHEEO manual (<http://urbanindia.nic.in/publicinfo/manual.htm>).

## 11.10 PROCESSING AND TREATMENT

Waste processing should be aimed at minimization of the waste by recovering recyclable material and energy to ensure reduction in landfill space for final disposal of the waste. The ULBs may also consider to utilize 'Construction & demolition waste for making sub-base of road formation, filling low lying areas etc. The 'Green waste and street sweeping (particularly leaves, branch of trees etc.)' may be utilized for conversion to green manures in parks inside city. The various processes involved are segregating, composting, vermi-composting and recycling waste through value addition.

### 11.10.1 Segregation

The waste can be segregated at various stages as;

Sorting at the source: In areas where two bin system with door to door collection is followed, the waste shall be separated into Bio Degradable (BD) and Non Bio Degradable (NBD) waste.

Sorting at the transfer station : At transfer station the manual sorting shall be done to sort out the recyclable / reusable waste from NBD into different components to be sold e.g. metals, glass, plastic etc. and stored at the site.

Sorting of the mixed waste shall have to be carried out into BD, recyclable/ reusable material and non-recyclable / non-reusable(NRU)

Sorting of waste shall be required at the final disposal sites also before processing as some of the waste may be directly sent to the disposal site.

### 11.10.2 Composting

The BD waste should be converted to manure by composting preferably through Public – Private partnership.

### 11.10.3 Vermi composting

Vermi-composting is decentralized method of SWM, which can be used to reduce the burden on the local body as well as economize the collection and transport component of SWM. For this the public be motivated to adopt this technology at individual house level or collectively. The cost of the method is low and suits the individual.

## 11.11 FINAL DISPOSAL

For final disposal land fills may be constructed at suitable location. The location should be decided after consulting the people living in the vicinity. This will be used to dump all non-biodegradable waste which is non-recyclable and non-reusable.

The proposal may include details of all infrastructural facilities and machinery required for collection, transportation, processing and disposal.

## 11.12 CRITERIA FOR DESIGN OF THE SWM SYSTEM

### 11.12.1 Design Population

#### 1. Population forecasting

The population projection figures may be used for the design of SWM system. The design periods given in the CPHEEO manual (<http://urbanindia.nic.in/publicinfo/manual.htm>) may be used.

### 11.13 PRIVATE SECTOR PARTICIPATION IN SWM

Involvement of the public and the private sector in collection, transportation, processing and the disposal should be explored.

### 11.14 RESOURCE RECOVERY

Resource recovery from solid waste must be an integral part of the proposal. It can be through the following routes

- a) Waste to compost
- b) Waste to energy
- c) Recycling
- d) Any other feasible technology

Having discussed the sizes, capacities and numbers of major items that need to be incorporated in the Feasibility Report, the cost estimates should be prepared. The items that may need to be included are mentioned below.

### 11.15 ESTIMATING STAFF REQUIREMENTS FOR HANDLING VARIOUS KINDS OF WASTES

In ULB the following categories of staff are deployed on solid waste management. Their sanctioned strength at the time of preparation of FR should be compared with the required strength on the basis of norms which need to be developed for out put.

**Table 11.1: Estimation of Staff Required for SWM**

	Designation	Number
a)	Health Officer	
b)	Sanitary Inspectors	
c)	Jamadar	
d)	Sweepers	
e)	Loaders / Drivers (The present position of staff deployed and that required on optimal norm may be worked out):	

### 11.16 COST ESTIMATE OF SOLID WASTE MANAGEMENT

Illustrative list of items for estimating cost of the System is given below:

**Table. 11.2: Illustrative list of items for estimating cost of the SWM**

S. No.	Details of Item	Quantity	Cost/unit, Rs.	Total Cost, lacs
<b>1.0</b>	<b>Collection and Storage System</b>			
1.1	HH / Community Bins / litter bins of various capacities			
1.2	Refuse compactor container of required capacity			
1.3	<i>Dumper Placer container of required capacity :</i>			
1.4	Wheel Barrow			
1.5	Six container pedal tricycle / hand carts			
1.6	Vehicle for collection and transfer			
	<b>Brooms / shovels / container for street sweeping</b>			
	Tractors, Dumper & Refuge			
	<b>Sub Total</b>			
<b>2.0</b>	<b>Transfer Station (with proper fencing)</b>			
<b>2.1</b>	<b>Composting</b>			
<b>3.0</b>	<b>Waste Disposal site</b>			
3.1	Computerised weigh bridge 20 MT capacity including foundation and substructure			
3.2	Bull dozer			
3.3	Excavator			
3.4	Compactor			
3.5	Water tanker			
3.6	Tippers/ Tractor Trailers			
3.7	Development of site office building, roads, water supply, lighting etc.			
3.8	Composting <ul style="list-style-type: none"> <li>a. Shredders</li> <li>b. Windrow turner</li> <li>c. Loader attachment</li> <li>d. Screens</li> </ul>			
3.9	<b>Miscellaneous works and Miscellaneous Equipments including tackles and tools etc.</b>			
3.10	<b>Incinerator for carcass disposal</b>			
3.11	Plastic recycling machine			
3.12	Environmental monitoring equipment			
3.13	Training of personals for segregation of waste and working on plastic recycling machine			
3.14	Improved crematoria with two platform 1 in each zone			
	<b>Sub Total</b>			
	Contingency @ of 2 %			
	<b>Sub Total</b>			
4.0	Operation and Maintenance for 5 years			
	<b>Grand Total</b>			

## CHAPTER - 12 AFFORESTATION

### 12.1 OBJECTIVES

This activity may be proposed with the following objectives

1. To improve the aesthetics within the area covered by the boundaries of the scheme.
2. To check river bank erosion and as part of its beautification.

### 12.2 WHERE TO PLANT?

Campuses of STPs, Pumping Stations, along Effluent Channels, Pathways and areas around Crematoria, areas around Bathing Ghats and Community Toilet Complexes etc. Also, in open space belonging to ULB and available etc.,

river banks under the project area.,

and in the case of lakes erosion prone areas in the catchment.

### 12.3 WHAT SPECIES TO BE PLANTED?

These are essentially to be avenue / aesthetic plantations and hence suitable local flowering tree species in consultation with local people and with active participation of NGOs who are working in that area may be selected. In case of plantations around STPs, Pumping Stations and along Effluent Channels, tall plants having dense foliage shall be planted. Selection of plant species may be done in consultation with State Forest Department. Plantation of revenue earning trees shall be made, as resource recovery, in the area of STP meant for future expansion.

### 12.4 IMPLEMENTING AGENCY

In the States, to take up plantation is the responsibility of the State Forest Departments. They have the requisite expertise and infrastructure; they may be given the task to take up works of afforestation.

### 12.5 FINANCIAL NORMS FOR PLANTATION

Estimates should include provisions for maintenance for a period of 5 years including the planting year.

Provision for barbed wire fencing and / or tree guards may be kept based on requirement. For this detailed justification may be given. Low cost vegetative fencing should be encouraged.

Employment of watchmen for the purposes of protection may be proposed. Appropriate mechanism must be evolved for maintenance and protection of the plantations taken up under these guidelines by resorting to the concepts of social fencing with the involvement of NGOs, Paryavaran Vahinis, Eco-clubs, Forest Protection Committees, Panchayati Raj Institutions etc. This mechanism must be indicated in the DPR.

## **12.6 RECORDS TO BE MAINTAINED**

The implementing agency will be required to meticulously maintain requisite documents like plantation registers including treatment map, measurement books, accounts etc. It will also diligently maintain every six months, the survival percentage of the plantations. A minus survival rate as specified by the State Forest Department is to be ensured.

## **12.7 EVALUATION**

Works may be monitored / evaluated through suitable entities.

## **12.8 COST ESTIMATES**

They should be prepared in consultation with social forestry or local horticulture department and / or State Forest Department as the case may be.



# CHAPTER - 13

## PUBLIC PARTICIPATION & PUBLIC AWARENESS AND STAKE HOLDERS CONSULTATION

### 13.1 INTRODUCTION

Programmes like NRCP or NGRBA are for the preservation of natural resources and these are basically 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. With a small investment on this activity many complex problems can be resolved. In the light of experience gained in the implementation of GAP and NRCP, it is now recognised that effective civil society / public participation can only bring about full success of the programme.

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 lay out 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 teachers 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 under NGRBA. Apart from hiring expert agencies for this purpose, arrangements to involve Nehru Yuva Kendra Sangathan have been put in place, which should be integrated with this component.

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.

### 13.2 OBJECTIVE

The objective should be to ensure that the communities are aware that

- i. There is a need for conservation programme and that they will benefit from it.

- ii. There are costs involved in such programmes and part of the O&M burden will have to be borne by them,
- iii. The communities are effectively involved in all stages of the project cycle from conceptualisation, to preparation, to finalisation, to implementation and finally O & M.

### 13.3 PUBLIC AWARENESS AND PUBLIC PARTICIPATION AS FRONT END ACTIVITY

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 **NATIONAL GREEN VOLUNTEERS**.

### 13.4 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, 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. Grassroot level functionaries of Municipalities and state government departments like public health, forestry, Jal Nigam, PWD, etc.,

### 13.5 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 coopted 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 Committee, or otherwise, for each ward identify an active NGO or promote a group of interested and committed people to be involved in 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 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 the rivers.
    - b) A website may be created to provide facts about the state of sanitation, in particular, the degradation of the river.
    - 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 programmes/events administrative and teaching faculty to organise 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 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) Awaken, 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 throwing of 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 in fact, they need to be properly educated and 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 coverage to the aspect of river pollution control measures through the active involvement of the people (Action: NGOs of repute having a sound organisation infrastructure of public relations unit).
- n) Awaken, educate and encourage the grassroot level functionaries belonging to such departments of state govt. as local bodies like, 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.

### 13.6 IMPORTANT STAGES OF STAKEHOLDER CONSULTATION AWARENESS GENERATION AND SECURING PUBLIC PARTICIPATION

- i. Stage of conceptualization
- ii. Exploration of the desirability of taking up pollution abatement of river
- iii. Preparation of Feasibility Report
- iv. Preparation of DPR
- v. Submission of the project to the State Government
- vi. Stage of sanction by the NRCD
- vii. During implementation
- viii. Any stage when obstacle is faced, say in identification of land needed for works.
- ix. Implementation of DPR
- x. Commissioning and evaluation

### 13.7 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 below:

**Table 13.1: Cost Estimate for Public Awareness and Public Participation**

S. No.	Item	Basis of Calculation (Amount in lacs of Rs.)	Total Amount Rs. In Lacs
<b>A</b>	<b>Mass Media</b>		
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>B.</b>	<b>Events</b>		
7	Sponsoring / Organising Events like Puja, Local Festivals etc.		

<b>S. No.</b>	<b>Item</b>	<b>Basis of Calculation (Amount in lacs of Rs.)</b>	<b>Total Amount Rs. In Lacs</b>
8	Preparation of Exhibition Material, Posters and Organising these events-rivere festival and run for the river events		
9	Special Cultural Events, Performances of Folk Media: (Folk theatre, Folk Music, Folk Stories) Street Plays ( <b>performances specially for slum localities</b> )		
<b>C.</b>	<b>Groups and Meetings</b>		
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.		
	<b>Total for Public Awareness and Public Participation Activities</b>		
	<b>Grand Total</b>		

# CHAPTER - 14

## TRAINING, HRD AND CAPACITY BUILDING

### 14.1 PHASES OF POLLUTION ABATEMENT PROJECT

A project passes through the following phases:

1. Problem identification
2. Conceptualisation
3. Project planning,
4. Project preparation
5. Project implementation,
6. Operation and maintenance
7. Monitoring and evaluation

### 14.2 DOMAINS OF KNOWLEDGE INVOLVED

1. Scientific and technical – Water Quality, Aquatic Biology, Civil Engg, Electrical Engg, Mechanical Engg, 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

### 14.3 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.

### 14.4 EDUCATION NEEDS

The following table gives the required educational attainments of manpower.

**Table 14.1: 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	v	v		
Conceptualization	v	v		
Project Planning	v	v		
Project Preparation	v	v	v	
Project Implementation		v	v	v
O&M		v	v	v
Monitoring		v	v	
Evaluation	v	v		

## 14.5 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 the projects that are 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 5 years 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.

## 14.6 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 organisation.

## 14.7 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. It should consist of identifying academic disciplines in which personnel with postgraduate degree, undergraduate degree, diploma and certificate are needed and the numbers in each. 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. A list of institutions of higher education with the academic disciplines where the personnel can be sent for education should be prepared.

The number of people at various levels required for such projects should be estimated and the personnel should be posted on appropriate jobs.

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.

#### 14.8 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.

#### 14.9 COST ESTIMATES

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

**Table 14.2 Cost Estimate of HRD and capacity building**

S. No.	Items	Cost (Rs. lacs)
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, safai karamchari, 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	
	<b>Total</b>	

## CHAPTER - 15

# PROJECT IMPLEMENTATION MECHANISM

The State Nodal Department must explore the possibility of promoting joint ventures in Public Private Partnership (PPP) or setting up a Special Purpose Vehicle to implement these projects.

Projects under NGRBA and NRCP are funded on cost sharing in the ratio of 70:30 between MoEF and State Government or local body concerned. It is also stipulated that out of the share of State/local bodies, at least 1/3rd may come as direct public contribution. This stipulation is essential to inculcate the sense of ownership among beneficiaries to improve sustainability.

The State Government may employ a number of project executing agencies for different types of projects.

For the preparation of FR and DPR reputed professional consultants may be engaged by the State Government.

# CHAPTER - 16

## PROJECT MANAGEMENT & INSTITUTIONAL ISSUES

### 16.1 INSTITUTIONS

Pollution abatement of rivers involves a complex of issues and institutions.

It is, therefore, obvious that institutions associated with the programme should be assigned specific responsibilities at the State Level and the town level for preparation, implementation and management of projects so that the rivers can be maintained in good health.

#### 16.1.2 Establishment of Project Management Units in States

In those States where a number of river stretches are polluted and many projects have to be prepared, it is desirable to create a dedicated State Project Management Unit (SPMU) in the State Government, to take all measures related to matters of policy, programme, project formulation, implementation, regulation, operation and maintenance and management for pollution abatement and improvement of quality of waters in rivers and lakes in the State. In this Unit the Departments in charge of urban local bodies (municipalities and municipal corporations), Environment, Irrigation, Forest, Agriculture, Rural Development and Finance should be represented.

#### 16.1.3 State Implementing Agency

The SPMU may appoint a State Implementing Agency. The organisation that handles projects related to water supply and waste water management in the State may be a natural choice for appointment as Implementing Agency. The Implementing Agency may be given the responsibility to coordinate, supervise, guide and manage the programme and projects of pollution abatement of rivers. It will work under the supervision and guidance of the SPMU and will be accountable to it. It will directly handle the Core Schemes while the Non Core Schemes will be handled by ULB, Irrigation Department and others as decided by the SPMU. It should service the SPMU.

the State Implementing Agency should have a compact Cell headed by an engineer who specialises in Environmental or Public Health engineering. The Cell should be equipped with computers, and suitable state-of- art software and usual equipment needed. The Cell may be provided access to necessary expertise in relevant disciplines including Remote Sensing & GIS, Biology, Environment, Sociology, Finance, Communication, and urban administration. For this purpose, a panel of such experts drawn from institutions, preferably of the state government, may be maintained.

#### 16.1.4 Project Management Unit at the District / Town / City Level

Projects have to be framed in towns and districts involving work in sectors that are handled by different agencies. Thus, a pollution abatement project for a city will have a number of component schemes. Since the objective of different components is the same i.e., improvement of water quality, there is a need for coordinated and integrated action. Therefore, for preparation of projects and their implementation, a Project Management Unit (PMU) should be set up with the DM/DC/Collector or the Chairperson of the District Planning Unit

under the Panchayati Raj System or the Mayor/ President of the ULB as the Chairperson. It should have as members representative of the ULB in whose area the pollution abatement project is to come up, the district officers of the departments concerned with the schemes eligible for inclusion in the pollution abatement project. The representative of the state Implementing Agency should service the PMU and provide the necessary infrastructure and staff for it.

### 16.1.5 Functions of the State Implementing Agency

The SPMU should be responsible for proposing measures to the SPMU for maintaining ecological health and water quality of rivers in the state and obtaining approval. It may perform the following functions

- a) Assess the ecological, particularly water quality, status of the river systems in the state on the basis of data available with the SPCB, CPCB and other organisations or generated in various studies.
- b) Identify polluted stretches of rivers in the state that need to be restored.
- c) Identify sources that produce load of pollution that are responsible for degradation of the identified stretches. The sources could be cities and villages or industries. Since the source of pollution are many a project will have many component schemes.
- d) Select the sources from those in c) above for which projects for the abatement of pollution are to be prepared and implemented.
- e) Identify specific agencies for handling specific component schemes.
- f) Set up a Project Management Unit (PMU) for each city.
- g) Under their supervision and guidance get the PMU to:
  - i. Prepare city sanitation plans.
  - ii. Prepare DPRs of component schemes of projects as in d) above
  - iii. To under take survey and investigation to generate primary and collect secondary data for preparing the plans as above.
- h) Arrange timely and efficient implementation of projects which have been approved.
- i) Arrange quality control of all work done by them or under their supervision and guidance.
- j) Arrange monitoring and evaluation of the projects implemented.
- k) Decide, with the approval of SPMU, the mode of doing any work from amongst the following
  - i. Departmentally and the activities to be outsourced to consultants and contractors.
  - ii. Examine the feasibility of SPV/JV/PPP and decide on the mode to be adopted for a specific project and working out the necessary details of the mode chosen.
- l) Set up a team for each scheme of which it has direct responsibility.
- m) Process proposals for seeking financial assistance.

### 16.1.6 Functions of the Project Management Unit at the district level

- i. It should perform the following functions
- ii. Allocate the component schemes to suitable agencies for preparation of project reports, their implementation, operation and maintenance and subsequent management.
- iii. Monitor progress of the schemes at different stages.

- iv. Coordinate the work of different agencies as there may be overlapping activities.
- v. Keep the implementing agency informed of the progress.

### 16.1.7 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.

### 16.1.8 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.

### 16.1.9 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.

### 16.1.10 Responsibility for activities and schemes

The following table suggests the agencies that can be given responsibility for schemes

**Table 16.1: Planning and Implementing Agencies**

Type of Schemes	Item of work	Planning and Implementing Agency
	Study of River and its basin	State Implementing Agency or Pollution Abatement Cell
	Selection of cities	"
Swirage Schemes	Sewerage Works & STPs	Institutions like Jal Nigams, Sewage Boards, PHEDs etc where they exist. In other places, the State Level Agency will decide who should do the work.

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

## 16.2 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 Cell's own staff or, if there is shortage of suitable expertise, help of suitable consultants can be taken.

## 16.3. IMPLEMENTATION OF DPR – EXECUTION OF WORKS PROPOSED IN THE DPR

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

## 16.4 INSTITUTIONAL ISSUES IN MANAGEMENT

### 16.4.1 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 organisations.

### 16.4.2 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 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 Government needs to resolve such overlaps. The role of each institution involved needs to be very clearly specified.

In the chapter on collection of secondary data, data that will reflect the strengths and weaknesses of the ULB and other institutions working in the city -, is required to be collected. This needs to be analysed to identify the areas where remedial measures are needed.

The PMU should solve any issues that may arise.

## 16.5 COST ESTIMATE OF INSTITUTIONAL ARRANGEMENTS

Since the SPMU will be a State Government body having all infrastructure of the Government, it does not need any financial support. The state implementing agency and the PMU will need financial support. Illustrative items for which funds may be required are mentioned below.

**Table 16.2: Cost Estimate of Institutional arrangements - State Level Implementing Agency**

S. No.	Items	Cost (Rs. In lacs)
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	
	<b>Total</b>	

**Table 16.3: Cost Estimate of Project Management Unit in the District/City**

S. No.	Items	Cost (Rs. In lacs)
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	
	<b>Total</b>	

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 - 17

# PERFORMANCE MONITORING

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

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. It would be preferable if the monitoring is done by an independent agency appointed by the project implementing agency. 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.

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 NRCD has a programme of water quality monitoring. This work is assigned by NRCD to reputed academic / R&D institutions and the NRCD bears the expenses of this work. However, there is a need for a dedicated person to collect data from the monitoring institution, 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.



## CHAPTER - 18

### COMPLETION SCHEDULE

Completion schedule for every scheme should be prepared and should be watched by the Implementing 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 at Annexure - 8.

Utilization certificates for the funds released by MoEF shall be submitted in the formats given at Annexure 12.

## CHAPTER - 19 COST ESTIMATES

### Estimation of Cost of Some Items

Each of the following items has been treated as a component scheme. These items are common to all the component schemes in the town. The funds allocated for these schemes are expected to cater to the requirements of all 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 abstract of cost may be provided in the format given in the table below, under the following subheads for each scheme:

**Table 19.1: Abstract of Cost of Works Proposed for Pollution Abatement**

S. No.	Item	Amount
1.	Land Acquisition scheme – this cost is to be borne by the State Government / IA	As in the respective chapter
2.	Interception & Diversion Including Internal Sewers	See the chapter on I&D and Sewage Treatment
3.	Sewage Treatment	"
4.	Community Toilet Complexes	See chapter on CTC
5.	Crematoria	See chapter on Crematoria
6.	Abatement of Other Non Point Sources of Pollution	See the concerned chapter
7.	River Front Development Works	"
8.	Plantation	"
9.	Municipal Solid & Biomedical Waste management	"
10.	Tools & Plant for maintenance of Works	See table on Centages
11.	Any other identified scheme	
12.	Monitoring & Evaluation	See the concerned chapter
13.	Awareness and Public Participation	"
14.	Training, Human Resources Development and Capacity Building	"
15.	Institutional Development & Strengthening	
16.	Centage As provided in the Table 1.1 given in the chapter 1	
17.		
18.		
19.		
20.	Total cost of project	
21.	Operation & Maintenance for first 5 years of commissioning of project (of all Schemes)	
	<b>Grand Total</b>	

Cost of land is an important element of cost estimate. 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.

Cost estimates of other components should be prepared in standard formats. These 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 NRCD 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:

Latest and updated SORs are used for scheduled items of work. Non-schedule items, if any, should be estimated on the basis of the current market price.

It takes some time to complete the DPR and then submit it to NRCD through State Government and finally appraisal and approval of DPR in NRCD. 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 NRCD.

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

The DPR would also be used for preparation of 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.

## CHAPTER - 20

# EXECUTIVE SUMMARY AND CHECK LISTS

### 20.1 REQUIREMENT TO PREPARE EXECUTIVE SUMMARY AND CHECK LISTS OF ALL SCHEMES

The City Sanitation Plan (CSP), Feasibility Report of Sewerage Schemes and DPRs of all Schemes should contain an executive summary and a check list. There should also be an integrated executive summary and check list of the Pollution Abatement Project as a whole.

Cost Estimates of the Project should also be prepared funding agency wise. Thus, one part should contain schemes to be funded by NRCD, another part to be funded by MoUD and other parts for other funding agencies, if any. In the executive summary the main items of every chapter should be covered.

### 20.2 CHECK LISTS

The various check lists are given below:

#### a) Check List of City Sanitation Plan

S. No.	Parameters	Yes	No
1.	Has the available data of the polluted stretch of the river basin been collected?		
2.	Have the maps of the river basin and the city been prepared?		
1.	Has the city been selected after studying the status of water quality of the river in the entire stretch in the state?		
2.	Has the problem of pollution with its causes been identified		
3.	Have all the sources of pollution of river been identified		
4.	Has the information of toilet facilities available in slums and elsewhere been collected		
5.	Has the condition of ghats been ascertained?		
6.	Has the expected outcome of pollution abatement project been spelt out in terms of improvement of water quality and of environment in the city been spelt out?		
7.	Has the present system of management of waste water and other works been studied		
8.	Have areas requiring up gradation of existing system of waste water management been identified.		
	Have areas where sewers to be laid been identified?		
	Have drainage areas and sewage districts been identified?		
	Has the need for following Schemes been examined?		
	(i) SWM		
	(ii) Community toilet		
	(iii) River front development		
	(iv) Other non-point sources of pollution		
	Have agencies that will be assigned the preparation of Component Schemes been identified?		
	Has executive summary been prepared?		

## b) Check list of Feasibility Report of Sewerage Schemes

S. No.	Parameters	Yes	No
1.	Has the CSP been approved?		
2.	Has the problem of pollution with its causes been identified ?		
3.	Has the expected outcome been spelt out ?		
4.	Has all available data relating to the city being necessary for FR and indicated in the Guidelines been collected?		
5.	Have maps of the city been prepared?		
6.	Has the present system of management of waste water and other works been studied ?		
7.	Have areas requiring upgradation of existing system of waste water management been identified?		
8.	Have areas where sewers to be laid been identified?		
9.	Have drainage areas and sewage districts been identified?		
10.	Have alternative systems of waste water management been worked out?		
11.	Has feasibility of options been worked out?		
12.	Has life cycle costs of options been worked out?		
13.	Have alternative options been evaluated and the most cost effective and sustainable option selected?		
14.	Has land requirement and its availability been examined?		
15.	Has executive summary been prepared?		
16.	Executive Summary attached		

## c) Checklist for DPRs of Community Toilet Complexes

S. No.	Parameters	Yes ( )	No (x)
1	Approval of CSP by MoEF		
2	Executive Summary		
3	Monitoring of DPR preparation at higher levels		
4	Preparation of digitised map giving location of CTCs		
5	Baseline data and current status of utilisation of existing CTCs		
6	Consultations with stakeholders to identify CTC locations		
7	Availability of land for such locations		
8	Selection of agency for pay-and-use operation		
9	Confirmation of State Government/local body to share 30% cost		
10	Programme of public education and awareness		
11	Use of latest SoRs for preparation of cost estimates		
12	Justification of cost estimate		
13	Proposal for performance monitoring		
14	Completion schedule		

## d) Checklist for Sewerage and STP DPRs

S. No.	Parameters	Yes ( )	No (x)
1	Details of total sub-projects proposed for the city		
2	Executive Summary		
3	Monitoring of DPR preparation at higher levels		
4	Preparation of digitised map giving complete details		
5	Consultations with stakeholders		
6	Current river water quality status along the city		
7	Life cycle cost analysis for selecting treatment options		
8	Acquisition of land -		
9	Inclusion of O&M cost for first 5 years of completion in the estimate		
10	Confirmation of State Government/local body to share 30% cost		
11	Inclusion of resource recovery component in the proposal		
12	Completion schedule		
13	Programme of public education and awareness		
14	Programme of training and capacity building		
15	Use of latest SoRs for preparation of cost estimates		
16	Justification of cost estimate		
17	Assessment of quality and quantity of wastewater as per guidelines		
18	Inclusion of all features on the city map as mentioned in para 2.4 Review of sewer system designed by consultant at the level of department		
19	Analysis of centralised vs decentralised options for locating STPs		
20	Life Cycle Cost analysis for technology of STP		
21	Public acceptance for house connections		
22	Provision of dedicated feeders for uninterrupted power supply		
23	List of grossly polluting industries with their current status and monitoring plan		
24	Projections of improvement in river water quality after completion of the project and proposal for performance monitoring		

## e) Training, HRD and Capacity Building

S. No.	Parameters	Yes	No
1.	Domains of knowledge or disciplines identified?		
2.	Education needs for each domain identified?		
3.	Training needs for each domain identified?		
4.	Experience needs of each domain identified?		
5.	Physical (Space, equipment and infrastructure) needs for capacity building identified?		
6.	Individuals identified for education, training and experience identified?		
7.	Cost estimates prepared for the project broken in to annual requirement?		
8.	Name of organisation preparing the component of project mentioned?		
9.	Guidelines followed?		
10.	Schedule of activities / PERT chart prepared?		
11.	Executive Summary Enclosed?		

**f) Afforestation**

S. No.	Parameters	Yes	No
1.	Places for undertaking plantation identified?		
2.	Forest Department engaged to undertake plantation?		
3.	Estimates of cost made in accordance with the norms?		
4.	Arrangement made for undertaking evaluation made?		
5.	Name of organisation preparing this component of project mentioned?		
6.	Guidelines followed?		
7.	Schedule of activities / PERT chart prepared?		
8.	Executive Summary Enclosed?		

**g) Public Participation and Public Awareness (PP & PA)**

S. No.	Parameters	Yes	No
1.	Names of members of Project team mentioned?		
2.	Project Components for which the PP & PA to be prepared identified?		
3.	National Green Volunteers agreed to undertake the programme?		
4.	Public Awareness and Public Participation plan for each component prepared?		
5.	Target groups for each component project identified?		
6.	For each target group the complex of measures for generation of awareness and public participation identified?		
7.	Stages of stakeholder consultation identified?		
8.	Cost estimates for each component project prepared?		
1.	Guidelines followed?		
2.	Schedule of activities / PERT chart prepared?		
3.	Executive Summary Enclosed?		

**h) Solid Waste Management**

S. No.	Parameters	Yes	No
1.	ULB assigned the responsibility to prepare the Project Report of this component?		
2.	Have the guidelines of NRCD and those of Manual on Municipal Solid Waste Management 2000 been followed? <a href="http://urbanindia.nic.in/publicinfo/manual.htm">http://urbanindia.nic.in/publicinfo/manual.htm</a>		
3.	Short term, Medium term and Long term plan prepared?		
4.	Information about different categories of waste quantity and characteristics collected?		
5.	Provision for collection & storage and transportation made?		
6.	Site for garbage dumping site identified?		
7.	Private sector participation explored?		
8.	Resource recovery included as a component?		
9.	Plan for HRD, capacity building, Public Awareness and Public Participation prepared?		
10.	Guidelines followed?		
11.	Schedule of activities / PERT chart prepared?		
12.	Executive Summary Enclosed?		

i) **Crematoria**

S. No.	Parameters	Yes	No
1.	<b>ULB assigned the responsibility to prepare the Project Report of this component?</b>		
2.	<b>Baseline status of each wood based cremation ground ascertained?</b>		
i.	Population served		
ii.	No of platforms		
iii.	Average no of cremations /day		
iv.	Average wood consumption		
v.	Average time taken in each cremation		
3.	<b>Field Investigations carried out to determine the need for</b>		
i.	Cover new habitations		
ii.	Upgradation of existing crematoria		
iii.	Demand for EC, or IWC ascertained?		
4.	<b>Design criteria</b>		
i.	Specifications prescribed for the crematoria electric, gas or wood followed?		
5.	<b>Cost estimates</b>		
i.	Are they based on quotations obtained for EC or Gas based		
ii.	Has provision been made for civil works		
6.	<b>Sites for new crematoria identified?</b>		
7.	<b>Private sector participation explored?</b>		
8.	<b>Resource recovery included as a component?</b>		
9.	<b>Plan for HRD, capacity building, Public Awareness and Public Participation prepared?</b>		
10.	<b>Guidelines followed?</b>		
11.	Schedule of activities / PERT chart prepared?		
12.	Executive Summary Enclosed?		



## CHAPTER - 21

# PROCESSES IN PROJECT PREPARATION

### 21.1 DPR FOR EACH COMPONENT SCHEME OF POLLUTION ABATEMENT PROJECT

A project for the abatement of pollution of a river consists of many components. Different components are within the area of responsibility of different organisations and the funding sources may also be different. Since the DPR forms the basis of consideration for the grant of financial assistance, for each component there should be a DPR. It is necessary that it should be self contained.

### 21.2 PROCESSES IN PREPARATION AND PROCESSING OF DPR- FLOW CHART

The processes involved are given in the flow chart figure 1. The chart is self explanatory. It will be seen that preparation of the City Sanitation Plan of the identified city is the first step. The schemes, which need to be implemented for improving the river water quality are identified in the CSP. The CSP also identifies the agencies that have responsibility of different Schemes. While the preparation of the DPRs of the sewerage Schemes of Interception and Diversion of Wastewater is to be preceded by Feasibility Report, the DPRs of Non-Sewerage Schemes may be prepared without preparing their Feasibility Report.

The CSP should be under go public consultation at the stage shown in the Flow Chart. Likewise DPRs of Non-Sewerage Schemes and the Feasibility Report of Sewerage Schemes should also undergo consultation at the stage shown in the Flow Chart. The Plans/Reports that are subjected to Public Consultation should be finalized incorporating the results of these consultations.

All DPRs need to be submitted to the SPMU through the District PMU and the State implementing agency, which will submit to the NRCD. The DPRs of schemes that are eligible for funding by other Ministries / Departments should be submitted to them under intimation to the NRCD.

The processes and the activities shown in the flow chart, figure 22.1 should be invariably followed.

### 21.3 SUGGESTIVE STRUCTURES FOR PROJECT REPORTS

In order to ensure that the required items are covered in the project reports, the contents of chapters to be covered in the following reports are suggested:

- i. City Sanitation Plan (Annexure 9)
- ii. Feasibility Scheme of Sewerage Scheme (Annexure 10)
- iii. Detailed Project Report (Annexure 11)

For reports of non sewerage works there is no structure suggested as these will be site specific.

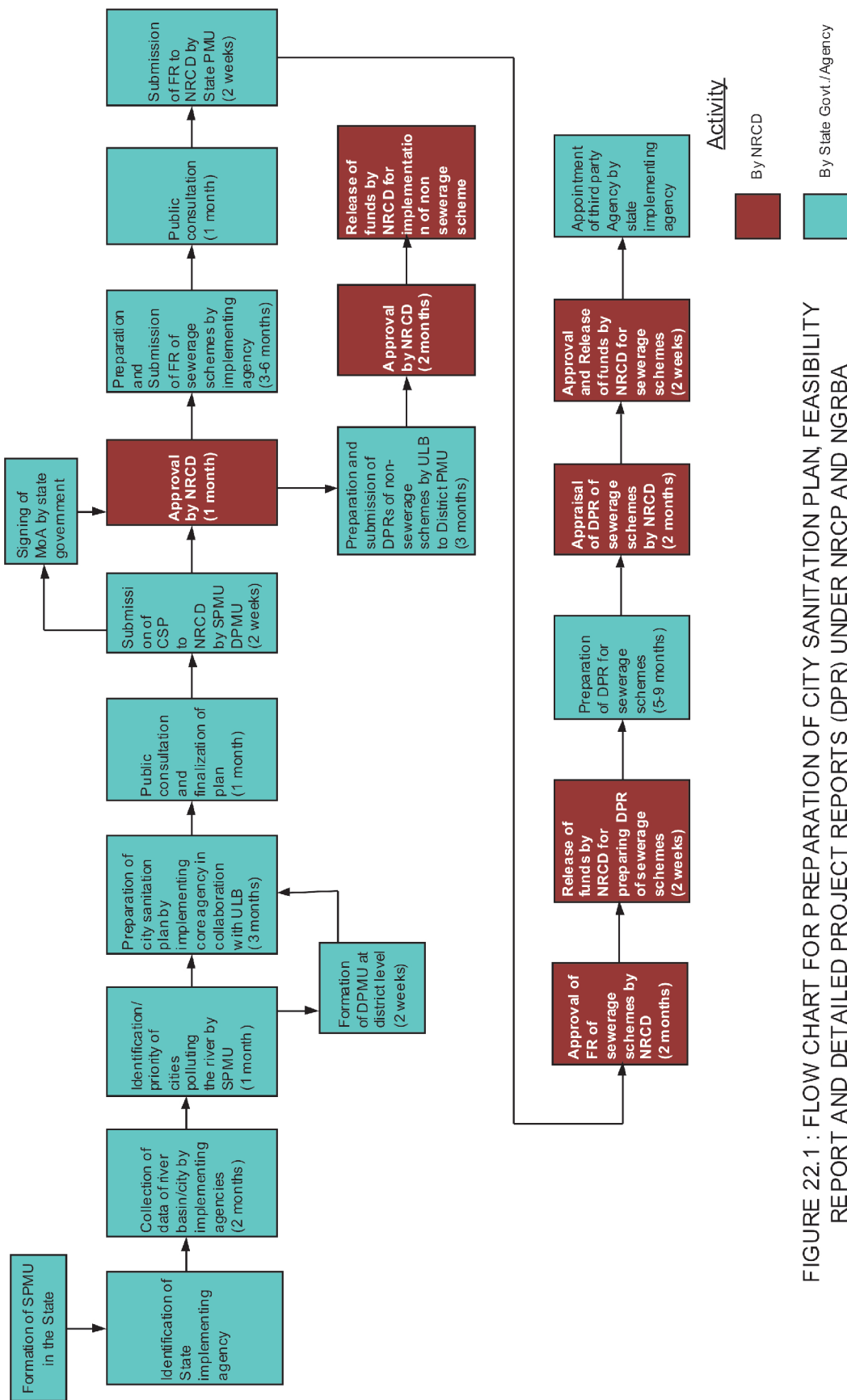


FIGURE 22.1 : FLOW CHART FOR PREPARATION OF CITY SANITATION PLAN, FEASIBILITY REPORT AND DETAILED PROJECT REPORTS (DPR) UNDER NRCP AND NGRBA

# ANNEXURES

## NATIONAL RIVER CONSERVATION PLAN (NRCP) SCHEME

(As applicable so far)

### 1.0 Objective

To improve the water quality of major rivers, which are the major fresh water source in the country, through the implementation of pollution abatement Schemes.

### 2.0 Brief History

The river-cleaning programme of the Ministry of Environment and Forests was started with the launching of the Ganga Action Plan (GAP) in 1985. A Central Ganga Authority under the Prime Minister was constituted to finalize the policy framework and to oversee the implementation of the Action Plan. Chief Ministries of concerned States, Union Ministers and Secretaries of the concerned Central Ministries and experts were its members. GAP was later extended to GAP Phase-II in 1993 and then to NRCP in 1995. GAP Phase-II was merged into NRCP in December 1996. Since then a single Scheme of NRCP is under implementation as a Centrally Sponsored Scheme. The CGA was re-named as National River Conservation Authority (NRCA) with a larger mandate to cover all the programmes supported by the National River Conservation Directorate.

The functions of the NRCA are as follows:

- i) To lay down, promote and approve appropriate policies and programmes (long and short-term) to achieve the objectives.
- ii) To examine and approve the priorities of the National River Conservation Plan.
- iii) To mobilize necessary financial resources.
- iv) To review the progress of implementation of approved programmes and give necessary directions to the Steering Committee, and
- v) To take all such measures as may be necessary to achieve the objectives.

Ganga Action Plan (GAP) Phase-I was started in 1985 as a 100% centrally funded Scheme. The main objective of GAP was to improve the water quality of Ganga to acceptable standards by preventing the pollution load reaching the river. Under GAP Phase-I pollution abatement works were taken up in 21 class-I towns in UP, Bihar and West Bengal. This Phase has been declared complete on 31st March 2000 at a cost of Rs. 451.70 crore.

GAP Phase-I was extended to GAP Phase-II approved in stages between 1993 to 1996, which covered the river Ganga and its major tributaries viz., Yamuna, Gomati and Damodar. This action plan covers pollution abatement works in 95 towns along the polluted stretches of four rivers spread over seven States. The total approved cost of this action plan is Rs. 1498.86 crore which was approved on 50:50 cost sharing basis between the Centre and the State Governments.

Later, however, it was felt that the river conservation activity needed to be extended to other rivers of the country also. Accordingly, the existing Scheme was merged into a National River Conservation Plan. National River Conservation Plan (NRCP) was approved for Rs. 772.08 crore

in 1995 on 50:50 cost sharing basis between the Centre and the State Government. The then Ganga Project Directorate was converted into National River Conservation Directorate for servicing the National River Conservation Authority and the Steering Committee. The objective of National River Conservation Plan being to improve the water quality of the major rivers which are the major fresh water source in the country through the implementation of pollution abatement Schemes. It covered pollution abatement works in 46 towns along the polluted stretches of 18 rivers spread over 10 States. The Ganga Action Plan Phase-II was merged with NRCP in December 1996. Seven additional towns of Tamil Nadu were approved in January 2001 at a cost of Rs. 575.30 crore on this funding pattern.

NRCP was converted into a 100% centrally funded Scheme on the lines of GAP Phase –I in November 1998. The land cost was however, to be borne by the States. Chennai Waterways in Tamil Nadu were approved in September 2000 at a cost of Rs. 491.52 crore and Yamuna Action Plan (extended phase) was approved in May, 2001 at a cost of Rs. 222.60 crore based on this funding pattern.

In a meeting of the National River Conservation Authority held in March, 2001 under the Chairmanship of Prime Minister of India., it was decided to adopt an integrated approach for the river cleaning programmes; and that all future works would be shared on a 70:30 basis between the Centre and the State Governments. Of the State share, the share of public shall be minimum of 10% of the total costs.

### 3.0 Activities covered

The activities under NRCP include the following: -

- Interception and Diversion works to capture the raw sewage flowing into the river through open drains and divert them for treatment.
- Sewage Treatment Plants for treating the diverted sewage.
- Low Cost Sanitation works to prevent open defecation on riverbanks.
- Electric Crematoria and Improved Wood Crematoria to conserve the use of wood and help in ensuring proper cremation of bodies brought to the burning ghats.
- River Front Development works such as improvement of bathing ghats.
- Public awareness and public participation.
- HRD, capacity building, training and research in the area of River Conservation.
- Other miscellaneous works depend upon location specific conditions including the interface with human population.

### 4.0 Funding Pattern

NRCD/Government of India shall bear upto 70% of the Project cost.

States and Local Bodies shall bear 30% of the Project cost of which the share of public would be a minimum of 10% to ensure public participation in the project.

The O&M shall be a part of the project and the costs thereon shall be borne entirely by the State and local bodies for which additional resources have to be demonstrably raised and committed to O&M.

The Local Bodies may raise loans from financial institutions such as HUDCO to contribute their share.

If there is a cost overrun in a project because of delay, inflation or any other reason, the contribution of NRCD/Government shall be limited to its contribution amount initially agreed. Any additional expense on account of any increase in cost shall be borne by the concerned State Government.

In addition NRCD/Government of India may undertake itself or commission projects to other institutions, voluntary agencies etc. also.

## 5.0 Mechanism of implementation and monitoring

Projects or River Action Plans are considered by the Govt. on the basis of pre-feasibility report estimates prepared by the State Govts. After the project is approved in principle, detailed project reports (DPR) with firmed up cost estimates for various sub-components are prepared by the State Govts./Project proponents. These DPRs are appraised and approved by the Ministry following which Administrative Approval and Expenditure Sanctions are issued. On the basis of these sanctions, the State Governments / implementing agencies award contracts according to their own policy and rules.

Progress of implementation is monitored by both the State Implementing Agencies and the Ministry through a multi-tier monitoring mechanism. This includes:

### 5.1 State Level

- i) The progress monitoring by a team of field engineers on a day to day basis.
- ii) Monthly review of progress at the Chief Executive level of the nodal implementing agency.
- iii) Citizen's Monitoring Committee in each town to review the progress and provide inputs for public participation and involvement.
- iv) Periodical review by the Divisional Project Monitoring Cells.
- v) Periodical review of progress by a State Steering Committee chaired by the concerned Chief Secretaries.
- vi) Periodical review by a High Powered Committee under the Chairmanship of Chief Minister.

### 5.2 Central Level

- i) Regular review by NRCD officials including frequent site visits.
- ii) Regular review by NRCD Project Director.
- iii) Quarterly review of progress by a Steering Committee headed by Secretary of the Ministry. Chief Secretaries of the concerned States and experts in the Public Health Engineering and other related areas are the members of this Committee.
- iv) Quarterly review of progress of scientific and technical aspects of the programme as well as the impact of works on the river water quality by a Monitoring Committee headed by Members Environment, Planning Commission.
- v) Periodical review by a Standing Committee of NRCA headed by the Union Minister of Environment & Forests.
- vi) Periodical review of progress by the National River Conservation Authority headed by Prime Minister. The concerned Chief Ministers, among others, are the members of this Committee.

**1.0 Highlights of the works Undertaken under NRCP**

Towns Covered	172
Rivers Covered	38
States Covered	20
Sanctioned Cost of DPR	Rs.5148.01 crore
Fund Released	Rs.3132.31 crore
Expenditure (including State Govt. Share):	Rs.3667.54 crore
Schemes Sanctioned	1105
Schemes Completed	842
Pollution load to be tackled	4397.80 MLD
Pollution load tackled (in addition to GAP - I)	3196.44 MLD

# NGRBA-ITS OBJECTIVES, APPROACH AND FUNCTIONS

## BACKGROUNDER

The Central Government, by a notification dated 20.2.2009, as set up 'National Ganga River Basin Authority' (NFRBA) as an empowered planning, financing, monitoring and coordinating authority for the Ganga river, in exercise of the powers conferred under the Environment (Protection) Act, 1986. The Prime Minister is ex-officio Chairperson of the Authority, and it has as its members, the Union Ministers Concerned and the Chief Ministers of states through which Ganga flows, viz., Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal, among others. The objective of the Authority is to ensure effective abatement of pollution and conservation of the river Ganga by adopting a holistic approach with the river basin as the unit of planning. The functions of the Authority include all measures necessary for planning and execution of programmes for abatement of pollution in the Ganga in keeping with sustainable development needs.

## Key Features of New Approach

River basin will be the unit of planning and management. This is an internationally accepted strategy for integrated management of rivers.

Accordingly, a new institutional mechanism in the form of National Ganga River Basin Authority (NGRBA) will spearhead river conservation efforts at the national level. Implementation will be by the State Agencies and Urban Local Bodies

The new strategy will take into account the competing demands on water and will seek to ensure minimum ecological flows. STPs minimise the pollution load up to discharge standard of BOD of 30mg/litre requiring dilution to achieve river water quality of 3mg/litre.

The minimum ecological flows or the entire Ganga will be determined through modelling exercises.

The NGRBA will take appropriate measures to regulate water abstraction for maintaining ecological flows in the river.

## Functions of NGRBA

The NGRBA would be responsible for addressing the problem of pollution in Ganga in a holistic and comprehensive manner. This will include water quality, minimum ecological flows, sustainable access and other issues relevant to river ecology and management.

The NGRBA will not only be regulatory body but will also have developmental role in terms of planning & monitoring of the river conservation activities and ensuring that necessary resources are available.

The NGRBA would work for maintaining the water quality of the river Ganga upto acceptable standards. The pollution abatement activities will be taken through the existing implementation mechanisms in the State and also through special Purpose Vehicles (SPVs) at the pollution hotspots.



The NGRBA will ensure minimum ecological flow in the Ganga by regulating water abstraction and by promoting water storage projects.

The NGRBA will plan and monitor programmes for cleaning of Ganga and its tributaries. To being with, it will concentrate on Ganga main stream.

The NGRBA would draw upon professional expertise within and outside the Government for advice on techno-economic issues.

The technical and administrative support to NGRBA shall be provided by the Ministry of Environment & for advice on techno-economic issues.

The technical and administrative support to NGRBA shall be provided by the Ministry of Environment & Forests.

## ANNEXURE-3

Government of India  
Ministry of Environment & Forests  
National River Conservation Directorate

Paryavaran Bhavan, CGO Complex,  
Lodhi Road, New Delhi-3  
Dated: 3.2.2010

### Office Memorandum

**Sub: Stringent effluent standards for STPs on critical stretches of River Ganga- reg.**

1. This Ministry is implementing a centrally sponsored scheme of National River Conservation Plan (NRCP) for pollution abatement of rivers in the country, on a cost sharing basis between the Central and State Governments. The Plan presently covers 38 rivers in 167 towns spread over 20 States. The pollution abatement schemes under NRCP include I&D works, sewage treatment, low cost sanitation, electric and/or improved wood crematoria etc.
2. Under NRCP, the standards being followed for treated waste water in respect of BOD and Suspended Solids (SS) are 30 & 50 mg/l respectively. These are as per the legal standards notified by CPCB. Criteria for permissible limits of fecal coliforms for sewage treatment schemes under NRCP were also separately prescribed by MoEF. Administrative directions in this regard were issued by the Ministry in October, 1999,
3. In order to achieve improved water quality in the river, more stringent design criteria were subsequently prescribed for Yamuna in the Delhi stretch. These are 20 and 30 mg/l for BOD and suspended solids respectively.
4. The Central Government has constituted the National Ganga River Basin Authority (NGRBA) for effective abatement of pollution and conservation of the river Ganga. NGRBA, in its first meeting held on 5th October, 2009, has adopted the Mission Clean Ganga, under which it will be ensured that by 2020 no untreated municipal sewage or industrial effluent is discharged into the river Ganga.
5. Water quality of river Ganga has become critical in certain stretches due to various reasons, including discharge of untreated municipal & industrial wastes into the river, lack of dilution in the river etc. It is, therefore, considered necessary for achieving improved water quality in the river Ganga that more stringent design criteria for sewage treatment plants be prescribed in the critical stretches of Ganga also. It has accordingly been decided that the guidelines for design criteria for sewage treatment plants be revised to 20 & 30 mg/l for BOD and Suspended Solids respectively in the critical stretches of Ganga river. The State Governments are advised to select techno-economically suitable sewage treatment technologies for meeting the revised guidelines in the critical stretches,
6. This is issued with the approval of Minister of State (I/C) for Environment and Forest.

  
03/2/10  
(Rajiv Gauba)  
Joint Secretary

To,  
As per the list

## **MEMORANDUM OF AGREEMENT**

Among

**Ministry of Environment and Forests (MoEF)  
Government of India**

**State Government**

**and**

**Urban Local Body**

**National Ganga River Basin Authority**

**May 2010**

**MEMORANDUM OF AGREEMENT (MOA)**  
**Among**  
**MINISTRY OF ENVIRONMENT AND FORESTS, GOVERNMENT OF INDIA**  
**THE STATE GOVERNMENT OF -----**  
**and**  
**URBAN LOCAL BODY (ULB) -----**

Abatement of river/lake pollution is an ongoing activity required to be taken up on a continuous basis with the complete involvement of all stakeholders associated with the implementation of the program. This MOA provides a framework of commitments by all stakeholders not only for successful implementation of the program but also for proper operation and maintenance of the assets created. This agreement lays down the conditions which the State Government, the ULB and the implementing agency will undertake on the basis of the financial support provided by Government of India through the Ministry of Environment and Forests (MoEF).

THIS AGREEMENT is made on this \_\_\_\_\_ day of \_\_\_\_\_ 20 \* between the Government of India, through the Ministry of Environment and Forests,

and

The State Government of (Name of the State) \_\_\_\_\_ through its \_\_\_\_\_ (Name of the Department)

and

\_\_\_\_\_ the Urban Local Body.

**WHEREAS**

The Ministry of Environment and Forests will provide financial support to the State Governments in their efforts to conserve rivers and lakes under their jurisdiction.

The State Government/ULB will commit to provide the State's share of the capital cost of the project and full operation & maintenance (O&M) costs. The State Government/ULB will also provide commitment to fulfill the conditions laid down as Annexure 'A'.

The State Government will also ensure commitment from ULB/implementing agency to take over the assets of the project on certification of project completion by the Implementing Agency.

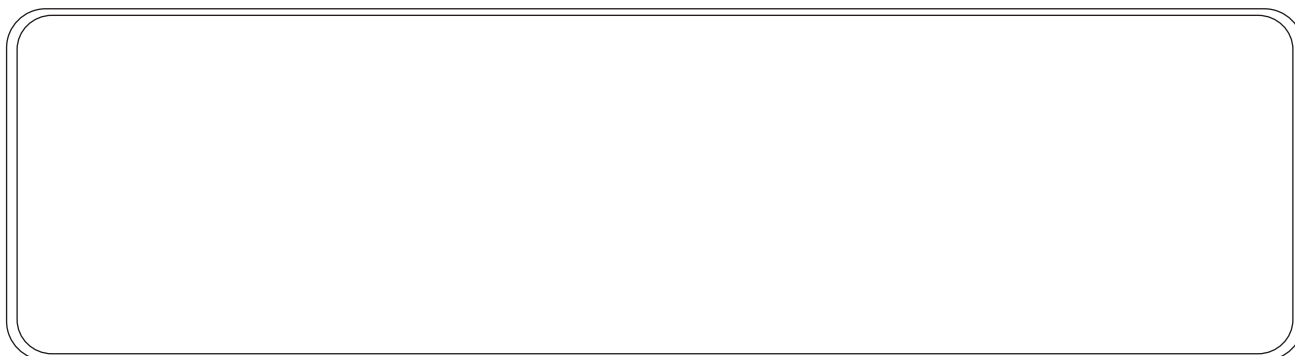
**NOW THE PARTIES WITNESSED AS FOLLOWS:**

1. Funds will be released upon execution of the MOA and sanction of DPRs by the MoEF.
2. MoEF shall release the first installment of grant to the Agency nominated by the State Government upon signing of the MoA and submission of the documents which are annexed with the Agreement as Annexure 'A'.
3. State Government will agree to bear 30% of the cost of the project or their share as decided from time to time.
4. The release of next installments of funds will be performance based, and will depend on submission of physical and financial progress reports and proper Utilization Certificates as well

- as on fulfillment of commitments as set out in Annexure 'A'.
5. The State Government shall also release their share of funds in proportion to the fund releases made by Government of India from time to time.
  6. The State Government will constitute a Project Review Committee headed by the Secretary of the Nodal Department for reviewing the progress of the project on quarterly basis. A representative of MoEF will be a member of this Committee.
  7. The State Government will appoint the implementing agency for the projects and the implementing agency will coordinate with the ULBs as well as other agencies to ensure synergy between programs like JNNURM/UIDSSMT and approved components under the NRCP/NLCP.
  8. The State Government and the ULB will be responsible for implementing, monitoring and reporting under the program.
  9. The State Government shall be responsible for necessary coordination mechanism between the Implementing Agency and the ULB.
  10. The State Government will ensure that the physical progress, expenditure reports and Utilisation Certificates are furnished by the Implementing Agency to MoEF on a quarterly basis. In case the Implementing Agency fails to submit such a report, further instalment of Gol's share may be withheld, until such submission.
  11. MoEF or any agency nominated by it, may undertake periodic site visits to ascertain the progress of the ongoing projects and compliance of the conditions in the Checklist.
  12. The responsibility of operation and maintenance will be with the ULB/ maintenance agency. The ULB will submit a report regarding the mechanism for raising resources for the operation and maintenance of assets and will provide details of the same while submitting the project report. These may include instruments like user charges, property tax, sanitation charges or innovative PPP options. Schemes will be sanctioned contingent upon evaluation of the O&M Plans submitted by the ULB/implementing agency. Subsequent fund releases would depend on satisfactory progress of implementation of O & M plan.
  13. The State Government and ULB will be responsible for proper O &M of existing facilities like sewage treatment plants, sewage pumping stations, low cost sanitation, etc.
  14. State Government and the Implementing Agency shall institute mechanism to ensure timely completion of projects undertaken under NRCP/NLCP
  15. The cost overrun due to delay of the project or cost escalation of different items shall be borne by the State Government/ULB.
  16. The implementation period can be extended, if so required, due to change in scope of work or other site specific condition. The decision in the matter of extension of time shall be at the discretion of MoEF.
  17. MoEF will set up the mechanism for concurrent evaluation and monitoring of the project.
  18. The State Government will provide the certification of project completion of the works.
  19. In case of dispute between the parties, the matter will be resolved through mutual discussion.
  20. In case of any breach regarding the terms and conditions of the MoA, MoEF shall be entitled to withhold release of subsequent installments of the grant.
  21. The funds routed through MOA mechanism will be liable to statutory audit by the Controller and Auditor General of India.
  22. This Memorandum of Agreement will take effect from the date of signing and would remain operative unless terminated by parties concerned by mutual consent.

## SIGNATORIES

For Government of India through Joint Secretary, Ministry of Environment and Forests



For State Government, State Secretary of Nodal Department



For ULB/ Mayor / Municipal Commissioner of concerned ULB



## CHECKLIST OF CONDITIONS

NRCP/NLCP requires certain conditions to be met by states/ cities with the objective of securing effective linkages between asset creation and asset maintenance, ultimately leading to self-sustaining delivery of urban services.

### STATE LEVEL

1. Specify agency / agencies involved in planning and delivery of the following civic services,:

Sector	Agency undertaking planning	Agency undertaking delivery of services	Prevailing role of ULB/s
1. Sewerage and Sewage treatment			
2. Solid Waste Management			
3. Burials and burial grounds, cremations, cremation grounds and electric crematoriums			

## CITY LEVEL

### 1. Preparation of Comprehensive Sewage Disposal Plan

Please provide the timeline for preparing this Comprehensive Plan for the city

Year 1	Year 2	Year 3	Year 4

### 2. Sewerage Network

Increase in the Sewerage network of the city

Year 1	Year 2	Year 3	Year 4

Construction of Sewage Treatment Plants to treat the captured sewage

Year 1	Year 2	Year 3	Year 4

Laying of trunk & intercepting sewers for diversion of sewage out falling into the river

Year 1	Year 2	Year 3	Year 4

Power connection to Sewage Treatment Plants and Pumping Stations

Year 1	Year 2	Year 3	Year 4

Obtain yearly consent to operate the STP from the concerned State Pollution Control Boards/Committees

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### 3. Storm Water Drainage (Flowing into the river)

Identification of Problem Areas

Year 1	Year 2	Year 3	Year 4

Primary Drain Rehabilitation and Improvement Program

Year 1	Year 2	Year 3	Year 4

Monitoring of water quality parameter (in the Drains at confluence with river)

Year 1	Year 2	Year 3	Year 4

### 4. Non point sources of pollution

Providing electric / improved wood based crematoria to minimize the river pollution on account of disposal of unburnt dead bodies.

Year 1	Year 2	Year 3	Year 4



Improvement of bathing ghats with toilet facilities

Year 1	Year 2	Year 3	Year 4
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Identification of slums adjoining rivers and lakes

Identification of water and sanitation issues in these slums

Year 1	Year 2	Year 3	Year 4
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Planning for sustainable water and sanitation solutions for households residing in these slums

Year 1	Year 2	Year 3	Year 4
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Extending services of toilets, drainage, solid waste management in these slums

Year 1	Year 2	Year 3	Year 4
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Removal of encroachments within duly demarcated river/lake boundry

Year 1	Year 2	Year 3	Year 4
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

## 5. User Charges

Please furnish the costs for providing the following services (total cost as well as per unit cost) and the total and per unit user charges collected in — —

Service	Total O&M Cost (Please specify the unit)		Total user charges collected (Please specify the unit)	
	Per Unit Cost	Total Cost	Per Unit Recovery	Total Recovery
Sewerage				

Time table to achieve full recovery of O&M costs from user charges (Please indicate proposed recovery level for each year)

Sewerage

Year 1	Year 2	Year 3	Year 4
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

## 6. Financial Management

Earmarking of funds for O&M

Year 1	Year 2	Year 3	Year 4
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

**No.A-12012/2/2010-NRCD-II**  
**Government of India**  
**Ministry of Environment and Forests**  
**NATIONAL RIVER CONSERVATION DIRECTORATE**

'Paryavaran Bhawan'.  
C.G.O. complex,  
B-Block, Lodi Road,  
New Delhi-110 003,  
Dated the 16th September, 2010

To

The State Nodal Departments (As per list attached)

**Sub:- Strengthening the Monitoring and Inspection Arrangements under National Ganga River Basin Authority (NGRBA) and National River Conservation Plan (NRCP)- Administrative Approval for the engagement of Third Party Inspection Agencies by States.**

Sir,

1. The undersigned is directed to say that in order to strengthen the monitoring mechanism and improve transparency and accountability for projects implemented under the National Ganga River Basin Authority (NGRBA) and National River Conservation Plan (NRCP), it has been decided to introduce a Third Party Inspection (TPI) system . This system is devised along the lines of Independent Review and Monitoring Agencies (IRMA) mechanism under the JNNURM and is expected to significantly augment the capacities of State Government to monitor the physical progress of projects.
2. The TPI system would review and monitor the performance of the projects funded under the NRCP & NGRBA through the entire lifecycle of implementation on the basis of detailed on-site review, examination of appropriate documents and discussions with the Project Implementing Agencies and other key stakeholders. The monitoring would cover all four stages in the life cycle of a project, namely Pre-construction, Construction, Commissioning & trial run and, Post-construction for effective monitoring.
3. This system will come into effect from April, 2011 and will apply to new projects sanctioned after this date. Projects which have already been sanctioned and for which only the 1st installment has been released by 31 st March, 2011 will also be covered. However in such cases the pre-construction inspection will not be applicable.
4. The system will not apply to on- going projects for which more than one installment has been released by 31st March, 2011.
5. The TPIs shall be appointed by the States through a transparent process. For this purpose, the list of agencies shortlisted for independent review and monitoring agencies (IRMA) under

JNNURM may be considered. As the services of the TPIs are required to be rendered over the entire life cycle of the project development, the period of engagement will be governed by the Project schedule. the maximum period of engagement of TPI for a project shall not exceed 3 years. However, extension of services of TPI beyond 3 years shall be decided by the State Nodal Department (SND), if considered essential.

6. The scope of services of the TPIs, frequency of review visits and panel of TPI agencies are at Annexure.
7. The cost towards meeting the expenditure involved in the appointment of TPI agency will be reimbursed by the NRCD, MoEF on the basis of claims submitted by the SND. The details to be furnished for the re-imburement of expenditure are:
  - i. The copy of the work order / contract issued to the TPI agency.
  - ii. The copy of invoice raised by the agency.
  - iii. Evidence of payment already made to TPI agency by the State Nodal Department.

The reimbursement costs shall not exceed-

- i. Rs.2.0 lakhs per project for the review of project documentation (one time for each project).
  - ii. Rs.0.5 lakhs per visit per project by the monitoring team (excluding visits undertaken for review of project documentation).
8. The TPI agencies appointed by the SND may participate in the review meetings and in the meetings of the Empowered Steering Committee (ESC) in the case of NGRBA projects. Inputs from third party monitoring will be taken into consideration in processing release of funds.
  9. The TPI will undertake desk review of documents and make periodical site visits to each project as mentioned above. They may conduct additional field inspections on the specific aspects as required by SND and NRCD. TPI shall provide reasonable advance notice of planned visit to site, schedule of meetings for review, and documents required for review, etc. to the Implementing Agency(IA). TPI shall report to the SND and send copies to the NRCD, of all communication / reports / Deliverables. The SND and IA will provide necessary inputs to the TPI team. The observations of the TPI team should be discussed with the SND and IA before concluding the visit. Reports should be filed with the SND and IA within 5 days of completion of the site visits. SND shall file with NRCD copies of the TPI Reports along with their responses/comments.
  10. This issues under the powers delegated to the Ministry of Environment and Forests and with the approval of Secretary, Ministry of Environment and Forests as well as with the concurrence of IFD vide their Dy. No.1368/AS(FA) dated 17-8-2010.

Yours faithfully,

---signed---

**(C. UPPILI)**

**Under Secretary to the Government of India**

Copy for information and necessary action to:

1. All Implementing Agencies of NRCP & NGRBA.
2. All officers of NRCD dealing with Projects.
3. Joint. Director of Audit, Commercial, Scientific & Misc. Works, AGCR Building, I.P. Estate, New Delhi-110 002.
4. Dir(IFD)///US(F)/US(P)/Computer Cell
5. Sanction folder/Guard file.

---signed---

**(C. UPPILI)**

**Under Secretary to the Govt. of India**

## SCOPE OF SERVICES

The Third Party Inspection (TPI) Agency is expected to review and monitor all projects sanctioned under National Ganga River Basin Authority (NGRBA) and National River Conservation Plan (NRCP).

The scope of services for the TPI will include the following:-

### 1.1.1 Pre-construction Stage:

Review of the project at this stage is to primarily review and monitor the preparatory activities that go into a project prior to beginning actual procurement and construction. Such review should cover:

#### i) Review of project design documentation

- a. Check extent of completion of design with respect to the sanctioned DPR
- b. Review adherence to technical standards in the detailed designs / drawings prepared
- c. Review the project implementation plan (level of detail, interdependencies, linkage to resources, etc.)
- d. Check the sequence of design documentation with respect to project implementation plan
- e. Review the probability of escalation in project cost and time delay in implementation on account of variation in design criteria, estimated quantities, unit costs, and other reasons related to design aspects
- f. Review the test reports to examine adequacy of all surveys that are needed to be carried out for project design.

#### ii) Review of bid documentation and bid process

- a. Completeness of the bid documents with respect to designed / planned project configuration, and the packaging of bids including battery limits of scope. This should include review of clarity in roles between IA and the contractors.
- b. Compliance of the bid documents with respect to design standards, especially with respect to Materials of Construction
- c. Alignment in the sequence of preparation of bid documents and release of tenders with respect to interdependencies in the project plan
- d. Review whether due transparent and fair procurement processes have been followed as per the rules of the IA, and good practices followed in the industry
- e. Review the probability of escalation in project cost and time delay in implementation on account of inefficiencies and mistakes in procurement
- f. Review the bid documents with respect to appropriateness of commercial terms and conditions of the contracts

#### iii) Review of site preparation and clearances to begin construction

- a. Undertake site visit to examine availability of land / right of way for the project, to examine that the project site is free of encumbrances; access to site is available; etc.

- Report on handing over of site to the contractor for construction.
- b. Report on progress with respect to shifting of utilities, if applicable.
- c. Review the probability of escalation in project cost and time delay in implementation on account of delays in site preparation and statutory clearances

#### iv) **Review of project management mechanisms**

- a. Report on whether mechanisms have been put in place for independent monitoring of physical quality of materials / construction / fabrication.
- b. Assess the institutional capacity of IA to manage implementation of the project in terms of dedicated man power, internal systems, and technical capacity, etc. Assessment should take into account agencies hired by IA to assist in project implementation.

#### 1.1.2 **Construction Stage**

Review of the project through the course of its construction is to primarily review and monitor physical progress, financial progress, commercial performance, project quality, compliance to statutes and other requirements. Such review to be conducted periodically over the construction period should cover:

##### i) **Report on Physical progress of the project**

- a. Review the physical performance accomplished in the project with respect to the milestones projected in the DPR or the project implementation plan finalized at pre-construction stage.
- b. Review of rescheduling of milestones on the basis of performance.
- c. Report on abnormal delays in project activities and advice on remedial measures.

##### ii) **Report on Quality Assurance Systems and Project quality**

- a. Report on methodology and frequency of tests carried out by the contractor/quality assurance consultant by examining Requests for Inspection (RFI) and reports. Ensure that they are in line with good industry practices.
- b. Confirm that the materials used for construction are as per the specifications of contract agreement 2.
- c. Report about cases of non-conformance from quality reviews based on available documents and interactions.

##### iii) **Report on the Commercial performance and Financial progress of the project:**

- a. Commercial performance
- b. Review and report on commercial performance of contractors under the project with respect to commercial terms and conditions, i.e. performance with respect to clauses such as – guarantee / warranty, defects–liability, licenses, bank guarantee, insurance, payment schedule, taxes, dispute resolution mechanisms, etc.
- c. Highlight and report on enforcement of critical commercial terms and conditions by either party that has an impact on time and cost of the project.
- d. Suggest remedial measures to improve commercial performance

- e. Financial progress of the project
- f. Report on adequacy of systems for project related financial management.
- g. Report the quantum and timelines of contribution of funds from all the counter parties of the project by verifying receipts statements.
- h. Review documents related to claim for payments and payments made. Such documents will include – Invoices, Measurement Book, Bank statements, etc.
- i. Report on utilization of funds in verification with bank reconciliation statements.
- j. Remedial measures to improve financial progress
- k. Report any major variation in overall project cost, due to changes in the Bill of
- l. Quantities as per the contract.

#### v) Compliance to the statutory requirements

- a. Report on compliance to directives by State and Central environmental agencies stated during the environmental clearance of the project, compliance with the Environmental Management Plan for the project, and good environmental management practices of the industry.
- b. Report on provision, installation, and usage of health and safety equipments, procedures and practices at site by visual observation and examination of records. The report should include health and safety issues concerning workers at site.
- c. Report on standards of health and sanitation arrangements maintained at campsite by visual observation and discussion with the concerned stakeholders.
- d. Report about the progress of Resettlement and Rehabilitation of Project Affected Persons
- e. Report on persons requiring resettlement and rehabilitation assistance as reported by the land acquisition team and the DPR.
- f. Report on compensation awarded and / or to be paid as per the records.
- g. Report on court cases, which likely to affect the physical progress of the project.

#### 1.3.3 Commissioning, Trial run and Testing Stage

- i) Report on necessary training imparted to the operations and maintenance (O&M) team for taking over the completed project. The agency will check with records and discussion with participants.
- ii) Report on stages of testing and level of participation by the O&M team.
- iii) Reports on handing over of all documentation, “As Built” drawings operational instructions and equipment manuals to the O&M team.
- iv) Report on trial runs and completion of project.

#### 1.1.3 Post Construction Stage

- i) To report on overall performance of the asset created (project) with respect to Capacity – delivering capacity requirements
- ii) Functionality – meeting all functional requirements
- iii) Usage – extent of usage, break downs and shut downs
- iv) Performance of the O & M team

## FREQUENCY OF REVIEW VISITS

The required frequency of reviews by TPIs is mentioned below, and shall vary based on the requirements of specific project. Review visits at a frequency higher than that mentioned below, shall only be undertaken at the express request by either the State Nodal Department or NRCD, MoEF. The table below provides an indication of the effort estimate required from the TPI.

S. No	Nature of review	Timing	Method of review	Frequency
<b>Pre-Construction Stage</b>				
1.	Review of project design document	On completion of design of project/ project component	Design documents and drawings	Once
2.	Review of bid documentation and bid process	Review of documentation prior to NIT Review of bid process through its duration	Proof of Advertisement, letters, and correspondence Bid Documents, Contract agreements	Once
3.	Review of site preparation and clearances to begin construction	Prior to start of construction	Inter departmental correspondences Official records	Once
4.	Review of Project Management Systems	After deployment of Project Management Systems	As per official records Observations Discussions with PEA	Monthly / Quarterly*
<b>Construction Stage &amp; Commissioning, Trial-Runs and Testing Stage</b>				
5.	Report on Physical progress of project	After handing over the site to contractor/ concessionaire, and regularly over the Construction period	Reports and documents submitted by PIU Review of milestones as per Contract agreement Discussions with PEA	Monthly / Quarterly*
6.	Report on quality assurance system		Request for inspection (RFI) reports Contract agreement and physical observation Discussions with PEA	



S. No	Nature of review	Timing	Method of review	Frequency
7.	Commercial Performance	Over the construction period	Contract and Relevant documents	Quarterly
8	Financial Performance		Invoices, Measurement Book, Bank statements BOQ as per contracts	
9	Compliance to the statutory requirements	Pre-Construction, during Construction and Post-Construction	As per the MoEF guidelines EMP document for the project. Comparison with relevant legislation / rules	Monthly / Quarterly*
10	Safety and Health	Construction and Post-Construction stage	As per relevant standards/ good practices / Contracts	Monthly / Quarterly*
11	Progress of Resettlement and Rehabilitation	During Pre-Construction and Construction stage if the Land acquisition process is not completed.	As per R&R Action Plan submitted along with DPR/ Land acquisition proposal submitted, Records of Competent Authority No. of court cases against land acquisition for the project	
12	Commissioning, Trial runs and Testing	Commissioning, Trial Runs and Testing Stage	As per Records and discussion with Concerned officials	Once
<b>Post-Construction Stage</b>				
13	Report on overall performance of the asset created (project)	Post Construction Stage, about one year after project completion	Records and discussion with officials / beneficiary community	Once

## PANEL OF TPI AGENCIES

<p>CONSULTING ENGINEERING SERVICES ( INDIA) PVT. LTD., 57,Nehru Place, (5th Floor) New Delhi- 110 019 Ph: 011-41392300/26485284/26460411 Fax: 011-2646049</p>	<p>DHV INDIA PRIVATE LIMITED B-1/1-1, First Floor, Mohan Cooperative Industrial Estate Mathura Road, New Delhi – 110 044 Ph: 011-40539303-06; Fax: 011-40539300 E-mail: dhvindia@airtelbroadband.in</p>
<p>FEEDBACK VENTURES PRIVATE LIMITED Feedback House 7, L.S.C Panchsheel Park New Delhi – 110 017 Ph:011-26495766/26495875 Fax: 011-26495762 E-mail: contactus@feedbackventures.com</p>	<p>HALCROW CONSULTING INDIA LIMITED 153, 2nd Floor Industrial Estate, Phase – III New Delhi – 110 020 Ph: 011-46501500 Fax: 011-46501599 E-mail: kumaran@halcrow.com</p>
<p>INTERCONTINENTAL CONSULTANTS AND TECHNOCRATS PVT.LIMITED D-180, Okhla Industrial Area, Phase-I New Delhi – 110 020 Ph:011-40573147/148/149 Fax:011-40573145/146 E-mail: info@itonline.com</p>	<p>LEA ASSOCIATES SOUTH ASIA PVT. LTD., B-1/E-27, Mohan Cooperative Industrial Estate, Mathura Road New Delhi – 110 044 Ph: 011-26973950-52 Fax: 011-41678659/26971062 E-mail: lasa@bol.net.in</p>
<p>MAHINDRA ACRES CONSULTING ENGINEERS LTD., Mahindra Towers, Ground Floor No.17/18,Patullos Road Chennai -600 002 Ph:044-28542325,28542326 Fax:044-28542324</p>	<p>MEINHARDT SINGAPORE PTE. LTD., (INDIA BRANCH) A-8, Sector – 16 Noida – 201 301 Uttar Pradesh Ph: 0120-2516165 Fax: 0120-2515745 E-mail: rajesh@meinhardtindia.com</p>
<p>MSV INTERNATIONAL INC., 6302, Phase-IV,DLF Gurgaon -122 002 Haryana Ph: 0124-4002603/04 Fax:0124-4002605 E-mail: info@msvgroup.com</p>	<p>MUKESH &amp; ASSOCIATES CONSULTANTS &amp; ENGINEERS 5/3,Ragavan Street, Swarnapuri Salem -636 004 Ph:0427-2330395/2330568/2331109 Fax:0427-2330209 E-mail: mukeshassociates@vsnl.com</p>
<p>NATIONAL CONSULTANCY FOR PLANNING AND ENGINEERING, 9-4-131/17/A, Tombs Road Akbar Bagh, Toli Chowki Hyderabad – 500 008 E-mail: ncpe_consult@rediffmail.com</p>	<p>OPERATIONS RESEARCH GROUP PVT. LIMITED D-24, Second Floor South Extension – Part -1 New Delhi – 110 049 Ph: 011-24603549/27694909 Fax: 011-24603549 E-mail: dbanerjee@orgplindia.com</p>
<p>RAMKY INFRA CONSULTING PVT. LTD C-011B,First Floor,Super Market-1 DLF Phase – IV Gurgaon -122 002 Ph:0124-5018652/5018653 Fax:0124-5019051</p>	<p>SHAH TECHNICAL CONSULTANTS PVT. LTD., CONSULTING ENGINEERS 407, Raheja Centre, Plot No.214, Nariman Point Mumbai – 400 021 Ph: 022-22871061/22820018/22820121 Fax: 022 -22023714 E-mail: stcmumbai@vsnl.com</p>

<p>SHRIKHANDE CONSULTANTS PVT. LIMITED  33-35, Shanti Centre, 3rd Floor,  Plot No. 8, Sector No. 17, Vashi,  Navi Mumbai - 400 705.  Tel No. 91-22-2789 1444 / 3993 / 2763  Fax No. 91-22-2789 1249  E-mail pmc@bom5.vsnl.net.in  WebSite www.scplasia.com</p>	<p>SMEC INDIA PVT. LIMITED  No:21,1st Avenue  Indira Nagar  Chennai – 600 020  Ph:044-42607311/22/33  Fax:044-42607311  E-mail: balaelan@smecindia.net</p>
<p>S.N.BHOBE &amp; ASSOCIATES PVT. LIMITED  62,Mahavir Centre  Sector-17,DBC-Vashi  Navi Mumbai - 400 705  Ph: 02227893507,27893487/27895284  Fax: 022-27891185</p>	<p>SUBHASH PROJECTS AND  MARKETING LIMITED  Subhash House, F 27/2,  Okhla Industrial Area,Phase-II  New Delhi -110 020  Ph: 011-26384091,41609595,41406953  E-mail: delhi@spml.co.in  Website: www.spml.co.in</p>
<p>WATER AND POWER CONSULTANCY  SERVICES (INDIA) LIMITED  76-C, International Area, Sector – 18  Gurgaon – 122 015 Haryana  Ph: 0124-2397391  Fax: 0124-2399224  E-mail: wapcos@dataone.in  wapcic@vsnl.net</p>	<p>SPAN CONSULTANTS PRIVATE LIMITED  Consulting Engineers, Architects &amp; planners  SPAN House, 92-C,Gurudwara Road  Madongir,  New Delhi- 110 062  Ph:011-29955645-53 (9 lines)  Fax: 011-29955643  E-mail: info@spanconsult.com</p>

## LIST OF POLLUTED RIVER STRETCHES Source CPCB

POLLUTED RIVER STRETCHES (BOD>30mg/l and BOD exceeding 6mg/l on all occasions )				
River	Polluted Stretch	Source/City	Monitoring Location	BOD (mg/l)
<b>ANDHRA PRADESH</b>				
1. Musi	D/s Hyderabad & Rangareddy	Hyderabad & Secundrabad	1.Nagole, Rangareddy	34
			2. Hyderabad D/s	23
2. Nakkavagu	D/s Medak	Medak	1.Bachugudem, Medak	50
<b>ASSAM</b>				
3. Bharalu	D/S Guwahati	Guwahati Sewage	1.D/S Guwahati	31.5
4. Kalong	D/s of Nagaon (Elangabeel System)	Nagaon- Sewage	1. Elangabeel System Pond	50
<b>CHANDIGARH</b>				
5. Patiala ki Rao	Patiala Ki Rao	Chandigarh	1.Patiala Ki Rao	50
6. Attawa Choe	Attawa Choe (N-Choe)	Chandigarh	2.Attawa Choe (N-Choe)	50
7. Sukhna Choe	Sukhna Choe	Chandigarh	3.Sukhna Choe	50
<b>DELHI</b>				
8. Yamuna	Wazirabad to Okhla	Industrial & Domestic Waste from Delhi	1.NizaMoUddin	55
			2.Okhla Bridge	32
			3.D/S Of Okhla A/C Shahdara Drain	70
<b>GUJARAT</b>				
9. Sabarmati	Ahmedabad to D/S of Vautha	Discharge from Meshwa & Ahemdabad	1. After Conf. With Meshwa At Vautha (Near Dhokla),	48
			2. At Ahmedabad At V.N. Bridge,	31
			3. At Vill. Miroli Taluka Dascroi, Ahmedabad	103
			4. At railway Bridge,Ahmedabad	29
			5. At Kheroj Bridge	12
			6. At Hansol Bridge	15
10. Amlakhadi	Along Ankeshwar	Industrial & Domestic waste from Ankeshwar	1.Amlakhedi after confluence of wastewater from Ankleshwar	46
11. Bhogavo	Surendranagar		1.D/s of Surendranagar	50
12. Daman River Ganga	Vapi D/S to Confl. with sea	Industrial & Domestic waste from Vapi, Salvas,Daman & Kachigaon	1.Kachi Gaon D/s	30

POLLUTED RIVER STRETCHES (BOD>30mg/l and BOD exceeding 6mg/l on all occasions )				
River	Polluted Stretch	Source/City	Monitoring Location	BOD (mg/l)
<b>HARYANA</b>				
13. Ghaggar	Interstate border of Punjab & Haryana to Ottu wier at Sirsa	Industrial & Municipal waste from Patiala, Derabassi, Sirsa	1. Before Ottu Weir (Before Mixing Of Satluj Canal Water)	50
			2. Gh-1 At Road Brdg. Sirsa,Debwali Road	33.2
			3. Gh-2 At Chandarpur Syphon,	40
			4. Near Bankarpur, Dera Bassi	22
			5. U/S Dhakansu Nallah	21
14. Markanda	Kala Amb to Narayan Garh	Industrial & Domestic waste from Kala Amb	1.Kala Amb D/S	590
15. Western Yamuna Canal	D/s of Yamuna Nagar	Yamuna Nagar Industrial & Domestic wastewater	1.100 metre D/s after receiving Industrial & Sewage effluent	247
			2.At Damla d/s of Yamuna Nagar	188
<b>HIMACHAL PRADESH</b>				
16. Sukhna	D/s Parwanoo	Parwanoo sewage	1.At Parwanoo, Solan	36
<b>MADHYA PRADESH</b>				
17. Khan	Indore	Indore Sewage	1.Sakkar Khadi (Near Indore)	50
			2.Sanwer	50
			3.Kabit Khedi	50
18. Chambal	Nagda D/s	Industrial & domestic wastewater of Grasim Citieship & Nagda	1.Nagda D/s	34
<b>MAHARASHTRA</b>				
19. Bhima	Vithalwadi to Takli	Pune – Sewage	1. Pune, D/S Of Bundgarden	40
		Daunt -Sewage	2. Pune U/S Vithalwadi	28.2
			3. Pargaon (After confluence with Mule Martha)	16
20. Godavari	Nashik D/s to Paithan	Nasik Sewage	1.Nashik D/s	36
			2.Jayakwadi Dam, Raheer	6.5
			3.U/S Of River Gangapur Dam, Nasik	6
			4.U/s of Paithan, Jayakwadi	6.8
			5.D/s of Paithan, Pathegaon	7.4
			6.Near Someshwar Temple	7.5
			7.Hanuman Ghat, Nashik	9
			8. Nasik D/S	18
			9.Panchavati At Ramkund	12
			10.KapilaGodavari, confl.Point, Tapovan	14
			11.Saikheda	16
12. Tapovan	20			

<b>POLLUTED RIVER STRETCHES (BOD&gt;30mg/l and BOD exceeding 6mg/l on all occasions )</b>				
<b>River</b>	<b>Polluted Stretch</b>	<b>Source/City</b>	<b>Monitoring Location</b>	<b>BOD (mg/l)</b>
<b>21. Mula &amp; Mutha</b>	D/s Pune city	City Sewage of Pune	1.Mula-Mutha River at Mundhawa Bridge	36
			2.Mula at Aunth Bridge	
			3.Mula –Harrison Bridge	50
			4.Mutha at sangam Bridge	32
<b>22. Pawana</b>	Pune-Sangavi Gaon	Pune Sewage	1.Pune-Sangavi Gaon	36
<b>23. Indrayani</b>	Alandi to confluence with Bhima	Pune Sewage	1.Alandi Gaon	36
<b>24. Koyna</b>	Karad D/s	Karad Sewage	1.At Karad	35.5
<b>25. Mithi</b>	Mumbai Stretch	Mumbai	1. Mithi river	50
<b>26. Kundalika</b>	Are Khurd	Roha sewage	1.Are Khurd	50
			2. Kundalika At Roha city	6.5
<b>PUNJAB</b>				
<b>27. Satluj</b>	D/S of Zenith Paper Mill to Bridge Harike, Amritsar	Sewage from Ludhiana & Jalandhar	1.100m D/S Budha Nala Confl.,Ludhiana	48
			2. D/S East Bein	6.2
			3.Boat Bdg. Dharmkotnakodar Road, Jalandhar	18
			4. 1 Km. D/S of Zenith	22
<b>28. Ghaggar</b>	Mubarkpur to Sardulgarh (Entire length in Punjab)	Municipal & Industrial discharge from Patiala, Chandigarh, Sukhna paper mills & Derra Bassi, Sardulgarh, Moonak,	1.D/S Dhakansu Nallah	32
			2.D/S Jharmal Nadi	32
			3.D/S Sardulgarh	45
			4.100m D/S Conf. With R. Saraswati (Patiala)	40
			5.Ratanheri, D/S Of Patiala Nadi (After Confl.)	50
			6.Moonak,	38
			7.U/S Jharmal Nadi,	40
			8.U/S Sardulgarh,	45
			9.D/s Chhatbir	10
			10. Mubarakpur Rest House(Patiala)	10
			11. Near Bankarpur, Dera Bassi	12
			12. U/s Dhakanshu Nallah	18
<b>TAMIL NADU</b>				
<b>29. Adyar</b>	Along Chennai	Chennai- Industrial & Municipal Wastewater	Nandambakkam, Ekattuthangal, Jaferkhanpet, Maraimalai bridge, Kotturpuram bridge, Boat club	43
<b>30. Coovum</b>	Along Chennai	Chennai- Industrial & Municipal wastewater	Annanagar, Arumbakkam, Amanjikarai, Poonamalle, College Road, Central Jail, Napier Bridge	105

<b>POLLUTED RIVER STRETCHES (BOD&gt;30mg/l and BOD exceeding 6mg/l on all occasions )</b>				
<b>River</b>	<b>Polluted Stretch</b>	<b>Source/City</b>	<b>Monitoring Location</b>	<b>BOD (mg/l)</b>
31. Cauvery	Erode D/s	Erode Sewage	1.Erode near Chirapalayam	38
<b>UTTAR PRADESH</b>				
32. Yamuna	Kosi Kalan to Juhika	Sewage from Agra, Mathura, Bateswar, Vrindavan & Etawah	1.D/S Of Agra, U.P.	33
			2.Mazawali	37
			3.Bateswar, U.P	26
			4.Etawah, U.P.	27
			5.Mathura U/S , U.P.	20
33. Hindon	Saharanpur to confluence with River Yamuna	Sewage & Industrial effluent from Ghaziabad, Saharanpur & Muzaffarnagar	1.Ghaziabad D/S, U.P.	36
			2. Confl. With R. Krishna & Kali Near Binauli City, Meerut	36
			3.Pura mahadev	34
			4. Saharanpur D/s	24
34. Western Kali	Muzaffar Nagar to Confluence with Hindon	Sewage & Industrial effluents from Muzaffar nagar & Mansoorpur	1.Kalinadi At U/S Of Muzaffar Nagar	32
			2.Kalinadi At D/S Of Muzaffar Nagar	364
35. Kali Nadi Eastern	Kannauj	Industrial and Municipal sewage from Meerut, Modinagar, Bulandsahar, Hapur, Gulaothi and Kannauj	1. At Kannauj (Before Conf.)	120
			2. U/S of Gulaothi City In Bulandsahar,	183
<b>POLLUTED RIVER STRETCHES(BOD between 20 &amp; 30 mg/l)</b>				
<b>River</b>	<b>Polluted Stretch</b>	<b>Source/City</b>	<b>Monitoring Location</b>	<b>BOD (mg/l)</b>
<b>KARNATAKA</b>				
1. Bhadra	D/s of Bhadravathi to confluence with Tunga	Industrial & Domestic	1.D/S Of Bhadravathi	22.5
		Waste water from Bhadravathi	2. D/s of KIOCL Road Bridge, Near Holehunnur	7.8
<b>MAHARASHTRA</b>				
2. Tapi	M.P. Border to Bhusaval	Bhusaval Sewage	1.Ajnand Village	21
			2.Uphad Village	22
			3. Bhusawal U/s	19
3. Girna	Malegaon to Jalgaon	Malegaon Sewage	1.Malegaon (Manmad)	23
		Jalgaon Sewage	2. Jalgaon	10
4. Nira	D/s of Jubilant Organosis, Pune	Industrial wastewater	1. D/s of Jubilant Organosis, Pune	21. 2
<b>MANIPUR</b>				
5. Nambul	Hump Bridge to Heirangoithong	Sewage	1. Heirangoithong	24
			2. Hump Bridge	26
<b>RAJASTHAN</b>				
6. Jojari	Along Jodhpur	Industrial & Domestic waste from Jodhpur	1.D/S Jodhpur	10.5-25.1
7. Bandi	Along Pali	Industrial & Domestic waste from Pali	1.D/S Pali	30-141

<b>POLLUTED RIVER STRETCHES (BOD&gt;30mg/l and BOD exceeding 6mg/l on all occasions )</b>				
<b>River</b>	<b>Polluted Stretch</b>	<b>Source/City</b>	<b>Monitoring Location</b>	<b>BOD (mg/l)</b>
8. Berech	D/S of Udaipur	Industrial & Domestic waste from Udaipur and Chittorgarh	1.D/S Udaipur	6.2-22.1
9. Khetri	Along Khetri	Industrial & Domestic waste from Khetri	1.D/S Khetri Complex	8.1-31.2
<b>TAMIL NADU</b>				
10. Noyyal	Along coimbatore, Tirupur, Palyanakotti	Industrial & domestic wastewater from coimbatore, Tirupur, Palyanakotti	1.Vicinity of Tirupur	>26
<b>UTTAR PRADESH</b>				
11. Bagad	D/S of Gajraula	Industrial effluent of Jubilant organics	1.D/s of Jubilant Organics	BOD - >26
12. River Ganga	Kannauj D/S to Kanpur D/s(Jajmau Pumping station	Industrial effluent from Kanpur	1.Kanpur D/S(Jajmau Pumping Station	21
			2. Kannauj D/s, U.P.	6
			3.Kanpur U/s(Ranighat), U.P.	6.4
<b>UTTARAKHAND</b>				
13. Kosi	D/S of Kashipur	Sewage & Industrial waste from Kashipur	1.D/S of Kahsipur	13
14. Dhela & Kichha	D/S of Kashipur	Sewage & Industrial waste from Kashipur	1.Dhela D/S of Kashipur	187
			2.Kichha D/S of Kashipur	17
15. Bahalla	D/S of Kashipur	Sewage & Industrial waste from Kashipur	1.D/S of Kashipur	15-22

<b>POLLUTED RIVER STRETCHES(BOD between 10 &amp; 20 mg/l)</b>				
<b>River</b>	<b>Polluted Stretch</b>	<b>Source/City</b>	<b>Monitoring Location</b>	<b>BOD (mg/l)</b>
<b>ANDHRA PRADESH</b>				
1. Manjira	D/s Gowdicharla	Industrial effluent of Ganpati sugar & Impact of Nakavagu	1.Gowdicharla a/c with Nakavagu	16
			2.Near Ganpati sugars	18
<b>ASSAM</b>				
2. Deepar Bill	D/s Guwahati	Guwahati	1.Deepar Bill	11
<b>GUJARAT</b>				
3. Khari	Lali village, Ahemdabad	Municipal & Industrial waste from Ahemdabad	1.Lali Village Near Ahmedabad	19
4. Kolak	D/s Patalia.		1.At Patalia Bdg.	12
			2. At Railway Bridge No. 313 Vapi, Valsad	8
5. Mindhola	D/s State Highway Bridge Sachin		1.Mindhola At State Highway Bridge Sachin	12
6. Shedi	Along Kheda	Kheda Sewage	1. At Kheda	19
<b>HARYANA</b>				
7. Gurgaon Canal	D/s of Delhi	Delhi	1. GC-1 Near Badarpur Border	24



POLLUTED RIVER STRETCHES(BOD between 10 & 20 mg/l)				
River	Polluted Stretch	Source/City	Monitoring Location	BOD (mg/l)
<b>JHARKHAND</b>				
8 Subarnrekha	D/s of Ranchi (Tatisilwal)	Industrial & domestic waste from Ranchi	1.Ranchi(tatisilwal)	10. 5
			2. Namkum Road bridge	6.8
<b>KARNATAKA</b>				
9 Tunga	D/S of Shimoga	Shimoga Sewage	1.D/S Of Shimoga City	13.5
10 Tungabhadra	Harihar D/S to Hara eahalli Bridge. & Ullanur	Harihar Sewage & Grasim waste	1.Haralahalli Bridge	16.5
11 Laxmantirtha	D/s of Hunsur City	Hunsur Sewage	1.D/s of Hunsur city	10
<b>KERALA</b>				
12 Karamana	Karamana At Moonnattumukku		1.Karamana At Moonnattumukku	11
<b>MADHYA PRADESH</b>				
13 Kshipra	Ujjain to confluence with Chambal	Ujjain- sewage	1.Ramghat At Ujjain,	15
			2.Trivenisangam (1 Km. D/S of Sangam)	14
			3.Siddhawati D/S of Ujjain	8
14 Narmada	Hoshangabad	Industrial & Domestic Wastewater	1.Hoshangabad D/s	11.4
<b>MAHARASHTRA</b>				
15 WeinRiver Ganga	D/S Ashti	Municipal sewage of Ashti city	1.At Ashti	10.5
			2.After Confluence of Kanhan	9
			3. D/s of Ellora Paper mill	9.4
			4.U/s of Ellora paper mill	8.6
			5.U/s of Gaurav paper mills, Jackwell	9
			6. D/s of Gaurav paper mills, Jackwell	7.8
16 Wardha	Along Rajura village	Paper mill waste	1.Rajura Bridge	11
			2.D/s of ACC Ghuggus	13
			3.At confluence point of Pangange & Wardha at Jaud	8.5
17 Bhima	Narsinghpur D/s	Nira – discharge	1. Narsinghpur,(D/SAfter.Confl.With R.Nira),	16.2
18 Krishna	Dhomdam to Kolhapur	Sewage & Industrial waste from Karad & Sangli	1. Krishna Bridge, Karad,	11. 6
			2. At Kshetra Mahuli	12
			3. Krishna Vennasangam at Mahuli	17.6
			4. At Wai	12.6
			5. Mahabaleshwar Dhom Dam Near Koina Dam,	8.6
19 Purna	Andura village		1. D/s of confl. of Morna & Purna, Andura village	10.2
			2. Purna at Dhupeshwar	

<b>POLLUTED RIVER STRETCHES(BOD between 10 &amp; 20 mg/l)</b>				
<b>River</b>	<b>Polluted Stretch</b>	<b>Source/City</b>	<b>Monitoring Location</b>	<b>BOD (mg/l)</b>
20. Nira	Along Pulgaon	Pulgaon Cotton Mill	1.Pulgaon Cotton Mill, Wardha 2.Sarole Bdg.On Pune-Banglore Highway	11.8
21 Chandrabhaga	Along Pandharpur City	Sewage Of Pandharpur City	1. D/S Of Pandharpur City 2. U/S Of Pandharpur City	12 10.5
22. Venna River	Varye, Satara		1. Satara D/s	12
<b>TRIPURA</b>				
23. Agartala Canal	D/s Agartala	Agartala sewage	1.Near Pragati Vidya bhawan, Agartala,	14.6
<b>UTTAR PRADESH</b>				
24. Gomti	Lucknow to Jaunpur	Sewage & Industrial effluent from Lucknow and Jaunpur.	1. Jaunpur D/S, U.P. 2. Lucknow D/S, U.P.	12 14
25. River Ganga	Varanasi D/S	Discharge through Kalinadi & RamRiver Ganga sewage & Industrial effluent from Kannauj and Kanpur	1.Varanasi D/S (Malviya Bridge)	14
26. RamRiver Ganga	Upstream Kannauj	Sewage & Industrial waste water from Ramnagar & Moradabad	1.RamRiver Ganga At Kannauj (Before Conf.)	16

<b>POLLUTED RIVER STRETCHES (BOD Between 6-10 mg/l)</b>				
<b>River</b>	<b>Polluted Stretch</b>	<b>Source/City</b>	<b>Monitoring Location</b>	<b>BOD (mg/l)</b>
<b>ANDHRA PRADESH</b>				
1. Krishna	Wadepally		1.Krishna at Wadepally A/c with River Musi	8
2. Godavari	D/S of Rajamundry	Rajamundry	1.Rajamundry D/S	6
3. Maner	Warangal U/S	Warangal	1.Warangal U/s	6.1
<b>ASSAM</b>				
4. Burhidihing	Margherita to Duliajan	Margherita	1.Burhidihing At Margherita 2.Burhidihing at Duliajan	7.9 7
<b>BIHAR</b>				
5. Sikrana	Sikrana At Chanpatiya	Chanpatiya	1.Chanpatiya	8
<b>CHATTISGARH</b>				
6. Arpa	Arpa river D/S of Bilaspur	Bilaspur	1.D/S Bilaspur	7
7. Seonath	U/S Rajnandgaon		1.U/S Rajnandgaon	7.1

POLLUTED RIVER STRETCHES (BOD Between 6-10 mg/l)				
River	Polluted Stretch	Source/City	Monitoring Location	BOD (mg/l)
<b>GUJARAT</b>				
8. Mahi	D/s Sevalia and Vasad	Municipal waste from Sevalia & Vasad	1.Vasad	6.8
			2.Near Rajasthan border at Kadana Dam	8.2
9. River Dhadar	D/s Kothada	Kothada	1.River Dhadar At Kothada	9
10. Tapi	Rander Bridge to Surat	Municipal & Industrial waste from Surat	1.Rander Bridge, Surat	7.4
			2.Tapi at ONGC bridge, Surat	6
11. Kim	D/s Surat	Municipal Sewage	1.Sahol Bridge, Olpad Hansol Road, Surat	6
<b>HIMACHAL PRADESH</b>				
12. Markanda	D/S of Paonta Sahib	Water from Paonta Sahib	1.Markanda At Paonta, Distt. Sirmour	8.2
13. Beas	D/S of Mandi	Domestic waste from Mandi	1. D/s Mandi	7.6
<b>JHARKHAND</b>				
14. Sankh	Along Bolba	Municipal Sewage	1.Bolba	6.2
<b>KARNATAKA</b>				
15. Kali	Along Dandeli City	West Coast Paper Mill waste	1.D/S West Coast Paper Mill	7
16. Krishna	U/S Of Ugarkhurd Barrage		1. U/S Of Ugarkhurd Barrage	9.8
<b>MADHYA PRADESH</b>				
17. Tons	Tons Along Madhavgarh	Sewage	1.Tons At Madhavgarh	8
18. Kalisot	Mandideep	Sewage & industrial effluent	1.Near road bridge, Mandideep	6
19. Betwa	Raisen	Sewage from Raisen	1.At Nayapur D/s, Mandideep Industrial Area No.1, Raisen	6.8
<b>MAHARASHTRA</b>				
20. Kalu	Atale village to Confl. with Ulhas	Municipal & Industrial waste water	1.Atale village	7.5
21. Kanhan	D/S Nagpur	Industrial & Domestic Waste of Nagpur	1.D/S of Nagpur	8.8
			2.U/s of M/s Vidharbha paper mill, Sinora	8.8
			3.D/s of M/s Vidharbha paper mill, Sinora	9.8
22. Kolar	Along Kamptee	Municipal waste water	1.Before Confluence To Kanhan At Kamptee	7
23. Ulhas	Mohane	Industrial & Domestic runoff Ulhasnagar	1.U/S Of Nrc Bund At Mohane	6
			2.Jhambul Water Works	7.5
24. PanchRiver Ganga	Kolhapur	Industrial & Municipal sewage of Kolhapur	1.D/S Of Kolhapur City	6.4
25. PatalRiver Ganga	Khopoli to Esturaine region	Industrial & Municipal sewage from khopoli, Rasayani & Paundh	1. Shilphata	6
			2. Near Intake Of Midc W/W	9

<b>POLLUTED RIVER STRETCHES (BOD Between 6-10 mg/l)</b>				
<b>River</b>	<b>Polluted Stretch</b>	<b>Source/City</b>	<b>Monitoring Location</b>	<b>BOD (mg/l)</b>
26. Rangavali	Along Navapur	Sewage of Navapur	1.D/S Of Navapur	8.4
<b>MEGHALAYA</b>				
27. Kharkhala	Near Sutnga Khlieri, Jaintia Hills		1.Near Sutnga Khlieriat,Jaintia Hills Dt.	7
28. Umtrew	Umtrew At Byrnihat East		1.Umtrew At Byrnihat East	7.7
<b>ORISSA</b>				
29. Kathjodi	Along Cuttack	Cuttack Sewage	1.Cuttack D/S	6.4
<b>PONDICHERRY</b>				
30. Arasalar	Along Karaikal	Domestic waste of Karaikal	1.Arasalar River Karaikal Region,	7
<b>RAJASTHAN</b>				
31. Chambal	D/S Kota city	Industrial & Domestic waste from Kota	1.Kota D/S (2 Km. From City)	6.2
<b>TAMIL NADU</b>				
32. Vaigai	Along Madurai	Madurai-Industrial & domestic wastewater	1.Vicinity of Madurai	>6
33. Tambiraparani	Along AmbasaMoUDam	Madura Coats Industrial waste	1.Rail Bdg. Nr. AmbasaMoUDam	6
34. Cauvery	Tiruchirapalli to Grand Anaicut	Municipal sewage of Erode, Tiruchirapalli	1.Tiruchirappalli D/S	6
			2.Trichy,Grand Anaicut	7.8
			3.1Km D/s of Bhavani river confluence	7.3
35. Bhavani	Bhavani	Municipal sewage	1.Bhavani Sagar Bhavani	7.6
			2..Bhavani at Bhavani	6.8
<b>UTTAR PRADESH</b>				
36. River Ganga	D/s of Haridwar		1.D/s of Haridwar	7.6
<b>WEST BENGAL</b>				
37. Damodar	D/s Asansol		1.Narainpur After Confl. Of Nunia Nallah	6.8
			2.Near Mujher Mana Village After Conf. of Tamla Nallah	6.8
38. River Ganga	D/s Dakshineswar	Industrial waste & sewage from Dakshineswar	1.Dakshineswar	6

<b>POLLUTED RIVER STRETCHES (BOD between 3&amp; 6 mg/l)</b>			
<b>River</b>	<b>Polluted Stretch</b>	<b>Monitoring Location</b>	<b>BOD (mg/l)</b>
<b>ANDHRA PRADESH</b>			
1. TUNGABHADRA	D/s Manthralayam	1. Manthralayam , Kurnool	3.3
2. KRISHNA	Thangadi , Mahaboobnagar	1. Thangadi , Mahaboobnagar	3.1
3. PENNAR	Puspagini,	1. A/C Papagni, Puspagini	3.2
<b>CHHATTISGARH</b>			
4. MAHANADI	Rajim U/s to interstate boundary with Orissa	1. U/s Rajim	3.2
		2. Interstate Boundry	3.1
<b>GUJARAT</b>			
5. MAHI	D/s Mujpur	1. At Umeta Bridge	3.1
		2. At Mujpur	3.2
6. PANAM	D/s Lunawada	1. At Lunawada	3.7
7. SABARMATI	Dharoi Dam to Mahudi jain Temple	1. Dharoi Dam	3
		2. At Mahudi Jain Temple	3.5
8. AMBIKA	D/s Bilimora	1. At Bilimora	4.2
9. ANAS	D/s Dahod	1. Anas At Dahod,(Kushalgarh),Dist. Panchmahal	3.8
10. BALESHWAR KHADI		1. Baleshwar Khadi At N.H. No. 8	4.5
11. KAVERI		1. Bridge At Billimora-Valsad Road	3
<b>HARYANA</b>			
12. YAMUNA	Kalanaur to Sonapat	1.Hathnikund	3
		2. At Kalanaur	4
		3. At Sonapat	5
		4. U/s Paonta Sahib	3
<b>KARNATAKA</b>			
13 TUNGABHADRA	Ullanur D/s	1. At Ullanur	3.1
14 HUNDRI	Joharpur D/s	1. Joharpur(V), Near Temple, Kurnool	3.1
15 KUNDU	Nandayal D/s	1. Nandyal, Near Over Bdg., Kurnool	3.1
16 ARKAVATI	D/s of Kanakapura	1. D/S of Kanakapura City	5
17 MALPRABHA	D/s of Khanapur	1. D/S of Khanapur Village	4.1
<b>KERALA</b>			
18 PUZHACKAL		1. At Puzhackal Bridge	4
19 KADAMBAYAR	D/s Brahmapuram	1. At Brahmapuram	3
<b>MADHYA PRADESH</b>			
20 NARMADA	Hoshangabad D/s	1.at Sethanighat	3.1
		2. at Hoshangabad	3.2
21 MANDAKINI	D/s Chitrakut	1. At Chitrakut	5
<b>MAHARASHTRA</b>			
22 ULHAS	Along Badlapur	1. U/s of Badlapur,	3.4
23 BHATSA	Along Pise village	1. D/s of Pise Dam Near Pise Village (Ulhas)	3.3

<b>POLLUTED RIVER STRETCHES (BOD between 3&amp; 6 mg/l)</b>			
<b>River</b>	<b>Polluted Stretch</b>	<b>Monitoring Location</b>	<b>BOD (mg/l)</b>
<b>NAGALAND</b>			
24 DHANSIRI	Along Dimapur	1. Near Check Gate (Dimapur Khutkhuti Road)	3.2
		2. Full Nagarjan	3.6
		3. Nuton Basti	4.8
		4. City Boundary Bridge (Diphu Road)	3.2
<b>ORISSA</b>			
25 BRAHMANI	Panposh to Rourkela	1. D/s Panposh	4.6
		2. Rourkela D/s	3
26 MAHANADI	Cuttack D/s	1. Cuttack D/s	4.6
27 KUAKHAI	Along Bhubaneswar	1. At Bhubaneswar	3.2
<b>SIKKIM</b>			
28 TEESTA	D/s Gangtok	1. After confluence with River Ranichu at Singtam	3
		2. After confluence with Rangichu after meeting the industrial effluents from the City Ranichu	3.1
		3. At Melli downstream	3.2
29 RANICHU	D/s Gangtok	1. Before confluence with River Teesta at Singtam	3.5
		2. After confluence of Ranichu and Rorachu at Ranipool	3.2
30 DIKCHU	D/s Gangtok	1. Before confluence with River Teesta Near NHPC Hydroelectric Power Project	3.4
31 MANEY KHOLA	D/s Gangtok	1. After Confluence with Ray Khola at Adampool after meeting waste of STP	3.2
		2. At Burtuk near Army Base Camp, 4 Km U/s of Gangtok	3.2
<b>TAMILNADU</b>			
32 PALAR	Along Vellore	1. Vaniyambadi Water Supply Head Work	4
<b>TRIPURA</b>			
33 HAORA	Agartala D/s	1. Chandrapur, Agartala D/s of Haora	3.5
<b>UTTAR PRADESH</b>			
34 SARYU	Along Ayodhya	1. At Ayodhya at main Bathing Ghat	3
35 RIHAND	Along Renukut	1. Renukut U/S	3.3
		2. Renukut D/S	3.2
<b>WEST BENGAL</b>			
36 BARAKAR	D/s Asansol	1. At Asansol (Water Intake Point)	3.8

## NORMS FOR STAFF AND STAFF QUARTERS FOR SEWAGE PUMPING STATIONS AND STPS

### A. STAFF QUARTERS

#### 1. Sewage Pumping Stations

Staff	Installed capacity < 150 HP	Installed capacity 150-300 HP	Installed capacity 300-500 HP	Installed capacity >500 HP
Pump Operators	Type B 1	Type B 1	Type B 1	Type B 1
Beldars	Type A 1	Type A 1	Type A 1	Type A 2
Pump Mechanics				Type B 1
Electricians				Type B 1
<b>Total</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>5</b>

#### 2. Sewage Treatment Plants

SN	Staff	Types of staff Qts.	10 mld	40 mld	80 mld	120 mld
<b>1</b>	<b>ASP / Biofiltration</b>					
	Beldars	<b>A</b>	4	4	6	8
	Operators	<b>B</b>	2	4	4	6
	Electrician class 1	<b>B</b>	1	1	1	1
	Pump mechanic/Fitters class 1	<b>C</b>	-	1	1	1
	J.E.	<b>C</b>	-	1	1	1
	A.E.	<b>D</b>	-	-	1	1
	Operators (Power Plant)	<b>B</b>	-	2	2	2
	<b>Sub-total</b>		<b>7</b>	<b>11+2</b>	<b>14+2</b>	<b>18+2</b>
<b>2</b>	<b>Oxidation Pond</b>					
	Beldars	<b>A</b>	2	2		
<b>3</b>	<b>Aerated Lagoons</b>					
	Beldars	<b>A</b>	2	2		
	Operators	<b>B</b>	2	2		
<b>4</b>	<b>UASB Treatment Plants</b>					
	Operators	<b>B</b>	1+1	1+1	1+1	1+1
	-	-	-	-	-	-
	Sweepers	<b>A</b>	1	1	1	1
	Watchmen/Gatemen	<b>A</b>	1	1	1	1
	Electrician cum Mechanic	<b>B</b>	1	1	1	1
	Chemists***	<b>B</b>	1	1	1	1
	J.E.**	<b>C</b>	1	1	1	1
	A.E.(Civil)	<b>D</b>	-	1	1	1
	EE(Civil)	-	-	-	-	-

Note: \*Operators' quarter for Power Package

\*\*One J.E. would look after more UASB Plants in a city

\*\*\*One Chemist would look after more UASB Plants in a city with a single laboratory.

### 3. Covered Areas for Different Categories of Residential Accommodation (Area as per CPWD norms)

Personnel	Type	Plinth Area
Sweepers, Watchmen	A	34.20 sq.m.
Operators, Electricians & Chemists	B	45.60 sq.m.
J.Es.	C	62.70 sq.m.
A.Es.	D	86.00 sq.m.

### 4. Guide Lines for Staff Quarters

- No staff quarters are necessary for the IPS and MPS, if the installed capacity is less than 150 HP.
- The staffing pattern for STP has been taken as per the guidelines of the Expert Committee set up by NRCD for the above purpose.
- Number and type of quarters for different capacities any types of treatment plants have been worked out taking into consideration the operating staff in shifts. Quarters have also been proposed for minimum maintenance staff in large pumping stations and STPs.
- Only a few supervisory staff at large STPs are to be considered for staff quarters at the site of treatment plant.
- The pay scales and type of accommodation are based as per norms laid down by the Ministry of Urban Development.
- If the land is not available at the site of MPS for construction of staff quarters, these quarters can be constructed at the site of treatment plant.
- Staff quarters are not to be treated as rent-free.
- 20% of the operating staff in shifts is to be provided quarters in the vicinity of STP.
- States can adopt their own eligibility norms for different categories of staff, provided the variations are not too large.

### B. REQUIREMENT OF STAFF FOR SEWAGE PUMPING STATIONS

Staff Required	Installed Capacity < 150 HP	Installed Capacity 150-300 HP	Installed Capacity 300-500 HP	Installed Capacity >500 HP
J.E.	½	½	1	1
Pump Mechanics	1	1	1 ½	1 ½
Electricians	1	1	1	1
Pump Operators	1x3	1x3	1x3	1x3
Beldars	1x2	1x2	1x3	2x3
Sweepers	1x1	1x1	1x1	1x1



### C. REQUIREMENT OF STAFF FOR STPs

Designation	Activated sludge Process/UASB				High Rate Filtration				Oxidation Ditch				Oxidation Pond				Aerated Lagoon			
	10	40	80	120	10	40	80	120	10	40	80	120	10	40	80	120	10	40	80	120
Ex Engineer (Project Manager)	-	-	1	1	-	-	1	1	-	-	1	1	-	-	-	-	-	-	-	-
AE(E&M)Asstt. Manager	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
AE(Civil)Asstt. Manager	-	-	-	1	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	1
JE(E&M)Junior Manager	4	4	6	6	4	4	6	6	4	4	6	6	-	-	-	-	4	4	4	4
JE(Civil)Junior Manager	-	-	1	2	-	-	1	2	1	1	1	2	1	1	1	1	1	1	1	2
Fitter(Mech)Ist Class	1	1	2	2	1	1	2	2	1	1	2	2	-	-	-	-	-	-	1	1
Electn, Ist class	1	1	2	3	1	1	1	2	1	1	2	2	-	-	-	-	1	1	2	2
Fitter, 2 <sup>nd</sup> class	-	-	1	1	-	-	1	1	-	-	1	1	1	1	1	1	1	1	1	1
Electn, 2 <sup>nd</sup> class	1	1	2	2	1	1	2	2	1	1	2	2	1	1	1	1	1	1	2	2
Gardener	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2
Driver	-	-	1	1	-	-	1	1	-	-	1	1	-	-	-	-	-	-	1	1
Cleaner	-	-	1	1	-	-	1	1	-	-	1	1	-	-	-	-	-	-	1	1
Jr. Accountant	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
UDC, Senior Asstt.	1	1	1	2	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1
LDC/Typist Junior Asstt.	1	1	2	3	1	1	2	3	1	1	2	3	1	1	2	2	1	1	1	2
Peon	1	1	2	3	1	1	2	3	1	1	2	3	-	-	1	1	1	1	1	2
Jr. Steno	-	-	1	1	-	-	1	1	-	-	1	1	-	-	-	-	-	-	-	-
Chemist	-	-	1	1	-	-	1	1	-	-	1	1	-	-	-	-	-	-	-	-
Asst. Chemist	-	-	1	1	-	-	1	1	-	-	1	1	-	-	-	-	-	-	1	1
Lab Asstt.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Lab Attendant.	1	2	2	2	1	2	2	2	1	2	2	2	1	1	1	1	1	1	1	1
Sweeper	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2
Welder cum Blacksmith	-	-	1	1	-	-	1	1	-	-	1	1	-	-	-	-	-	-	-	-
Operators	12	16	19	19	12	16	19	19	8	8	12	12	-	-	1	1	4	4	4	4
Labour (Beldars)	28	44	54	73	28	44	53	72	21	28	48	52	11	20	36	50	10	14	27	34

## 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-9

## STRUCTURE OF THE CITY SANITATION PLAN REPORT

Chapters	Description
(i)	Table of Contents
(ii)	List of Abbreviations
(iii)	<b>SALIENT FEATURES OF THE PROJECT</b>
(iv)	<b>EXECUTIVE SUMMARY</b>
<b>1.</b>	<b>ABOUT THE PROJECT AREA</b>
1.1	<b>Authority for preparation of project</b>
1.2	<b>Composition of the team set up for preparing the City Sanitation plan</b>
1.3	<b>Description of the project area</b>
i.	Brief description of the polluted stretch of the river and its basin
ii.	Justification for selecting the town for project formulation under NRCP / NGRBA
iii.	Brief history of the town
iv.	Geographical Location
v.	Climate
vi.	Topography
vii.	Drainage channels
viii.	Administrative divisions
ix.	Commercial aspects
x.	Industrial activities
xi.	Educational activities
xii.	Cultural activities
xiii.	Religious activities
xiv.	Socio –Economic status
xv.	Town Management
xvi.	Land cost in and around the town (copy of rates be attached in support)
xvii.	City Development plan, if any, covering the sewerage and non sewerage aspects.
1.4	<b>Population within the project area</b>
i.	Ward wise Census population of the last 5 decades, area, no. of households, growth rate, density of population
ii.	Slum wise population of the last 5 decades
iii.	Details of future population projections as per the City Master Plan
iv.	Cattle population
<b>2.</b>	<b>SEWERAGE WORKS</b>
2.1	<b>Status of water supply</b>
i.	Actual Water supply from different sources ward wise, Population covered and rate of water supplied in different areas
ii.	Proposals for augmentation of water supply system
2.2	<b>Status of existing waste water disposal works</b>
i.	Existing works
ii.	Works under execution
iii.	Works sanctioned but not yet started
iv.	Total waste water generation
v.	Industrial flow

Chapters	Description
<b>2.3</b>	<b>Status of Pollution of the river</b>
i.	Nos. & details of drainage channels
ii.	Waste water flow carried by drains,
iii.	Details of measurement of flows in drains along with copies of test reports
iv.	Waste water characteristics of different drains,
v.	Details of measurement of Waste water characteristics along with copies of test reports
vi.	Water quality of the river u/s, d/s and at outfalls of drains discharging into the river
vii.	Details of measurement of the quality of river water along with copies of test reports
viii.	Methodology followed for flow measurement and quality characteristics
ix.	Water quality standards of river water quality
<b>2.4</b>	<b>Justification of the project for pollution abatement of the river</b>
<b>3.</b>	<b>NON SEWERAGE WORKS</b>
<b>3.1</b>	<b>Community Sanitation Scheme</b>
<b>a)</b>	<b>For each ward provide the following information</b>
i.	floating and permanent population
ii.	Number of houses not having toilet
iii.	Slum wise population
iv.	Slum wise availability of public toilets
<b>b)</b>	<b>Details of plan for Slum rehabilitation, if any.</b>
<b>c)</b>	<b>Identification of Slums where CTCs are required</b>
<b>d)</b>	<b>Identification of Public places where Toilet Complexes are required.</b>
<b>3.2</b>	<b>Crematoria</b>
<b>a)</b>	<b>Base line information</b>
i.	Total population including floating population
ii.	Details of existing cremation grounds- Electrical, Gas Based, Wood based (Conventional)
iii.	No of bodies cremated in each cremation ground
iv.	Wood consumption per cremation ground wise.
<b>b)</b>	<b>Cremation grounds where Improved Wood Based Criteria / Electric Furnace are justified</b>
<b>3.3</b>	<b>River Front Development</b>
	Baseline status
	For each ghat
	Number of users – peak at any given time and average
	Approximate dimensions of the ghat
	The state of the ghat
	Improvements required
	Locations of new ghats needed
	Approximate dimensions of new ghats
<b>3.4</b>	<b>Dhobi Ghats</b>
	Dhobi ghat wise information
	Specific location
	Number of dhobis washing clothes
	Identification of locations where alternative facilities to the affected dhobis can be provided.

<b>Chapters</b>	<b>Description</b>
<b>3.5</b>	<b>Carcass Disposal</b>
	The number of cattle that die in the town
	Existing arrangements for safe carcass disposal
	Identification of the need for carcass disposal.
<b>3.6</b>	<b>Others (Waste Disposal from dairies, slaughter houses etc.</b>
<b>4.</b>	<b>SOLID WASTE MANAGEMENT</b>
	Baseline information municipal ward wise
	Category wise quantity of solid waste and its characteristics
	Bio- degradable and non biodegradable waste
	Industrial Waste
	Bio-medical waste
	Segregation of the waste
	Collection and storage system
	Transfer System
	Garbage Dumping and Disposal site(s)
	Solid waste converted to compost – composting site and its capacity
	Solid waste recycled
	Deficiencies in the SWM system
	Justification for up grading the present system or a new system
<b>5.</b>	<b>CONSULTATION WITH STAKE HOLDERS</b>
	Resolutions of ULBs for CSP adoption
	Consultation with community
<b>6.</b>	<b>FINANCIAL STRATEGY FOR EXECUTING THE DIFFERENT COMPONENTS</b>
<b>7.</b>	<b>MAPS</b>
	<b>(MAPS – Several themes can be shown in one map depending upon convenience)</b>
i.	Map of the Country and State showing the location of the town
ii.	Map showing the polluted river with its basin and the selected town
iii.	Map of the city showing River Basin and details as mentioned in chapter 3
iv.	Map of the city showing drains and their outfall points
v.	Map of the city showing land use
vi.	Map of the city showing existing water supply works
vii.	Map of the city showing existing sewerage works
viii.	Map of the city showing Municipal wards
ix.	Map of the city showing Industrial Estates
x.	Map of the city showing Grossly polluting units
xi.	Map of the city showing Slums
xii.	Map of the city showing markets and commercial places (For Toilet Complexes)
xiii.	Map of the city showing existing community toilet complexes
xiv.	Map of the city showing Crematoria
xv.	Map of the city showing Ghats (River fronts where people collect for bathing )
xvi.	Map of the city showing Dhobi ghats
xvii.	Map of the city showing Cattle wallowing sites
xviii.	Map of the city showing Washing of motor vehicles
xix.	Map of the city showing Garbage dumping sites
xx.	Map of the city showing Bio-medical treatment facilities

**Note:**

CSP is a comprehensive document covering wider issues of sanitation works required for the city.

The CSP should flow from the City Development Plan, wherever applicable / feasible.

Base line data on present status should be as accurate as possible.

It is in the best interest of the city, its residents, the local body and other stake holders.

Planning and development may involve people along with other stakeholders in structured and scientific manner

Financial status of the city government (overall financial profile) may answer

What budgetary and accounting practices are being followed?

What sources of revenue does the city govt. have or plans for meeting the sustainability (recoveries)?

criteria for fixing user charges

(sector-wise financial profile - Water supply, sewerage, Sanitation)

## ANNEXURE-10

### Suggestive Structure of the Feasibility Report For Sewerage Works

The project should include the following chapters

Chapters	Description
i.	Table of Contents
ii	List of Abbreviations
iii	<b>Executive Summary</b>
<b>1</b>	<b>ABOUT THE PROJECT AREA</b>
	<b>Authority for preparation of project</b>
	<b>Description of the project area</b>
	Brief history of the town
	Geographical Location
	Climate
	Topography
	Drainage channels
	Administrative divisions
	Commercial aspects
	Industrial activities
	Educational activities
	Cultural activities
	Religious activities
	Socio –Economic status
	Town Management
	Land cost in and around the town (copy of rates be attached in support)
	City Development Plan, if any, covering the sewerage works
<b>1.2</b>	<b>Population within the project area</b>
	Census population of the last 5 decades, area, no. of households, growth rate, density of population
	Slum population of the last 5 decades
	Details of future population projections as per the City Master Plan
<b>1.3</b>	<b>Status of water supply</b>
	Actual Water supply from different sources ward wise, Population covered and rate of water supplied in different areas
	Proposals for augmentation of water supply system
<b>1.4</b>	<b>Status of existing waste water disposal works</b>
	Existing works
	Works under execution
	Works sanctioned but not yet started
<b>1.5</b>	<b>Status of Pollution of the river</b>
	Nos. & details of drainage channels
	Waste water flow carried by drains,
	Details of measurement of flows in drains along with copies of test reports
	Waste water characteristics of different drains,

Chapters	Description
	Details of measurement of Waste water characteristics along with copies of test reports
	Water quality of the river u/s, d/s and at outfalls of drains discharging into the river
	Details of measurement of the quality of river water along with copies of test reports
	Methodology followed for flow measurement and quality characteristics
	Water quality standards of river water quality
	<b>Justification of the project for pollution abatement of the river</b>
<b>2</b>	<b>APPROACH AND SEWERAGE DISTRICTS</b>
<b>2.1</b>	<b>Approach</b>
	Design Criteria
	Design periods
	Population projections for the town for design periods
	Norms of rate of water supply
	Interception factor (IF)
	Plans for renovation, up gradation, augmentation etc of the existing sewerage works
<b>2.2</b>	<b>Drainage areas</b>
	Description
	Details
	Population projections of each drainage area for design years
	Actual water supply from different sources, Population covered and rate of water supplied in different areas
	Projected waste water flows in each drainage area in design years based on projected flows in drains and actual $lpcd * populn * IF$
<b>2.3</b>	<b>SEWERAGE DISTRICTS</b>
<b>2.3.1</b>	<b>Details of Decentralized Option</b>
	<b>Possible no. of sewerage districts</b> , based on topography, existing sewerage works, availability of land for SPS and STPs, location of rly lines, ridge lines, rivers, National Highways etc, availability of power, encroachments, quicker construction and commissioning of works etc.
	Population projections of each district in design years
	Projected waste water flows in each district in design years
	Lengths of sewer lines and capacity of SPS, STPs in each district
	Availability of land for various components in each district
	Approx capital and O&M cost of works in each district
	Economics of option of providing land at farther distance at cheaper rates and providing STP of cheaper technology
<b>2.3.2</b>	<b>Details of Centralized option</b>
	Capacity of STP
	Life Cycle Cost of STP
	Anticipated number of SPS
	Land required for various components
	Land available for various components
	Land cost in and near the town (copy of rates be attached in support)
	O&M cost of proposed works
	Life Cycle Cost of proposed works
	Economics of option of providing land at farther distance at cheaper rates and providing STP of cheaper technology



Chapters	Description
<b>3.3.3</b>	<b>LCC of centralized v/s decentralized options for various combination of no. of districts</b>
<b>3</b>	<b>OPTION ADOPTED</b>
	Finally deciding no. of districts and Justification
	Brief description of each district, works proposed, approx capital and O&M cost of works
	Impact of the proposed works on the health of the river, as compared to the river water quality standards
	General Abstract of Cost (Comprehensive)
<b>4</b>	<b>INSTITUTIONAL ARRANGEMENTS</b>
<b>5</b>	<b>ENVIRONMENTAL IMPACT ASSESSMENT</b>
<b>6</b>	<b>COST ESTIMATES AND RESOURCE REQUIREMNT</b>
	Abstract of cost estimates for each component of works
	Possible Resources
	Phasing
	Resource recovery plan
<b>7</b>	<b>ANNEXURES</b>
	Data collected as mentioned in chapter 2
	Executive Summary of City Development Plan, if any
	Executive Summary of City Sanitation Plan
	Approval of City Sanitation Plan by ULB
	Approval of City Sanitation Plan by the State Government
	Approval of City Sanitation Plan by NRCD
	Test Reports of River Water Quality, including those by CPCB, SPCB and other agencies
	Reports of quantity and quality of waste water in the drains
	Rates of Land Acquisition in and around the town
	Sub Soil Water Data
<b>8</b>	<b>Drawings</b>
	Map of the Country and State showing the location of the town
	City map showing surrounding areas (based on survey of India topographical map)
	Satellite imagery of the town
	Map of the city showing River Basin and details as mentioned in chapter 3
	Map of the city showing drains and their outfall points
	Map of the city showing land use
	Map of the city showing existing and proposed water supply works
	Map of the city showing existing sewerage works
	General Layout of city showing all proposed sewage districts
	City plan showing the broad location of Non Sewage works ij the city plan map

# ANNEXURE-11

## Suggestive Structure of the DPRs ( only for Sewerage works)

Chapters	Description
i.	Table of Contents
ii	List of Abbreviations
iii	Salient Features Of The Project
iv	Executive Summary
1	<b>ABOUT THE PROJECT AREA</b>
1.1	<b>Authority for preparation of project</b>
1.2	<b>Description of the project area</b>
	Brief history of the town
	Geographical Location
	Climate
	Topography
	Drainage channels
	Administrative divisions
	Commercial aspects
	Industrial activities
	Educational activities
	Cultural activities
	Religious activities
	Socio –Economic status
	Town Management
	Soil characteristics
1.3	<b>Population within the project area</b>
	Census population of the last 5 decades, area, no. of households, growth rate, density of population
	Slum population of the last 5 decades
	Details of future population projections as per the City Master Plan
1.4	<b>Status of water supply</b>
	Actual Water supply from different sources ward wise, Population covered and rate of water supplied in different areas
	Proposals for augmentation of water supply system
1.5	<b>Status of existing waste water disposal works</b>
	Existing works
	Works under execution
	Works sanctioned but not yet started
1.6	<b>Status of drains</b>
	Nos. & details of drainage channels
	Waste water flow carried by drains,
	Details of measurement of flows in drains along with copies of test reports
	Waste water characteristics of different drains,
	Details of measurement of Waste water characteristics along with copies of test reports

Chapters	Description
1.7	<b>River water quality</b>
	Water quality of the river u/s, d/s and at outfalls of drains discharging into the river
	Details of measurement of the quality of river water along with copies of test reports
	Methodology followed for flow measurement and quality characteristics
	Water quality standards of river water quality
1.8	<b>Justification of the project for pollution abatement of the river</b>
2	<b>APPROACH and status of existing works</b>
2.1	<b>Description of sewerage districts</b>
2.2	<b>Design Considerations</b>
	Design periods of various components
	Norms for rate of water supply
2.3	<b>Population within the project area</b>
	Census population of the last 5 decades
	Details of future population projections as per the City Master Plan
	Population Projections of each district in design years
2.4	<b>Water Supply</b>
	Actual Water supply from different sources ward wise, Population covered and rate of water supplied in different areas
	Proposals for augmentation of water supply system
	Rate of water supply in each district
2.5	<b>Sewage Generation</b>
	Interception Factor
	Sewage Generation in each district in design years as per norms of rate of water supply
	Sewage Generation in each district in design years as per projected actual flows in drains
	Sewage Generation in each district in design years as adopted
2.6	<b>Status of existing waste water disposal works</b>
	Existing works
	Works under execution
	Works sanctioned but not yet started
	Details of proposed renovation, up gradation, augmentation etc of the existing sewerage works
3	<b>Design Details of proposed works</b>
3.1	<b>Design Criteria</b>
	Design periods of various components
	Norms for rate of water supply
32	<b>Sewer network</b>
	Hydraulic Design of Sewer Network, District wise
	Design of sewer Bedding

<b>Chapters</b>	<b>Description</b>
3.3	<b>Sewage pumping stations</b>
	Hydraulic Designs of Sewage Pumping Stations
	Design of capacities of Pumping Plants of sewage pumping stations
	Design of capacities of Generators
	Design of Economical sizes of Rising Mains
3.4	<b>Sewage treatment plants</b>
	Capacities of STPs
	Characteristics of raw water
	Characteristics of treated effluent
	Disposal of treated effluent
	Life Cycle Cost analysis for different technologies of treatment of waste
	Calculations for land required for various components
	Hydraulic Design of Sewage Treatment Plant, component wise
	Electrical Load List of S.T.Ps
	<b>Sewer network</b>
	Hydraulic Design of Sewer Network, District wise
	Design of sewer Bedding
	Land required for various components
3.5	<b>Other provisions</b>
	House connections
	Land
	Staff Quarters
	Reinstatement of roads
	Design of sewer Bedding
	Permission from Forest, Railways, Telephone etc departments
4	<b>Environmental Impact assessment of works</b>
5	<b>Implementation programme</b>
6	<b>Institutional Arrangement</b>
	Capacity of ULB – financial, material, human resources related to implement, operate and maintain the WWMS
	Proposed strengthening plan
7	<b>Financial and ECONOMIC Analysis</b>
	Abstract of Cost estimates
	Cost sharing of the project
	Schedule of demand of funds
	Economics
	Estimate of Annual O&M Cost of Sewerage Works for 5 years
	O&M Recovery Plan for 15 years
	Break up of Cost of works(component wise) and its schedule of execution
	Schedule of funding
	<b>Estimate of Cost of Annual O&amp;M of Sewer Lines</b>
	Estimate of Cost of Annual O&M of Sewage Pumping Stations
	Estimate of Cost of Staff Required for O&M of MPS/IPS
	Estimate of Cost of O&M of MPS/IPS

Chapters	Description
	Estimate of Cost of Annual Electric Consumption for Running Sewage Pumps MPS/IPS
	Estimate of Cost of Annual O&M of D.G. Sets – MPS /IPS
	Estimate of Cost of Annual O&M of STPs
	Requirement of Staff for O&M of MPS / IPS
	Requirement of Staff for O&M of STPs
<b>8</b>	<b>ANNEXURES</b>
	Data collected as mentioned in chapter 2
	Executive Summary of City Development Plan
	Executive Summary of City Sanitation Plan, as approved
	Executive Summary of FR, as approved
	Approval of City Sanitation Plan by the State Government
	Approval of City Sanitation Plan by NRCD
	Approval of Feasibility Report by the State Government
	Approval of Feasibility Report by NRCD
	Test Reports of River Water Quality, including those by CPCB, SPCB and other agencies
	Test Reports of Discharge of drains
	Rates of Land Acquisition in and around the town (copy of rates be attached in support)
	Approved Labour Rates applicable in the project area
	Approved Material Rates applicable in the project area
	Schedule of Rates for the District / Town for various items
	Sub Soil characteristics and Water Data
	Rates of PWD for reinstatement of roads
	Budgetary Offers of various components
<b>9</b>	<b>ESTIMATES</b>
	Unit Estimate of Manhole, size wise
	Unit Estimate of Boundary Wall
	Unit Estimate of Steel Gate
	Unit Estimate of House Connection from property Line upto Sewer Line
	Unit Estimate of Gully Pits
	Abstract of Cost of Sewerage Works (Including Sewers, Rising Mains, IPS, MPS & STPs)
	Estimate of Cost of Sewer Lines, sewerage district wise
	Estimate of Cost of Civil Works of MPS, pumping station wise
	Estimate of Cost of Civil Works of IPS, pumping station wise
	Estimate of Cost of Rising Mains of MPS / IPS /STP, pumping station / STP wise
	Estimate of Cost of Civil Works of Sewage Treatment Plant, STP wise
	Estimate of Cost of Civil Works of various components of Sewage Treatment Plant, STP wise
	Estimate of Cost of Laboratory cum Office Building
	Estimate of Cost of Staff Quarters Required for STPs//MPS/ IPS
	Estimate of Cost of Land Acquisition for Sewerage Works
	Estimate of Cost of Boundary Wall
	Estimate of Cost of Permission from Forest Department
	Estimate of Cost of Shifting of Electric Cables, Lines etc./ Telephone Poles, Cables etc.
	Estimate of Cost of Special T&P
	Estimate of Cost of EM Works, component wise

Chapters	Description
10	<b>DRAWINGS</b>
	Map of the Country and State showing the location of the town
	City map and surrounding area (based on Survey of India map)
	Satellite imagery showing plan of the city including roads, water bodies etc
	Map of the city showing River Basin and details as mentioned in chapter 3
	District Map showing Polluted cities
	Map of the city showing drains, their outfall points, land use
	Contour plan of the city in appropriate scale and contour interval
	Map of the city showing existing and proposed water supply works
	Map of the city showing existing sewerage works
	Plan of proposed Sewers showing GLs, ILs, Diameters etc.
	L-Sections of Sewers
	Manholes
	Sewage Pumping Stations (plan, sections)
	Sewer Bedding Details
	Site Plan of STP indicating land requirement for design year
	Outline drawings of recommended STP technology structure covering hydraulic flow and broad with dimensions, levels

Ministry of Environment & Forests  
**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 \_\_\_\_\_