

FORMULATION OF DPR AN OVERVIEW

RAJEEV SINGHAL

DIRECTOR

National Water Academy

Pune

1. BACKGROUND

One of the important activities assigned to Central Water Commission is techno-economic appraisal of irrigation, flood control and multipurpose projects (of Water Resources) proposed by the State Governments. This task is performed and coordinated by the Project Appraisal Organization (PAO) of Central Water Commission. After the project is found technically feasible and economically viable, the Advisory Committee of Ministry of Water Resources (MOWR) on Irrigation, Flood Control and Multipurpose Projects headed by the Secretary, Water Resources (WR) considers projects for acceptance and thereafter recommends the same to the Planning Commission for investment clearance.

Ministry Of Water Resources has published revised “Guidelines for Preparation of Detailed Project reports of Irrigation and Multipurpose projects” in 2010. The Guidelines is available on CWC website **cwc.nic.in**.

It has been observed in general that DPR submitted by the Project Authorities is not prepared as per the aforesaid guidelines. As such, it takes ample and unreasonable time in CWC for getting the DPR through from techno-economic angle.

In order to enable scrutinizing agencies like Central water Commission to examine the DPR from techno economic feasibility/viability point of view, it is necessary that the intended project should be investigated thoroughly as per the CWC/MoWR guidelines and the project report should be prepared systematically as per the existing guidelines incorporating all requisite data, studies, designs & estimates.

2. PROJECT PLANNING

While carrying out Project planning of a Water Resource Project, a very comprehensive and detailed exercise of study of data, field investigation, project engineering and compilation of findings in the shape of a Project Report has to be carried out. A systematic approach for project planning and consequent report preparation involves the following stages –

- Desktop Study.
- Pre-feasibility Report preparation.
- Detailed Project Report preparation.

With the study at each stage as given above, the level of confidence for the intended project goes up. Various aspects to be studied at the time of project planning are broadly listed as under:

- i. Need for project development,
- ii. Type of project,
- iii. Topography of the project area,
- iv. Reservoir Planning
- v. Hydrological Studies
- vi. Geological and Geotechnical assessment
- vii. Seismological Studies
- viii. Construction material availability
- ix. Benefit assessment
- x. Engineering of project components
- xi. Environmental Impact Assessment
- xii. Planning of project infrastructure
- xiii. Construction equipment planning
- xiv. Cost estimation and financial evaluation

In this lecture, discussion shall be limited to preparation of Detailed Project report. The details will be covered in the subsequent lectures.

3. PREPARATION OF DPR:

DPR is a mirror in which one can see the image of the project. The quality of the image of the project depends on the quality of the mirror. As per the existing guidelines, the DPR should have the following sections:

Section 1 Check list- To ensure that all the information that are required are covered in the DPR.

Section 2 Salient features- to highlight the prominent parameters of the Project.

Section 3 Main report (DPR) - This section has been further explained in detail in the subsequent Para.

Section 4 Drawing Volumes covering drawings / maps of the various components of the Project.

Section 5 Appendices and annexure- Additional information related to the project.

4. MAIN REPORT (DPR)

4.1 Introduction

The following important items and sub items if any, as relevant to the project shall be discussed briefly under this chapter.

- .- Aim(s) of the project and description of the works
- .- Location of project area including longitude and latitude and district(s) and tehsil/taluka(s) affected/ benefited

- Access by air/rail/road/ferry/ sea/ port / and other communication facilities available in the area
- General climatic conditions of the state and project area in particular
- General descriptions of topography, physiographic and geology of the area
- Population affected and benefitted by the project
- Natural resources –
Salient features of master plan for overall development of water resources of basin, the present level of utilisation of land & water resources and system efficiency are given.
- Land-use and socio-economic aspects (including tribal, backward and drought areas etc.)
- History (Earlier proposals)
- Choice of project: Alternative studies, carried out for various major components of the project and including water resources planning and final choice of project.
- Stages/phases of development of the project
- Fitment of the scheme in overall development of the river basin
- Intimation to the other development authorities regarding this Scheme.
- Public announcement and public hearings.
- Inter-linking of the scheme with neighboring schemes.
- Cost and Benefit of the scheme
- Public Cooperation and participation
- Provision for domestic and industrial power supply

4.2 Physical features

Details of Geographical disposition, Topography of the basin, Geology of the basin etc should be discussed in this chapter.

4.3 Interstate/International Aspect(s)

DPR should contain a separate chapter on interstate/international aspects discussing details of the following important items and additional items, if any, as relevant to the project.

- State/countries traversed by the river.
- Distribution of catchment in states/countries and yields, from the catchment of the state/country concerned.
- Effect of the following issues/aspects on the project
 - (a) Interstate/International agreement on sharing of waters, sharing the benefits and costs, acceptance of submergence in the upstream state(s)/ country(s) etc., if any.
 - (b) Interstate/International adjudication, if any.
 - (c) Interstate/International aspect of territory, property, etc. coming under submergence, project affected people, rehabilitation, compensation, etc. Prior concurrence of other country(ies)/other

State(s) where territory/property is affected by the project should be obtained and appended in the DPR.

(d) Existing and sanctioned projects.

(e) Any other aspect of the project involving Interstate/International problems.

- Existing riparian use
- Whether operation and regulation of the project conform to the stipulation made in the Tribunal award/agreement and also the mechanism for such operation.
- In case of addition/alterations for existing project involving submergence in other states and additional utilisation of water, concurrence of the concerned states is to be included.
- Details regarding consumptive use of water in case of Hydro electric or Thermal Power Projects

4.4. Surveys and investigations

The surveys and investigations carried out for the various alternatives considered to justify the final choice of the location and type of various components of the project shall be discussed.

- Topographical Surveys

Brief details of the surveys carried out for items listed below as relevant to this project shall be furnished. For such surveys, suggested methodology shall be as under:

- (a) Block level surveys shall be generally carried out on 50 m or less grid basis depending upon the site conditions.
- (b) Cross-section and D-section shall be taken by taking levels at 50m or fewer intervals depending on the bed/bank slopes.
- (c) The contour interval for slopes less than 10° to the horizontal shall be 0.10 or 0.30 or 0.50 or 1 m depending upon the purpose of surveys. For slopes $10^\circ - 30^\circ$ the contour interval shall be 2 m and more than $30^\circ - 3m$ or more depending upon the steepness of the slopes.

- Geology, geo-technical features and seismicity.

Detailed report on geological, geo-technical features and seismicity discussing Foundation Investigations, Construction Material Investigations, Hydrological and Meteorological Investigations etc shall be discussed under this chapter.

5. HYDROLOGY

The details of the up-to date data collected and various studies made in regard to Hydrology shall be furnished/discussed in a separate volume and appended to the project report.

The points regarding the hydrological studies shall be briefly discussed in the separate chapter.

6. GROUND WATER

- Ground water resource availability
 - a) Location (shallow or deep) and extent of potential Quantum available
 - b) Status of present utilisation
- Ground water development prospects
- Anticipated behaviour of ground water on downstream after creation of the reservoir based on the experience in the similar projects/areas.
- Quality of ground water (Salinity, pH, SAR, Boron, Fluorine etc.) and its suitability for irrigation.
- Identification of areas of rising/declining water tables and feasibility of conjunctive use of surface and ground water.

7. DESIGN FEATURE AND CRITERIA FOR DIFFERENT RIVER VALLEY STRUCTURES

A separate volume discussing the design of project components in details relevant to the project shall form an appendix of the project report.

8. RESERVOIR

The following points and additional points, if any, as relevant to the project shall be discussed in details under this chapter:

8.1 Fixation of Storage and Reservoir Levels:

- Dead storage Level (EI-m)
- Low Water Level (Minimum draw down) (EI-m).
- Full Reservoir Level (EI-m)
- Maximum Water Level (EI-m)
- Maximum Back Water Level at Full Reservoir Level and its effect. Points to which back water effect is felt.
- Any saddles present along the rim of the reservoir, how they are being tackled etc.
- Fetch
- Direction of wind-velocity of wind, wave height, free board, Top of dam

8.2 Sedimentation data and studies

8.3 Life of Reservoir in years with basis

- 8.4 Capacities (M cum)
- 8.5 Effect on sub soil water table in the adjoining areas particularly downstream of the dam
- 8.6 Reservoir rim stability
- 8.7 Area of submergence (ha) at:
- 8.8 Land Acquisition, property submerged and rehabilitation
- 8.9 Recreation facilities
- 8.10 Pisciculture
- 8.11 Need and recommendation for soil conservation measure in the catchment
- 8.12 Any other relevant information

9. IRRIGATION PLANNING

The following items shall be discussed under the Chapter Irrigation Planning of the Detailed Project Report.

- Existing/proposed Irrigation facilities in the proposed project command area
- Existing cropping pattern
- Agro-climatic Conditions
- Proposed cropping pattern
- Crop water requirements
- Water Planning
- Command Area Drainage
- Water Course/field channels
- Water Management
- Agricultural support services

A separate Chapter on Irrigation Planning is to be given in the report.

10. COMMAND AREA

The Chapter on Command Area Development shall be prepared in accordance with the guidelines prescribed in Part IV (Command Area Development) of the guidelines. This Chapter shall discuss briefly the following items covered in the detailed volume.

- Command Area Details
 - (a) Location
 - (b) Classification of land (Forest, grass land, cultivated land. cultivated fallow, culturable waste barren
 - (c) Gross command area, Culturable command area
 - (d) Size of land holding

- (e) Date of last revenue survey and land consolidation conducted in the proposed command area to be given village/holding wise (only abstracts).
- Climate of Command Area
 - (a) Average Annual Rainfall (weighted) (mm)
 - (b) Seasonal distribution (Monsoon & non-monsoon) (mm)
 - (c) Co-efficient of variation
 - (d) Temperature (maximum, minimum and average) (°C)
 - (e) Humidity (maximum minimum & average)
 - (f) Evapo-transpiration (ETO)-annual
- Irrigation
 - (a) Present sources of Irrigation in the command
 - (b) Method(s) of irrigation followed
 - (c) Status of land development for Irrigated Areas
 - (i) Condition of channels (lined/unlined)
 - (ii) Longitudinal slopes in the field
 - (iii) Status of field channels/drains
 - (d) Assumed field application efficiency with justification
 - (e) Record of water logging, salinity and flooding
- Socio-economic aspect
 - (a) Population major occupation(s) income etc.
 - (b) Classification of farmers (marginal, small, medium, big)
 - (c) Land tenure
 - (d) Income-average
- Infrastructure facilities
 - (a) Railways and roads (villages, district etc.)
 - (b) Marketing facilities
 - (c) Agro-industries
 - (d) Banks; credit societies etc.
- Topography and Soils
- Drainage Density of natural drainage (km. per sq. km. of the command area)
- Agriculture

11. FLOOD CONTROL

The following points and additional points, if any, pertaining to flood control and drainage aspects of the multipurpose project shall be discussed under this Chapter.

- Description of the flood problem in the tributary/sub-basin in which the reservoir proposed as well as in the main river basin with particular reference to the command area of the project.
- Details of the inter-state international aspects of the flood/drainage problems, if any.
- Flood Data

(a) Historical floods

- (i) Source of information
- (ii) Years of occurrence
- (iii) Estimated peak discharge
- (iv) Peak Gauge
- (v) Area affected (Map to be enclosed)
- (vi) Flood damages

(b) Observed floods (year-wise):

The following data shall be furnished for the period since observations were started:

- (i) Year
- (ii) Flood hydrograph
- (iii) Observed/estimated peak discharge
- (iv) Maximum gauge
- (v) Area affected with average depth of flooding

- Flood damage (year-wise)

The following information shall be supplied for a minimum period of preceding 10 years:

- (a) Village, Taluka or Tehsils/Towns/Districts etc affected
- (b) Population affected
- (c) Area affected (in the proposed project)
 - (i) Gross area
 - (ii) Culturable area
 - (iii) Cultivated area
 - (iv) Damage/loss
- (d) Physical and monetary year-wise (in particular river basin/sub-basin)
 - (i) Property
 - (ii) Crops
 - (iii) Human Life
 - (iv) Cattle
 - (v) Public utility services
 - (vi) Any other

(e) Flood relief expenditure (year wise)

- Existing storage and flood control works in the tributary/ main river basin
 - (a) Existing storage works
 - (i) Location

- (ii) Catchment area intercepted
 - (iii) Live storage
 - (iv) Specific flood storage, if any
 - (v) Flood moderation by the existing reservoir
 - (vi) Residual floods
 - (vii) Possible modification for improvement of flood situation
- (b) Flood control works -Details of existing works like embankments
 - (i) Location
 - (ii) Spacing of embankments in case of double embankments and distance from present river bank in case of single embankments.
 - (iii) Design HFL and frequency of floods for which embankments were designed
 - (iv) Top level of embankment
 - (v) Carrying capacity of river with embankments
 - (vi) Possible modification for improvement of flood situation
- Flood control by proposed reservoir
 - (a) Existing safe carrying capacity of the tributary/river in the flood prone areas
 - (b) Hydrological considerations for flood moderation by reservoir
 - (c) Impact of the proposed flood protection works including likely reduction in general damage, expenditure on relief, remission of revenues etc.
- Flood control measures for command area:
 - (a) Peak flood of 25, 50 and 100 year frequency at damage centres after taking into account moderation by reservoir(s) and synchronizable contribution of uncontrolled catchment.
 - (b) Safe carrying capacity of river in flood prone area
 - (c) Technical details of proposals for flood protection of command area are as under:
 - (i) Embankments
 - (ii) Channel improvement
 - (iii) River diversion
 - (iv) Programme of completion
 - (v) Degree of protection

12. DRAINAGE

- Basin Characteristics
 - (a) Geological history/geology
 - (b) Physiography
 - (c) Existing Drainage lines
 - (d) Farm drainage
 - (e) Rainfall, its distribution over space and time

- Investigation in Brief
 - (a) Water-table investigation and Artesian conditions
 - (b) Soil surveys-texture and permeability
- Cultivation practices
- Existing Drainage
- Drainage deficiencies
- Drainage requirements including alternative layout of drains, their capacities (surface and sub-surface).

13. POWER

13.1 The following points and additional points, if any, as relevant to the Power aspect of Multipurpose project shall be discussed under this chapter.

- Available generating capacity (MW) in the State/region from different sources with location, category-wise:
 - a) Hydro Power (for ROR, ROR with pondage, storage, pumped storage separately).
 - b) Thermal power
 - c) Diesel power
 - d) Gas Turbine
 - e) Atomic power
 - f) Tidal Power
 - g) Solar power
 - h) Geothermal power
 - i) Pumped storage plants
 - j) Any other
- Present status of utilisation of power:
 - a) Agriculture
 - b) Industry
 - c) Domestic
 - d) Commercial
 - e) Others
- Energy availability (kWh) and peaking capability (MW) month wise and category-wise.
- Shortages/surpluses and import/export of power from/to the neighbouring States/regions.
- Transmission system

13.2 Power requirements

13.3 Future plans of power development in the States/region.

13.4 Assessment of power benefits of the proposed project.

13.5 Power house & equipment

13.6 Power Plant Head and Flow

- Minimum net head at MDDL
- Maximum net head at FRL
- Rated net head
- Design net head
- Maximum discharge at MDDL
- Minimum discharge at FRL
- TWL
- Minimum
- Maximum
- Maximum under flood condition

13.7 Transmission Arrangement

- Transmission Voltage
- Number of Circuits
- Single Circuit/Double Circuit
- Terminal Sub-station Details

13.8 Installed capacity

13.9 Power Benefits

- Firm power
- Annual Energy Generation in 90% dependable year

13.10 Financial Package proposed for construction of the project.

13.11 Capital Cost (base year)

- Civil works cost
- Electromechanical equipment
- Transmission cost
- Interest during Construction
- Total project cost
- Capital cost per kilowatt hour

13.12 Implementation Schedule

- Pre-construction (years)
- Construction (years)

13.13 Allocated cost of head works.

13.14 Comparison of the total cost of the hydro-electric components of the project with any other viable category viz. thermal, atomic, tidal etc.

13.15 Construction power requirement and proposed supply arrangement.

13.16 Economic Evaluation

- Unit cost of generation at Bus Bar
- B.C. ratio
- Internal rate of return (IRR)

14. NAVIGATION

If required, navigation aspect should also been discussed.

15. CONSTRUCTION PROGRAMME AND MANPOWER AND PLANT PLANNING

Information on details of year-wise construction programme, plant planning and manpower planning should be discussed in this chapter.

16. ENVIRONMENT, ECOLOGY & FOREST ASPECTS OF THE PROJECT

As per Planning Commission letter (No: 16 (2)99-WR dated 30.11.2000), the State Government shall obtain all required statutory clearances from the Ministry of Environment and Forest and Ministry of tribal Affairs like environmental clearance, Forest clearance, approval for rehabilitation and resettlement plan and all other clearances, as may be required before the investment approval is accorded.

17. ESTIMATE

"Guidelines for preparation of estimate for river valley projects" formulated by Central Water Commission should be followed for making Cost Estimate. Details are covered under Cost Estimate Chapter.