

Terms of References for comprehensive Environmental Impact Assessment Study of proposed Par-Tapi-Narmada link project

1.0 Introduction

As per EIA Notification of 2006 and its subsequent amendments, It has been made mandatory to get environmental clearance for certain sectors, including river valley and hydro electric projects. The objective of this study is to prepare comprehensive Environmental Impact Assessment (EIA) to get assessment of all possible impacts and use that information in the decision making process about the proposals and also planning mitigation measures including environmental, required under mandatory clearances from Ministry of Environment and Forests and any other authorities.

2.0 Scope of Work

The base line should consist of three seasons field data i.e. Pre-monsoon, Monsoon and Winter season covering one year. The broad scope of the work is to carry out Environment Impact Assessment of proposed Par-Tapi-Narmada link project. EIA includes identification of positive and adverse impacts with their economic evaluation and prepare Environmental Management Plan (EMP) to mitigate the adverse effects, including the socio-economic aspects and R&R Plan for project affected people. EIA shall also include dam break analysis and prepare Disaster Management Plan. The scope also includes preparation of monitoring plan for implementation of EMP.

3.0 The Project

The Par-Tapi-Narmada link comprises the following components :

- Construction of Jheri dam across river Par in Peint taluka of Nasik district of Maharashtra.
- Construction of Mohankavchali dam across river Par near village Mohankavchali in Dharampur taluka of Valsad district in Gujarat State.
- Consturction of Paikhed dam, across river Nar, the main tributary of river par near village Paikhed in Dharampur taluka of Valsad district.
- Construction of Chasmandwa dam across river Tan a tributary of river Auranga in Dharampur taluka of Valsad District.
- Construction of Chikkar dam across river Ambica near village Chikkar in Ahwa taluka of Dang district in Gujarat State.
- Construction of Dabdar dam across river kapri, a tributary of river Ambica near village Dabdar in Ahwa taluka of Dang district in Gujarat State.

- Construction of Kelwan dam across river Purna near villages Kelwan and Kakarda in Ahwa taluka of Dang district in Gujarat State.
- Construction of Three diversion weirs one each in the downstream of Paikhed, Chasmandwa and Chikkar dams as the hilly terrain does not permit the link canal to take off from the dam sites.
- Out of six power houses, four power houses are located at the toe of Jheri, Paikhed, Chasmandwa and Chikkar dam. Remaining two power houses located at the falls of the feeder canals connecting Dabdar and Kelwan reservoirs to the main canal of Par-Tapi reach.
- A 400 km long canal (including two tunnels of 5.0 km & 0.5 km long)

The objective of the Par-Tapi-Narmada link is to divert the surplus water from west flowing rivers between Par & Tapi to water deficit areas in North Gujarat (Saurashtra & Kutch) by substitution. The project proposes to provide enroute irrigation to 0.52 lakh ha and takes over 1.17 lakh ha of Sardar Sarovar Project command and the water thus saved in Narmada main canal can be used to extend irrigation in Saurashtra and Kutch.

3.1 Study Area

The study area for the project can be considered as :

- 1 km either side of the link canal
- 10 km radius around the project area from the periphery of the project site

Submergence and catchment area for the dams/barrages/reservoirs, command areas and riverrine area in the down stream of the reservoirs, enroute of link canal and substitution command and areas of backwater influence in the upstream. However, only direct draining tributaries and nalas in the reservoir shall be considered as part of the project.

4.0 Available Information

Feasibility study of proposed Par-Tapi-Narmada link project under peninsular component has been incompleated and the web friendly version of the same is available on NWDA's website <http://www.nwda.gov.in>. The adequacy of the data and information contained in the feasibility study are to be assessed. Based on the adequacy check, any additional data collection requirements are to be identified and shall be collected as part of the preparation of EIA report.

5.0 Planning and Development of Data base

- Consequent upon the collection of environmental and socioeconomic data, desk studies shall be carried out so as to undertake preliminary planning and development of a comprehensive database. The data base shall be in such a format that can be used in web based GIS portal also.
- The database shall be generated with provisions of data inputs from multiple sources and shall be capable of generating outputs in the form of tables, graphs, reports & data files. The output files shall be used in conjunction with software, spreadsheets, word processors and statistical software.

6.0 Environmental Impact Assessment

The Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) report shall be prepared considering all the relevant notifications issued by Ministry of Environment and Forests (MoEF) or any other competent authority (viz. EIA notification, 2006 and subsequent notifications/amendments issued from time to time) and in accordance to all the relevant guidelines issued by MoE&F or any other competent authority. The studies shall be carried out for each reservoir including its appurtenant works as an independent unit and later on integrated with other reservoirs considering the impact on all the connected basins.

As outlined in the notification cited above, public hearing shall be carried out as per the requirements of the fulfilment of EIA notification as a part of consultation with civil society.

Details pertaining to the Environmental and Ecological Aspects are furnished below :

The sequence of steps to be followed for consideration and assessment of Environmental and ecological aspects shall be as follows :

- Assessment of alternate sites and justification for selecting the present site
- Study no project option & alternative options
- Legal status of the proposed project site with respect to various applicable Environmental Legislations
- Baseline Environmental Data
- Environmental Impact Assessment
- Environmental Management Plan

6.1 Legal Status of the Project Site

The legal aspects of the project with respect to various environmental legislation/guidelines shall be discussed. This will include the status of the project with reference to various environmental acts like Forest Act, 1980, National Forest Policy, 1998, Environment (Protection) Act, 1986, Wildlife Protection Act etc. Subsequent revisions and amendments, if any in all these acts should also be considered.

The legal aspects of diversions of designated land use categories to other like National Park or loss of endangered species should be covered. Consideration should also be given to the requirement of prior approval of the Central Government under the Forest (Conservation) Act, 1980 and the Supreme Court in the designated areas.

6.2 Baseline Environmental Data

Baseline Environmental Status of the project shall be established based on the baseline survey carried out for various relevant seasons (either fresh or based on available literature/authenticated documents supplemented by field monitoring) in accordance to the MoE&F requirements for all the following elements. The field monitoring span for EIA should be over a period of one year to cover the entire annual cycle accommodating seasonal variations on various parameters.

- Air Environment
- Water Environment
- Land Environment
- Biological Environment (Aquatic and Terrestrial Ecology)
- Socioeconomic Environment including public health, Demography etc.

I. Air Environment

- Description of climatological conditions of the site with respect to wind speed & direction, temperature, atmospheric pressure, humidity, solar radiation and rainfall based on secondary data collected from nearest IMD station(s) as well as meteorological observations taken during field studies. Monthly and Annual averages of Pressure, Relative humidity, Solar radiation, Temperature and Rainfall should be presented Seasonal and Annual wind rose should be prepared (3 seasons). In addition, weather phenomena like hail, thunder storms, fog/smog and cloud cover should be noted in terms of their intensity and duration.

- Ambient Air Quality near dams, power houses, canals, weirs/barrages & townships
- SO₂
- NO_x
- SPM
- RPM
- Methane
- CO₂
- Noise

II. Water Environment

This will cover all the aspects of surface as well as ground water. This shall include but not limited to:

- Hydro-geological aspect (siltation)
- Hydrological cycle
- Surface Water Quality and flow including nutrient levels
- Ground water regime (ground water table, aquifers)
- Ground water quality

III. Land Environment

- Land use and land cover (e.g. Forest, agriculture, wasteland etc.) using satellite imagery
- Mineral resources
- Water use
- Water logging

IV. Biological Environment

- Forest cover
- Rare and endangered species
- Species which require management
- Species of economic significance
- Species of special interest to local population or tourists
- Aquatic fauna of commercial/recreational value and migratory fish species along with their spawning ground
- Habitat including breeding ground and access corridor for food and shelter
- Biodiversity

V. Socioeconomic Environment

- Archaeological Locations and places of worship
- Sources of water pollution (present as well as future)
- Dependence on water system
- Tourism

- Public Health
- Human settlements (occupational pattern, demographic profile, economic profile, agricultural practices etc.)

6.3 Environmental Impact Assessment (EIA)

Environmental Impact Assessment (EIA) shall be carried out for construction and operation phases using qualitative or quantitative methods (wherever possible) and using predictive modelling techniques. *EIA should have proper reference for all the facts and figures. In case of Primary data, precise information regarding time, data, place etc. of the observations should be given.*

The EIA study shall cover all the relevant environmental issues that have impact due to the proposed project including the following:

- Air Environment
- Water Environment
- Land Environment
- Biological Environment (Aquatic and Terrestrial)
- Socioeconomic Environment

I. Air Environment

- Impact on air quality due to construction
- Changes in microclimate
- SO₂
- NO_x
- SPM
- RPM
- Methane
- CO₂
- Impact on ambient Noise level specially during construction period

II. Water Environment

- Likely change in the regime of the river including down-stream of dam
- Impact due to change in hydrological cycle
- Present and future ground water and surface water use in the upstream and the impact on the water availability of the project.
- Impact on siltation preferably using quantitative techniques and its removal
- Impact due to spread of contamination due to agro-chemicals and organic/heavy metals
- Impact due to transportation of fluorides, Nitrates, toxic chemicals, heavy metals

- Impact due to acidification of lakes and water bodies due to presence of soils with rich minerals
- Impact on water quality (surface/ground) including down-stream riverine area
- Impact on ground water levels and recharge potential
- Impact on ground water pollution due to seepage from canal system and reservoir (ground water level and quality)
- Impact due to change in waste assimilation capacity of the river system including down-stream of dam
- Impact on water quality due to influx of labour
- Impact on drainage system upstream near reservoir submergence area*
- Impact on drainage system downstream due to canal system*
- Impact on existing water bodies downstream as well as upstream in the project area*
- Back water effect for one in 100 year flood including tributaries & MWL.
- Impact due to sudden releases downstream from the dam into the river and in link canal.
- Impact on the performance of existing projects.
- Impact of water releases from the project downstream the river (pre, during and post monsoon) and in the recipient basin.

*** (Assessment by using GIS tools and satellite imageries. The imageries will be supplied by NWDA).**

III. Land Environment

- Impact on land use/land cover and change in designated land-use in the project area i.e. submergence area due to construction of proposed dams, weirs, power houses, roads, colonies, transmission lines etc., areas one Km either side of proposed link canal and areas under proposed command. The assessment can be done using the GIS tools and satellite imageries of the area **(to be supplied by NWDA)**. However, it will have to be confirmed by ground truthing.
- Impact due to irrigation induced salinity and water logging
- Impact due to inundation of mineral resources
- Impact on soil erosion
- Impact of mining for construction materials
- Impact due to dumping of much generated from foundation excavation, tunnels etc.

IV. Biological Environment

Terrestrial environment

- Impact on forest area and National park and sanctuaries and other sensitive ecosystem
- Impact on biota and biodiversity loss particularly with special reference to the rare and threatened species, endemic species of both animals and plants.
- Impact on habitat loss particularly with special reference to the rare and threatened species, endemic species of both animals and plants.
- Impact due to habitat change having effect like corridor loss and loss of migratory path for wildlife including birds.
- Impacts on the breeding grounds of species and on access of animals to food and shelter.
- Impact on animal distribution
- Impact of loss of species
- Impact due to loss of ecosystem services being offered by the area.

Aquatic environment

- Impact on flora and fauna in the connecting basins as well as along the link.
- Impact on aquatic ecology including fisheries and endangered species
- Impact on sensitive ecosystem
- Impact due to bio-accumulation and bio-magnification in aquatic life and biota
- Impact due to change in ecological functioning of river system
- Impact on growth of aquatic weed
- Impacts on fish spawning and migration including impact on their breeding ground.
- River both at head as well as mouth regions would be considered while addressing the issues on wildlife and breeding places.

V. Socioeconomic Environment

- Impact of loss of common property resources (river, forest, land etc.) on livelihood
- Impact on public health due to vector borne diseases
- Impact on sensitive locations like archaeological sites and places of worship etc.
- Impact on change in occupational pattern

- Impact on tourism
- Impact on human settlement
- Impact on flood moderation & drought mitigation
- Impact of influx of labour

VI. Geological and Other Aspects

- Geology, Physiography and Topography of the area
- Bedrock formation
- Geological stability or instability
- Fault zones
- Seismicity

6.4 Environmental Management Plan (EMP)

Based on environmental impact assessment, mitigation/enhancement measures need to be specified in the form of environmental management plan. The components of the EMP will inter-alia deal with the following as may be relevant to specific project site:

- Environmental safeguards (management) during construction activities
- Catchment Area Treatment
- Plan for restoration of quarry areas/borrow areas and areas for dumping excavated material.
- Management to arrest salinity/alkalinity in the wake of recharge of water in the interlinking channels
- Problems associated with transportation of silt across basins and utilization there of in environmentally/ecologically benign manner
- Compensatory Afforestation plan along with cost benefit analysis
- Plan for green belt (other than catchment area)
- Reservoir rim treatment plan
- Comments/observations/recommendations of Chief Wildlife Warden in case Wildlife habitat/migratory path exists within 10 kilometers of project site
- Conservation plan for affected flora/fauna including rehabilitation plan for rare/endangered species including action plan for alternate breeding ground and access corridor for food and shelter.
- Action plan for control of irrigation induced water logging, salinity etc. including strategies and policies with choice of species/crop for optimum use of water for agriculture to reduce adverse impacts of excessive irrigation including water logging
- Action plan for command area development in respect of irrigation potential
- Watershed management

- Ground water management including harnessing of ground water in conjunction with surface water
- Land use management with special emphasis on water logging problem
- Management of flora and fauna in the connecting basins as well as along the link including action plan for alternate breeding grounds
- Alien flora and aquatic weeds management
- Fishery Development Plan
- Wetland management
- Protection of sensitive and archeological monument sites
- Action plan for health delivery systems
- Post project environmental monitoring plan (including physical & financial details covering all aspects of EMP)
- Disaster Management plan including risk and dam break analysis
- Provision of free fuel to labour
- Soil fertility management plan
- Action Plan for release of assured flow downstream of the dam to meet ecological and other water needs in the affected river reach
- Suggest suitable structural measures to pass silt laden water from the reservoirs so as to ensure sediment flow downstream
- Compliance mechanism with due representation from affected people

7.0 Socio-Economic Aspects and Preparation of R&R

A detailed socio-economic study of project affected people will be carried out.

7.1 Socio-Economic Survey

In order to perform the socio-economic studies, on-site socio-economic survey shall be carried out covering socio-economic profile of the region. The region shall include the project-affected areas likely to come under submergence or land acquisition and wider project influence areas comprising the catchment area, areas downstream of dam and upto confluence of major tributary, the command area, the area enroute the link canal where there could be secondary displacement. The following aspects shall be covered in the socio-economic surveys.

- Demographic profile with social categories, number of households/ families, type of housing, health and educational profile, migration patterns, if any
- Land ownership and operational holding
- Existing cropping pattern of the project area and changes thereof due to commissioning of the project

- Agricultural practices including traditional knowledge on endemic species
- Improvement in crop production and productivity
- Possible improvement in surface and ground water availability and benefits accrued to irrigated agriculture, drinking water use, industries and thermal power plants
- Riparian rights of downstream users vis-a-vis proposed water release and drinking water availability
- Agricultural input pattern
- Economics of cultivation
- Non-agricultural Practices such as poultry, cattle raising etc.
- Employment profile
- Income profile with sources of income
- Expenditure profile
- Other economic activities prevailing in the region
- Availability of social infrastructure
- Availability of economic infrastructure
- Gender issue

7.2 Secondary Data

Before start of the on-site socio-economic survey, available secondary information from various government agencies shall be collected. Relevant information from concerned State Government and Census of India about infrastructure availability etc. at district/block/village level and from Survey of India on topography maps are other sources of useful information to be collected before launching of on-site survey. Based on this information, design of questionnaire and methodology of field surveys shall be finalised.

7.3 Sample Design

The survey shall cover both project affected (displaced) and project influenced (benefiting) areas. Sample shall be distributed between project affected and influenced households on the basis of number of reservoirs and length of main canal and distributaries.

7.4 Questionnaire

Different mode of data collection such as sample survey, Participatory Rural Appraisal (PRA)/Rapid Rural Appraisal (RRA) and focus group discussions shall be used in evaluating impact of ILR.

Questionnaire shall take into account all the relevant aspects mentioned above. Current Land prices and wages prevailing in the area is another important factor on which data should be collected in socio-economic survey. This shall help in assessment of cost of land acquisition for implementation of envisaged developments.

7.5 Resettlement & Rehabilitation (R&R) Aspects

While studying Resettlement & Rehabilitation (R&R) aspects techniques such as Rapid Rural Appraisal (RRA)/ Participatory Rural Appraisal (PRA) and focus group discussion should be used to find out present situation in the area. This shall also involve collection of photographic records of the area likely to be submerged.

Information on following aspects should also to be collected.

- (a) People's own perception on the settlement aspects and kind of facilities they expect in the area where they will be settled after displacement.
- (b) Preferences of affected population about the compensation package, whether it should be in cash or kind.
- (c) What is the location preference for settlement by affected population, whether they want to be settled closer to their existing place of residence or at a distance?
- (d) Participation of affected people in construction of canals/ reservoirs should also be explored.
- (e) Migration patterns into and out of the project area.

A detailed R&R package shall be prepared and the National Rehabilitation & Resettlement Policy 2007 (NRRP-2007) formulated by MoRD shall form basic minimum criteria for devising the R&R package. Due weightage should also be given to the R&R Policy/Act of Gujarat and Maharashtra State. However, in line with the section 1.7 of the NRRP-2007, the R&R package should not limit itself to the National R&R Policy-2007 and should look for a wider horizon with millennium development goals and Planning Commission targets. The R&R package shall ensure restoration of vocation for tribals (land for land, if agriculture) to the extent possible. Also, the various schemes of the Government for rural development and welfare should be combined to make R&R package attractive enough. The R&R Policy should clearly come out with the kind of infrastructure required to achieve these goals. While preparing the R&R package, the past practices and difficulties experienced in implementation of various provisions of R&R package should be kept in mind.

A layout of model village for resettlement of Project Affected People (PAP) shall be prepared.

7.6. Impact of Par-Tapi-Narmada Link Canal

Par-Tapi-Narmada Link canal will have both short and long-term impact on economy. The short-term impact of the link canal on economy in general and regional economy in particular will be in the form of increased employment opportunities and growth of service sectors in the area. Impact of link canal on regional economy will depend on how strong the forward and backward linkages of construction and agriculture sectors are with the rest of the economy. In medium-to long-term major impact of link canal on economy will be through increased/assured irrigation, which will lead to increased agricultural production. All these aspects will be studied in detail.

Impact of Par-Tapi-Narmada link on different types of households such as agriculture dependent households, agricultural labourers, salaried earners, petty businessmen etc. should be analysed. Efforts should also be made to present pre and post canal commission employment profile.

7.7 Environmental Monitoring Programme

Environmental Monitoring Programme to monitor the mitigatory measures implemented at the project site should be prepared. The plan should spell out the aspects required to be monitored, monitoring indicators/parameters with respect to each aspect and the agency responsible for the monitoring of that particular aspect throughout the project implementation.

7.8 Users Charges

Socio-economic survey shall also cover aspects of user charges/cost recovery. Assuming that the full usage cost would be recovered from industry, power generation, the only sector that needs attention for user charges is agriculture and household sector. Willingness to pay for assured/new irrigation by the beneficiary farmers should be tested through the survey, which will help authorities in finalisation of user charges for water. Another important dimension that should be probed as far as possible is whether the consumer group should be entrusted the responsibility of maintenance of the water resource and collection of user charges.

8. Public Hearing

On completion of EIA the consultant shall submit all relevant documents/reports/records to NWDA for Public hearing required under the Air and Water Pollution Act. The consultant shall fully assist NWDA in the public hearing, including furnishing the requisite replies/information to the questions/issues raised during the hearing. *The consultant shall submit sufficient number of copies of the report as may be required for the purpose of public hearing.* **The fee for conducting the public hearings in the project area shall be paid by NWDA to the concerned State Pollution Control Board.**

9. Cost Estimation

The cost of all the environmental management measures proposed as per the environmental management plans (including R&R Plan) and the cost for implementing Environmental Monitoring Programme shall be worked out. The environmental and socio-economic benefits of the project shall also be worked out, to the extent possible.

10.0 Statutory Clearances

The consultant shall identify all the statutory clearances required to be taken for undertaking the project and provide all necessary assistance to NWDA in obtaining the clearances such as Environmental clearance, Forest clearance, Wild life clearance, R&R clearance etc. from Government organisations, administrative ministries and statutory agencies.

11.0 No Objection Certificates (NOCs)

The consultant shall obtain the NOCs from concerned State Governments required under Air and Water Pollution Act.

12.0 Time Schedule

A time schedule of 16 months is envisaged for completion of the study as under:

- a. Submission of Inception report (15 copies) within two months delineating reconnaissance survey results, work elements proposed and methodology with time schedule.
- b. Submission of first and second interim reports (15 copies) within eight and twelve months delineating baseline environmental status, and findings from earlier studies.

- c. Submission of draft report (15 copies) within 14 months.
- d. Submission of draft final report in sufficient number as may be required for public hearing within 16 months.
- e. Submission of 30 copies of final report duly incorporating the concerns of stake holders raised during the public hearing.
- f. Submission of 30 copies of final report after complying to the comments of EAC of MoE&F and its approval.

13.0 Preparation of Work Plan and Time Schedule for Study

The Consultant, immediately on award of consultancy work, shall prepare a detailed micro level Time Schedule/PERT chart and submit for approval by the NWDA/Review Committee. Non-Compliance of the Time Schedule shall attract penalty in the form of Liquidated Damage @0.5% of the total cost of the consultancy work per fortnight of delay or part thereof. However, if the completion of work is delayed for the period more than 6 months, agreement/MoU shall be liable to be terminated and the NWDA may forfeit a sum equivalent to the value of Performance Bond and / or with-hold the payment of pending bills in whole or in part.

14.0 Reporting

14.1 Reporting Procedure

- A brief monthly progress report and detailed quarterly progress reports shall be submitted by the consultant to the NWDA for monitoring the progress of the assignment.
- After completion of preliminary planning and design, consultant shall finalize a detailed scheme for on-site survey requirements for the assigned study including development of a model questionnaire, EIA and EMP in consultation with NWDA.
- Prior to the submission of draft final report, 15 copies of draft reports shall be submitted for review and acceptance. Subsequently, after incorporation of review comments, the draft final report shall be submitted within the time schedule as stipulated in para 12.0 in sufficient numbers of copies as may be required for the purpose of public hearing. After addressing the concerns raised by stakeholder and project affected people during public hearing, the consultant shall submit 30 copies of the final report. The consultant shall also assist NWDA in presenting the report before Expert Appraisal Committee of Ministry of Environment & Forests and shall carry out the necessary modifications in the report in compliance to the

observations of EAC and supply 30 hard copies of the report as well as soft copy in CD and DVD.

14.2 EIA Report

The reporting of all the activities shall be in three components viz. data, text and drawings, if any. Simultaneous to the hard copy submissions, the EIA report shall also be submitted in soft copy i.e. CD. The text of the report shall be in MS WORD, data sheets shall be in MS EXCEL, and the drawings shall be in Auto CAD.

The EIA Report shall also include all the relevant documents, analysis and results with back up calculations, drawings, inter active models and schemes, estimates etc. as per the scope of work. The EIA report shall be prepares as per suggested templates listed at Annexure-IV.

Specified number of draft reports along with all the Annexures as well as draft final report and subsequent final report shall be submitted in both hard and soft copies as per the details indicated under item 8,12.0 & 14.0 above.

On completion of EIA report preparation, a web based GIS portal shall also be developed as per the requirement by NWDA for providing overall project information, highlighting the benefits. Therefore, the database, text, drawings, any other output of the study of environmental and socio-economic aspects must be in such a format which can be straight away integrated with web based GIS portal **(developing GIS portal shall not be the part of this study).**