

## PROCEEDINGS OF CONSULTATIVE MEETING

# PREPARATION OF DPR FOR REJUVINATION OF RIVER NARMADA THROUGH FORESTRY INTERVENTION

Venue: TRC Bhavan, Conference Hall, JH Road, Van Sankul, Sector-30, Gandhinagar, Gujarat.

**Date:** 11.07.2019

**Time:** 10-30 AM to 5 PM

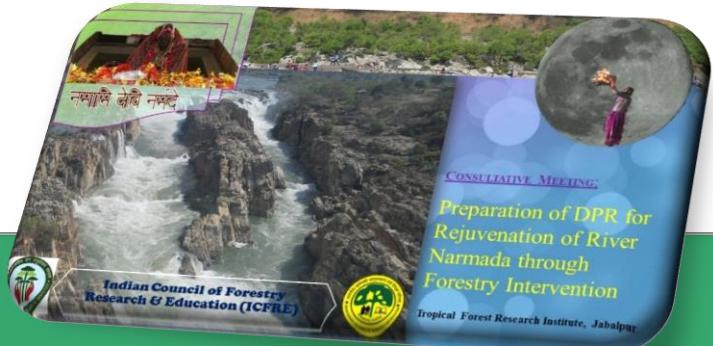
**Facilitator:** Indian Council of Forestry Research & Education (ICFRE, Dehradun)

**Organizer:** Tropical Forest Research Institute (TFRI), Jabalpur

**Participants:** 82 delegates

A one day stakeholders meeting was held on 11<sup>th</sup> July, 2019 in Gandhinagar, the state capital of Gujarat with an objective of bringing together all the stake holders under one platform and to evolve strategies and work out the plans to be carried out for preparation of Detailed Project Report (DPR) on Narmada River.

The programme started with "Lighting of Deepak" and welcome address by Dr. G. Rajeshwar Rao, Director, TFRI. While welcoming the guests, Dr. Rao announced that the Institute looks forward to develop region specific strategies and reports based upon feedback and consensus. He also urged the experts to provide scientific and technical suggestions in their respective fields. He emphasized that the exchange of experiences and information would be an extremely useful tool for accomplishing a comprehensive DPR. He ascertained that DPR for rejuvenation of Narmada would be submitted to ICFRE headquarter at Dehradun, by March 2020.



After a brief self-introduction by the delegates, a visual media report on preparation of DPR for Narmada River reported by IBC24 News Channel was screened to the august gathering.

Chairman of the meeting Dr. Dinesh Kumar Sharma, *IFS*, PCCF (HoFF), in his remarks informed that water conservation is taken on priority by the Gujarat Forest Department, not only in forest lands, but also outside forests and river banks. But the issues related with rejuvenation of river Narmada can't be tackled by Forest Department in isolation; it is a joint responsibility of all the stakeholders. He said 'this is a very welcome step' that a research institute like Tropical Forest Research Institute, Jabalpur, a part of ICFRE, Dehradun is rightly taking the effort to converge various government departments. He mentioned that, river Narmada is 'Life Line of the State of Gujarat'. It is a life line not only for humans, but also for varied flora and animals. He stressed that; people in Gujarat know better, the importance of water because there is drought like situation in every 2-3 years. Dr. Sharma laid emphasis on 'Sustainable Development'. He said that, recent developmental projects have this prominent consciousness that they have to consider ecological and economic issues. While lauding the initiatives taken up by TFRI, he urged that 'execution of DPR at an early date is important'. Dr. Sharma assured that Gujarat Forest Department (GFD) will provide all the necessary support needed while preparing this important document.

Sh. C. Behera, *IFS* and Nodal Officer elaborated the scope and objectives of the project by means of a detailed power point presentation on the role of forests in conserving river, he also dealt on some basic aspects of river hydrology and its riverscape. He explained the DPR activities, its methodology, legal framework of riverscape management, and role of various agencies and stakeholders. He addressed the participants about their role in preparation of the DPR, how the processing of data sharing and analysis will take place, how the data formats will be circulated to concerned forest divisions and the role of DFOs in it. He threw light on how forestry and soil and water conservation measures will be taken up in the pre-identified sites within the 8326.34 sq. km of river basin area falling within the state. He stressed upon the importance of improving the quality of existing forests along the river and employing site specific forestry models with plantation of native tree species and grasses. Mr. Behera stressed the importance of National Water Policy in the current scenario with reference to water resources and their management in India. He also emphasised the importance of the legal frameworks warranting the conservation and protection of rivers in India.

Sh. S. K. Chaturvedi, *IFS*, APPCF (Financial Management & Planning) apprised the house that the State of Gujarat was one of the pioneers in the country to carry out treatment of catchments. He said the department used to carry out plantation and soil moisture conservation activities since 1990. He informed that (a) degraded areas (0.4 density) used to be treated with soil and water conservation measures; (b) moderately vegetated area (0.4 – 0.6 density) used to be planted with 400 plants per ha. along with soil water conservation measures and (c) well vegetated area (>0.6 density) used to be planted with 2000 plant per ha along with soil water conservation measures. He added that, if we are to consider the catchment area of Gujarat, where forest area is maximum and about 75% is under sanctuary. A lot of land is already been given to the farmers for cultivation. Therefore, our focus in those areas upstream of Sardar Sarovar Dam should be on ‘forest land’ and downstream of the dam should be on ‘agriculture land’. He was of the opinion that the DPR should also recommend incentives to the local farmers to ensure our catchment is protected.

Sh. U. D. Singh, *IFS*, APCCF (Land Management) expressed concern that ‘Salinity’ is an issue for agriculture and drinking water in the villages downstream of the dam. Sea water intrusion has occurred up to Kabirvad, he said. He urged that the DPR should have holistic approach.

Sh. Ramkumar, *IFS*, APPCF (Monitoring and Evaluation), also endorsed the view that, we should go with a watershed approach. He opined that, biotic pressure and ecological pressure in the riparian areas should be addressed.

Dr. C. N. Pandey, *IFS* (Retd.), Visiting Professor, IIT Gandhinagar, while appreciating the necessity of preparing the DPR, mentioned the august gathering that there are diverse group of experts available with IIT, Gandhinagar who would be willing to collaborate on the DPR preparation. He also emphasised that the watershed should be the ecological unit for any interventions. Watershed approach will ensure participation of villagers. He stressed upon three important sites which would be important for reclamation and stabilization: (i) Mahi ravine area (ii) Dantiwada river valley project in North Gujarat and (iii) Shoolpaneshwar Wildlife Sanctuary. He also suggested that the river conservation work already been done by various agencies should be factored in the DPR. He also drew the focus towards cultural and religious values of river Narmada. A lot of temple can be developed as sacred groves, he said.

Dr. Udit Bhatia, Professor, IIT Gandhinagar, categorically mentioned that while identification of priority areas for intervention, we should not overlook climate change and climate variability. Decadal, inter-decadal and centennial scales are needed to be looked into so as to understand what these changes mean for watersheds. With respect to modelling of hydrological systems, he said ‘Earth System Models’ (ESM) are run at spatial resolutions which are too coarse for assessing effects at watershed level. Hence, local scale projections are to be obtained using statistical downscaling techniques which uses historical climate observations to learn a low-resolution to high-resolution mapping. He said, he is already involved in such downscaling projects, and he can contribute to the DPR if such downscaled climate predictions would be required.

Sh. M. P. Singh, CE, Regional Office-MTBO, Central Water Commission, expressed that, his office can provide hydrological observation data, especially discharge level, sediment transport and water quality which can ideally be used as yardsticks to monitor changes post implementation of DPR. He said that, Narmada related data is not classified and hence be procured from Executive Engineer Office at Bhopal and/or Gandhinagar by raising a data request. He brought to the notice of house that, National Water Commission has funded a project to IIT consortium for producing downscaled climate data (at less than 50km) under future scenarios to carry out river basin impact studies. It has been done to enable the studies such as impact assessments on river basin scales which can potentially be used in the DPR.

Dr. Jayanta Sarkar, Director, Regional Office, IMD informed that his office can share information relating to weather. While replying to a query on ‘future data behaviour’ raised by Dr. G. R. Rao, Director, TFRI , Dr. Sarkar explained that, there is one FLOOD MET forecasting unit at Gandhinagar which provides Quantitative precipitation Forecast (QPF) basin / sub-basin wise, catchments / sub catchments-wise for the major rivers in Gujarat to Central Water Commission during monsoon period. This can be of use to DPR, he said.

Dr. P. R. Bhatnagar from Regional Centre - Vasad, ICAR-IISWC, was also of the opinion that, watershed approach will benefit local people. He emphasised that farmers are important stakeholders and they are to be involved.

Dr. C. P. Singh, SAC-ISRO, Ahmadabad informed that his lab works on ecosystem modelling, and that he can help in identification of riverscape whether it has to be 2 or 3 or 5 km. He suggested that niche modelling can be done so as to identify the suitability of species in specific climate and habitat.

Dr. Manmohan Dobriyal, Assistant Professor from College of Forestry, Navsari Agriculture College, emphasised the need for incorporating agroforestry models on large scale. Some agriculture and integrated models such as (api-, silvi-, aqua-agroforestry) can be encouraged so that degradation is halted and livelihood is ensured. Dr. Dobriyal also mentioned that, fast growing species should not be always preferred for plantation, while our focus is long term and especially conservation oriented. He also stressed that biological barriers using mangroves can deal with salinity ingress.

Dr. Sumer Chopra, Director, Institute of Seismological Research, Gandhinagar informed that there is a network of permanent GPS stations located in periphery of Dams that are located in river Narmada where seismological observations are recorded. This information if required can be taken into consideration in the DPR. Dr. Chopra suggested to (a) prepare DEM map of entire river stretch with 1 m accuracy; (b) prepare drainage (morphological) map and (c) take into consideration of tectonic parts.

Dr. Praveen Gupta, SAC-ISRO, Ahmadabad mentioned that his institute has technologies to measure earth objects from space platform which can be of help for the DPR preparation. He said that, they have observations on reservoir, ground water changes and water quality along the upstream, middle and downstream of the river. Dr. Gupta appraised the house about a National level wetland inventory carried out by SAC, Ahmedabad using multi-date IRS-LISS-III Data of 2006-07 timeframe on 1:50,000 scale under the project "National Wetland Inventory and Assessment (NWIA)" funded by MoEF&CC whose state-wise and basin-wise findings can be extended to TFRI.

Dr. Dr. Nitasha Khatri, Senior Scientific Officer, GEMI informed that her institute has just initiated river simulation modelling. She emphasised that evaluation of water quality status of all the surface water resources using physicochemical and biological could be done during the preparation of DPR.

Following three working groups were formed in order to brainstorm in specific themes and suggest ways to go forward: 18 delegates participated



<b>Working Group</b>	<b>Delegate</b>	<b>Affiliation</b>
<b>1. Forestry models in forests, agriculture and urban landscapes; identification of priority areas for treatment</b>	<b>Dr. C. N. Pandey</b> <i>Group Leader</i>	Visiting Professor, IIT Gandhinagar
	Dr. A. P. Singh	APCEF WP
	Dr. H. C. Patel	College of Horticulture, Anand Agri. Univ. Anand
	Smt. Kalpana Pandral	Directorate of Horticulture, Gujarat
	Dr. Manmohan J. Dobriyal	Navsari Agri. Univ. Navsari
	Sh. R. B. Patel DCF,	Social Forestry Division, Bharuch
	Dr. Bipin Rathod	Directorate of Horticulture, Gandhinagar
	Sh. Chirag Amin	IFS, Gujarat
<b>2. Soil and water conservation measures for restoration of riparian areas</b>	<b>Dr. P. R. Bhatnagar</b> <i>Group Leader</i>	ICAR-IISWC, RC, Vasad
	Sh. J. G. Vaja	WALMI, Anand
	Er. N.G. Patel	Dakshin Gujarat Vij Company Ltd, Bharuch
	Er. A. G. Patel	Dakshin Gujarat Vij Company Ltd, Bharuch
<b>3. Survey and monitoring methods, information sharing and usage of GIS and other technologies</b>	<b>Dr. P. K. Gupta</b> <i>Group Leader</i>	SAC, ISRO Ahmedabad
	Dr. Udit Bhatia	Earth Sciences, IIT Gandhinagar
	Shri. Vipul Vaghela	Road and Building Department, Govt. of Gujarat
	Dr. Jalpa Darji	DEE and unit Head, GEMI Gandhinagar
	Dr. Nitasha Khatri	GEMI Gandhinagar

# Working Group 1: Recommendations on Forestry models in forests, agriculture and urban landscapes; identification of priority areas for treatment



## A. Forestry Models in Forests (Including Social Forestry)

- First the area to be treated must be defined. For doing so, watershed approach should be followed. The area should include the catchment area of Narmada river, the villages falling in all the micro - watersheds covering the catchment of the river, the river banks, the eco-sensitive zone etc. The total area so determined may be called the Narmada Landscape
- Within this landscape, the village should be taken as the smallest unit of management. This will facilitate peoples' participation.
- Various interventions should be planned, executed and monitored by involving local people through village level communities on the lines of Joint Forest Management.
- Promoting Responsible River Use by local people and component of sacred grooves would be created.
- Cultural sensitivity; the river is of very high religious significance. The approach would be culturally sensitive
- Plantations of herbs, shrubs, trees and climbers including grasses for creating effective multi canopy forests on forest lands and other public lands. Local species of high NTFP and medicinal values should be preferred.
- Suitable agro forestry models should be adapted for private lands. Horticulture may also be promoted.
- Mangrove restoration in the estuaries formed by Narmada river where it meets the Arabian sea.

## B. Agriculture Landscape

- Water saving agronomic practices, organic farming and vermiculture will be promoted.
- Climate resilient species would be researched upon and promoted.
- Chemical fertilizers and pesticides would be discouraged. Farm bunds on the downstream side will have thick vegetative fence so that the chemicals present in the run off may be arrested.
- Proper water conservation, rain water recharge structures etc would be promoted.
- An integrated approach involving agriculture, forestry, horticulture, floriculture, apiary, animal husbandry, dairy development, fishery, poultry etc. would be developed.

## C. Urban Landscape

- Peoples' involvement models including senior citizens, women and youth to be created at each municipal unit/ ward and available lands will be part of the tree planting programme.
- Common green spaces will include gardens and wild spaces that would act as urban bio diversity spots and would play the role of facilitating nature education, nature-based recreation etc.
- Rainwater recharge with rooftop structures will be promoted and all-natural wetlands would be conserved.

Regular monitoring of works will be done through GIS/ remote sensing as far as possible.

## Working Group 2: Recommendations on Soil and water conservation measures for restoration of riparian areas



- Soil & Water Conservation is very important to ensure better productivity of the land and water as well as protection of the natural resources (Land and Water) from degradation and unproductive or less productive utilisation. Hence emphasis should be given to adopt scientifically tested and recommended interventions and strategies in areas that are to be resorted and also nearby areas in watershed mode.
- The useful interventions may be bunding of different nature as per suitability, drainage line treatment using check dams and other structures as per need, suitable interventions with farming or plantation process such as conservation furrows, strip farming, micro catchments etc. The major issues discussed are as below:
- Participatory Irrigation Management Act 2007 of Gujarat should be implemented fully. It will educate the farmers and stakeholders to use water more usefully, increase the water productivity and save the water. Hence, the command area of same water resource may be enhanced to cover other potential areas. In this, water user associations (WUA) are entrusted to decide the water demand and delivery, that may be more useful as farmers know when water is required.
- Watershed based land and water management strategies need to be adopted to minimise the soil erosion and runoff so that further enhancement of ravines and degraded lands may be checked.
- Appropriate interventions for such endeavour are needed to be adopted based on actual need and evaluation of the site characteristics. Awareness creation with working together approach and input sharing with all type of stakeholders needs to be ensured for their active involvement in planning, development, and maintenance of all type of structures, or practices so envisaged.
- Encroachment in natural water ways and water areas must be evacuated and further prevented for smooth water conveyance and restoring ecologies issues.
- Domestic and Industrial waste should be avoided.

## **Working Group 3: Recommendations on Survey and monitoring methods, information sharing and usage of GIS and other technologies**



### **Observation and Future Projections:**

- Historical records and continuity of various hydro-meteorological, biological, water quality etc. measurements from various Government and private agencies and open source datasets such as CWC, CGWB, ISRO, NASA-CEDAC, IMD, TFRI, FSI etc. In addition, future climate projections from regional climate models, downscaled GCM projections from IITM, IIT's CMIP-5/6 etc.

### **Survey and Monitoring Methods:**

- River survey; Lidar mapping, bathymetry measurements, water quality pollutants and sources.
- Sample plots survey based on stratified random sampling along with riparian zone community details (socio-economic and ecology (tree species, density, girth, height etc.)
- Salinity and backwater intrusion survey in coastal area.
- Ground truth sample surveys for soil type and properties verification, site suitability for soil and water conservation structures, riparian wetlands etc.

### **Knowledge and Information Sharing:**

- Development of web-portal for information, analysis and GIS data sharing.

### **Advance Technologies:**

- GIS for spatio-temporal analysis
- Deep learning architectures for downscaling, clustering, bathymetry regression, plant species classification etc.
- River simulation models (coupled hydrologic-hydraulic) for basin runoff, river flow, water quality, future hydrological scenarios, hypothetical scenarios based on different percentages of afforestation.
- Satellite technologies (multi-spectral, hyperspectral, microwave, altimeter, scatterometer, gravity anomaly etc.) for water quality, inundation and wetlands mapping, plant species classification, river reservoir water level estimations, groundwater assessment etc.

### **Plenary Session**

- The group leaders of all the three groups were requested to brief their deliberations on the specific topic and narrate their recommendations. Accordingly, Dr. C.N. Pandey, Dr. P.R. Bhatnagar and Dr. P.K. Gupta, highlighted their thoughts and submitted a write up. The meeting concluded with a general appreciation and unanimous agreement by all the stake holders to be actively involved during the preparation of DPR proposed by TFRI. They assured all cooperations and help.

### **Vote of Thanks**

- Dr. S. Chakrabarti, Scientist G, on the behalf of 'Team TFRI', thanked the sincere and methodical approach of all delegates. He expressed his deep sense of gratitude to forest officials, professors, scientists, and experts who contributed in the workshop throughout the day. At last he applauded the 'Team TFRI' for their long and tireless involvement to make this event a great success.





Pictorial glimpses of  
the workshop