

Minutes of the 202nd meeting of the State Level Expert Appraisal Committee held on 31/07/2014 at Committee Room, Gujarat Pollution Control Board, Gandhinagar.

The 202nd meeting of the State Level Expert Appraisal Committee (S-AC) was held on 31st July, 2014 at Committee Room, Gujarat Pollution Control Board, Gandhinagar. Following members attended the meeting:

1. Dr. Nikhil Desai, Member, SEAC.
2. Shri R.I.Shah, Member, SEAC.
3. Shri V.C.Soni, Member, SEAC.
4. Shri R.J.Shah, Member, SEAC.
5. Shri Hardik Shah, Secretary, SEAC.

The agenda with reference to the applications received for TOR (Terms of Reference) finalization along with appraisal cases, EC amendment case and TOR reconsideration case was taken up. Three appraisal cases, two EC amendment cases, one TOR reconsideration case and eight scoping TOR cases i.e. total fourteen cases were taken up. The applicants made presentations on the activities to be carried out along with other details furnished in the Form-1 / Form-1A, EIA report and other reports.

Appraisal Cases:

[3] Bhadbhut Barrage Project proposed by Kalpasar Department of Government of Gujarat, Near Bhadbhut Village, Tal. Vagra, Dist. Bharuch.

The Kalpasar Department, Government of Gujarat has proposed to construct a barrage across Narmada river near Bhadbhut village. Barrage Project has not been included in the specified list. However the proposed barrage will provide irrigation to about 1136 ha of land. Accordingly, the project falls under category B of the project / activity no. 1(c) [i.e. the project having irrigation command area less than 10,000 ha] in the schedule of the EIA Notification, 2006.

Earlier, the project was considered for screening /scoping in the meeting of the SEAC held on 05.01.2012 and 48 TOR were prescribed for the EIA study. Subsequently, additional 6 TOR were prescribed in the meeting of the SEAC held on 06.02.2013. Public hearing for the project was organized by the GPCB on 19.07.2013 at Bhadbhut village. Final EIA of the project was submitted in February, 2014.

During the meeting, the project was appraised based on the information contained in the EIA Report and the details presented before the committee.

The Kalpsar Department, Government of Gujarat has proposed to construct a barrage across river Narmada near village Bhadbhut in Bharuch district with the following objectives:

- a) Protection of water quality of river Narmada from salinity due to tidal water influence and salinity ingress for achieving improvement of ground water quality in the upper reaches of the river Narmada
- b) Storage of regulated release of water from SSP including free-catchment, if available, for domestic, irrigation and industrial needs
- c) Protection of low lying areas affected by high flood of River Narmada on the left bank
- d) Reduction in traffic congestion between Surat (Hazira) & Bharuch (Dahej) with an alternative route and also reduction in travel distance by about 18 km by constructing a six lane road on the top of the barrage
- e) Assured water for existing defunct lift irrigation schemes

The basic data for design of proposed Bhadbhut Barrage are shown in table below:

Barrage	
River gorge width at Bhadbhut barrage location	1700 m
Bed material property	Siltv sand
Type of barrage	Barrage on permeable foundation
Design flood (1 in 100)	81717 cumecs
Discharge through barrage (SPF)	101,300 cumecs
Total Length of barrage	1663 m
Crest level of barrage bays	(-) 2.0 m
FRL of the storage	(+) 7.5 m
Clear span between piers	15.50 m
Nos. of gates	90
Top road bridge width	33 m
Road bridge top level	(+) 12.85 m
Size of gates	15.5 m x 9.5 m (vertical gates)
Fish Passage	5 m width
Ship Lock	15.5 m width
Approach embankment	
Type of embankment	Earth embankment
Length of embankment	6.90 km on right side + 7.31 km on left side
Top width	30.0 m
Side slopes U/S and D/S	2.5 (H): 1 (V)
Average height	6.50 m
Protection of side slopes	Gabion on both sides.
Left bank protective embankment	
Type of embankment	Earth embankment
Length of embankment (Barrage to Golden bridge)	24.05 km
Top width	30 m
Side slopes U/S and D/S	2.5 (H): 1 (V)
Average height	6.50 m
Protection of side slopes	Gabion on both sides.

Irrigation command area	Existing L.I. Schemes	
	1. Angareshwar	: 568 ha.
	2. Zonor scheme	: 568 ha.
	Total area	1136 ha.

The barrage will be constructed in downstream of village Bhadbhut to segregate Narmada river water in the upper reach from tidal water of estuary, while allowing the environmental flow to pass through the downstream estuary. The site for barrage construction is the river gorge of about 1700 m width, 5.15 Km downstream from village Bhadbhut (21 km downstream of Bharuch city and about 25 km upstream of the river mouth). Main objectives of constructing the barrage are checking the problems of salinity ingress and deterioration of ground water quality in upper reaches of Narmada, storage of fresh river water for irrigation, domestic and industrial water supply, to provide lift irrigation facility to about 1136 ha agricultural land along the river bank, flood protection of about 400 sq. km of low lying area of 17 villages on left bank of river Narmada, road connectivity through alternative shorter route from Surat-Hazira-Olpad-Hansot-Bhadbhut-Dahej by about 16 km. There will be provision of fish passage for unobstructed migration of fishery species and ship lock-type arrangement for allowing boat passage between upstream and downstream of the barrage. Construction of Bhadbhut barrage on Narmada river will create 500 MCM fresh water reservoir. Two defunct lift irrigation schemes will get rejuvenated due to the project. Further higher elevation areas, which are not getting benefits of canal irrigation, will be benefited by new lift irrigation schemes and more area will be brought under lift irrigation.

The barrage project due to its location in the estuarine zone of Narmada river attracts provisions of CRZ Notification, 2011 and accordingly Kalpasar department has applied for CRZ clearance for the proposed project. It was presented that the project was discussed in the meeting of GCZMA held on 25/03/2013.

EIA Report has been prepared by NEERI, Nagpur. The baseline environmental quality data was collected within the project impact zone during summer, monsoon and winter of 2010-11. The methodology included reconnaissance, collection of primary and secondary data through field monitoring and other sources, micro-meteorological data (wind speed and wind direction) of the project region was also collected simultaneously through a weather monitoring station installed at the project site.

Salinity ingress in Narmada river takes place upto 70 km u/s and makes the river water saline and unusable for domestic, irrigation, and industrial purposes. As a result, water for Dahej and PCPIR region is supplied from Angreshwar (which is 70 km upstream), Narmada canal and Ukai canal. The saline water has also rendered two lift irrigation schemes namely Zonor and Angreshwar defunct. The Bhadbhut barrage, in addition to be a fresh water source for domestic, agriculture and industrial requirement, will revive the two lift irrigation schemes and also make water available for agricultural areas at higher elevation.

Data collected from the Assistant Director of Fisheries, Bharuch depict a declining trend of Hilsa fish production from a high of 16646 MT in the year 1990-91 to the low 693 MT in the year 2010-11. The production data of Prawn over the period 2004-05 to 2011-12 indicate a fluctuating trend (going up

and down) in Prawn production over these years. The measures proposed to avoid impact on fishery have been narrated below:

- (a) Fish hatcheries with modern technology tools would be set up at various locations in *u/s* and *d/s* of the barrage to enhance the fish production in the area.
- (b) There will be provision of fish pass, gates as well as navigation ship locks together with crane in the proposed barrage. The fish pass would facilitate Hilsa to ascend in the river and Prawn in *d/s* of barrage. Similarly, the barrage gates will be opened in the monsoon for movement of fish both ways.
- (c) Release of environmental flow: To maintain the ecological conditions in the river *d/s* of barrage, 600 cusecs of water (as decided by NCA) will be released from Sardar Sarovar Project (SSP) as environmental flow
- (d) Fishing rights would be ensured to local fishermen for their livelihood in consultation with Fisheries Department.
- (e) A ship lock in the design of barrage is planned for easy movement of boats from reservoir to estuary and vice versa. In addition to ship lock, provision of crane is also made in the design of barrage as an additional measure for lifting and shifting of the boats as being practiced presently at Veraval and Mangrol fishing ports.

Erosion and morphological changes with and without Barrage have been narrated below:

- (a) *Erosion of upstream left bank agricultural land areas:* Ankleshwar to Hansot left bank is at level 4 to 7 m only hence, during monsoon the flood water gets aggravated and encroaches upon 400 sq. km agricultural land on left bank affecting 17 villages partially / fully. There is continuous erosion of agricultural land. Land in some villages is entirely eroded which have been shifted to higher elevation.
- (b) *Erosion of downstream right bank village land areas:* Water channel of Narmada river from Dhanturia up to Kantiyajal on the left bank is silted up. Consequently, the entire Narmada flow is shifted towards the right bank *d/s* of village Bhadbhut. During the neap tide periods, the tidal flow and the river flow are unidirectional and therefore attains higher velocity causing erosion of right bank in *d/s* of village Bhadbhut.
- (c) *Silting in right bank from Bharuch to Bhadbhut:* Due to prevailing hydraulic conditions, silt deposition has taken place from Bharuch upto Bhadbhut village on right bank. The formation of Dhanturia island is also due to silt deposition, causing obstruction to the river flow.
- (d) *Morphological situations of the downstream estuary:* The flow of tidal water during ebb tide is opposite to river flow which carries large sediment load and attains erosivity. Since opposite flows cause reduction in velocity, the deposition and erosion take place depending on hydraulic conditions. Formation of Dhanturia island and erosion of left bank are testimony to these phenomena. The existing mud island Aliabet is at EL 4.0 m to 7.0 m, from the left bank of the estuary and is stabilized. Of these two Narmada estuary channels, the western Aliabet channel is completely silted up and is non-functional.
- (e) *Sedimentation:* The total sediment contribution to Bhadbhut Barrage from the intercepted and catchment works out to 24 Mm³. However this sediment yield is only indicative and depends on factors like sediment capture by upstream reservoirs, construction of flood protection

embankment, erosion of left bank area, actual sediment deposit in proportion to reservoir volume capacity (500 Mm^3) to total inflow volume (6068 Mm^3 @50% dependability as per NIH study). Sediment load during monsoon will be disposed off by opening the barrage gate. In addition, provision of silt excluders at the base of the barrage would facilitate continuous passage of sediment even when the barrage gates remain closed during the flood-free period.

A three dimensional physical model of Barrage and river covering 700 sq. km area from Shuklatirth upto Luwara point is constructed at Gujarat Engineering Research Institute, Vadodara. The physical model was run at a different flood velocities without Bhadbhut barrage and the outcome shows the shifting of the Narmada river towards left side. The physical model was also run with Barrage and the impact of flood on *uls* and *d/s* of barrage were monitored. Thereafter, the model has been run with barrage as well as left bank flood protection embankment between Hansot and golden bridge (24 km long) and observations have been taken at various flood frequencies. The physical model is useful for locating and designing the left bank flood protection embankment as well as constructing right bank protection in *d/s* of barrage as well as for deciding various issues like operation of gates, providing fish passage and shiplock etc.

Kalpasar Department has entrusted Mathematical Model Study for Kalpasar Project as well as Bhadbhut Barrage to NIOT, Chennai at a cost of 22 crores. NIOT has tied up with DHI, Netherlands and the mathematical model of entire gulf of Khambhat without Kalpasar Dam and Bhadbhut Barrage have been run recently to observe tide, current, erosion, sediment etc. phenomena occurring in gulf. Now the model will also be run with Bhadbhut Barrage to observe / monitor the impact on Aliabet / Kantiyajal as well as right bank.

As per study carried out by NIO, Goa, There will be 0.4 m rise in tidal water level on downstream of the barrage. With the construction of barrage, the volume of tidal prism *d/s* as well as current! velocity will get reduced, thereby reducing tide induced sediment generation, as indicated by the study carried out by NIO, Goa. To check the negative impacts due to rise in tidal water level, the estuary banks will be trimmed to widen horizontal space in order to increase spread of tidal water. In addition, a protective embankment for downstream estuary banks will be provided. Deepening and widening of estuary channels and also opening of Aliabet channel are proposed for facilitating estuary water exit.

As per GEC Mangroves Atlas-2010 of Bharuch district, the mangrove patches which are stunted and sparse are far away from the Bhadbhut barrage site (from 25 to 35 km, at village Devla, near Dahej and near Vamleshwar). No mangroves exist in the close proximity of the project site and therefore there would be no impact of the project on mangroves. Further, as per the Coral Atlas of Gujarat State - 2011, Corals are absent from Gulf of Khambhat. Only Gulf of Kachchh holds coral formations. Aliabet lies at the confluence of the river Narmada and the Arabian Sea in Gulf of Khambhat. It is about 7 km from Hansot town. Because of salinity, there are no agricultural activities on the land, a part of which is also prone to submergence during high tide. Bhadbhut barrage alignment is fixed in such a way that the Aliabet will remain downstream of barrage. In addition, barrage has the provision of guide bund as well as flood protection embankment to store the water in the barrage only with limited spread beyond Narmada river. Thus, Aliabet will not come under submergence due to the proposed barrage project. Barrage left bank approach involves 31.40 ha of forest land for which the

Kalpasar Department had made request to Forest Department to acquire this piece of land in lieu of equal government land in Bhavnagar District as compensatory land. The approval to the above proposal has been received from the Collector, Bhavnagar vide letter dtd. 23.06.2014 and sent to Forest department by the Kalpasar department on 10.07.2014 for acquiring the land. Barrage left bank flood protection embankment requires about 15 ha land which falls under forest land. The Kalpasar department has initiated action for acquiring this land from the forest department.

During the meeting, issues raised during the public hearing were discussed at length. The main issues raised during Public Hearing encompassed fisheries, river/estuary erosion, sedimentation and submergence, river water quality as well as impacts of barrage on mangroves and Aliabet island. The committee asked the project proponent to submit action plan to address each of the issues raised during the public consultation. While inquiring about impact on drainage of water shed area upstream of the Barrage, the project proponent informed that there will be provision of drain parallel to the embankment and it will be having discharge in downstream of the Barrage. The committee asked the project proponent to give details of drainage plan in writing. While asking about reasons of proposing fish pass instead of fish ladder, the project proponent informed that fish pass has lesser steep slope and it facilitated easy to & fro pass of fish than the fish ladder. He added that fish pass provided at Naraj weir on Mahanadi is proved successful. The committee concerned about breeding of Hilsa fish considering that Hilsa fish is saline water fish coming to fresh water of Narmada estuary for breeding in monsoon. At this, the project proponent informed that Hilsa migrates to estuary water for breeding only during high tides in monsoon when gates of the barrage will be kept open. The committee asked the project proponent to take into account the ecological factors including migration of Hilsa while deciding when to open / close gates of Barrage in monsoon and also to work out detailed SOPs in this regard. The committee also asked the project proponent to give scientific justification supporting that environment flow of 600 cusecs would be sufficient to sustain ecology of Narmada estuary. While envisaging chances of erosion in downstream banks of Narmada estuary, the project proponent informed that there will be provision of guide bund in downstream to avoid bank erosion and moreover gate openings will be based on the physical model study to avoid erosion in downstream. On inquiring about impact of 0.4 m rise in tidal water level in down-stream in terms of submergence of land area if any going under submergence, the project proponent informed that no area would go under submergence as they are going to do dredging in about 25 km stretch in downstream. The committee asked the project proponent to submit details on need for capital and maintenance dredging, disposal of dredge material and exact expected rise in tidal water level taking into account proposed dredging. The committee noted that Environmental Management Plan together with Environmental Monitoring Program have been formulated and incorporated in the EIA report in order to minimize the negative impacts and maximize the positive impacts. After deliberation on various aspects, it was decided to appraise the project further after satisfactory submission of following additional information / documents:

- 1) Time bound action plan for addressing each of the issues raised during the public consultation process.
- 2) Exact extent of forest area required to be diverted for various components of the project.

- 3) Status of Stage-I forestry clearance for diversion of 31.40 ha of forest land required for Barrage left bank approach and about 15 ha of forest land required for Barrage left bank flood protection embankment.
- 4) Exact status of application made for CRZ clearance along with supporting documents.
- 5) Details on outputs of physical model and mathematical model studies. Correlation between outputs and details on remedial measures proposed based on the outputs for preventing ecological impacts including bank erosion, drainage, submergence, impact on migration of Hilsa fish, etc.
- 6) Impact of construction of left bank protective embankment on drainage of water shed area. Detailed on the drainage plan considering the construction of left bank protective embankment.
- 7) Scientific base for deriving 600 cusec as environmental flow and proper justification supporting that environment flow of 600 cusecs would be sufficient to sustain ecology of Narmada estuary.
- 8) Detailed SOPs for opening or closing of barrage gates taking into account the ecological factors including migration of Hilsa in monsoon. Details of proposed fish pass and detailed plan for ensuring that migration of Hilsa fish would not be affected due to the proposed barrage project.
- 9) Exact rise in tidal water level at the barrage at the time of highest of high tide and its impact in terms of submergence of area downstream of the barrage. Whether any land area would go under submergence due to this rise in tidal water level?
- 10) Impact of the barrage in terms of erosion in downstream banks of Narmada estuary. Details on measures proposed to avoid chances of bank erosion in downstream including provision of guide bund, gate opening based on physical model study, etc.
- 11) Details on need of capital and maintenance dredging in estuary stretch in downstream of the barrage, expected quantity of dredge material, and where it will be disposed.

The project shall be appraised further after submission of above cited additional details.

Minutes approved by :

1. Dr. Nikhil Desai, Member, SEAC.
2. Shri R.I.Shah, Member, SEAC.
3. Shri V.C.Soni, Member, SEAC.
4. Shri R.J.Shah, Member, SEAC.
5. Shri Hardik Shah, Secretary, SEAC.