

Proceedings of the national workshop on 'RESERVOIR PLANNING AND OPERATION', (19th December, 2007) organized by Civil Engineering Department, Assam Engineering College, Guwahati-781013 Under the DST sponsored project 'Planning for Optimal Utilization of Water in Three Proposed Reservoirs in North-East India'.

Editor: Dr. Bibhash Sarma

---

International Journal of Innovative Technology & Adaptive Management (IJITAM)  
ISSN: 2347-3622, Volume-1, Issue-3, December 2013

---

## **DAM OR RESERVOIR PROJECTS IN NORTH EAST INDIA: SOME REGION SPECIFIC ENVIRONMENTAL ISSUES**

**B. C. PATWARY**

Scientist 'F' & Head  
Centre for Flood Management Studies  
National Institute of Hydrology  
Dispur, Guwahati

### **ABSTRACT**

Dam or reservoir projects in N-E region so far exist mainly for hydro power generation. Other multi purpose projects are in planning, investigation or initial stage of execution. Considering the existing or on-going HEP projects, one review states that hydropower potential of North Eastern Region of India is around 32000 MW at 60% load factor. This is 38% of the total of 84,044 MW hydro power potential of India. The present generation capacity of the region is around 2% of identified potential. These facts underline the importance of speedier exploitation of hydro power potential of the region for industrialization and economic growth of not only NE region but for the entire eastern part of the country. North Eastern Region is potentially a very big block of cheap hydro power in the world but with negligible development. Some other multi purpose mega projects, essentially for flood control, irrigation etc. are coming up and these involve number of critical issues peculiar for the region.

The region specific environmental and other issues often delay clearance of such projects or entirely prohibit them. In fact, environmental degradation does not always occur due to such project developmental activities. Due to lack of awareness and under the influence of

Proceedings of the national workshop on 'RESERVOIR PLANNING AND OPERATION', (19th December, 2007) organized by Civil Engineering Department, Assam Engineering College, Guwahati-781013 Under the DST sponsored project 'Planning for Optimal Utilization of Water in Three Proposed Reservoirs in North-East India'.

Editor: Dr. Bibhash Sarma

---

**International Journal of Innovative Technology & Adaptive Management (IJITAM)**  
ISSN: 2347-3622, Volume-1, Issue-3, December 2013

---

tradition, the people of NE region are themselves also causing tremendous harms to the elements of its environment like forest cover, wild life habitat, water source etc. Reservoir projects in the region, if developed for its various benefits, will certainly improve the quality of life and encourage people to orient to new life style abandoning the age old practices while struggling for survival. The paper critically examines some region specific issues for development of the projects.

## **INTRODUCTION**

In N-E Region, dam and reservoir projects have been recommended by various apex bodies and agencies for flood control and water augmentation purposes. The recurrent floods in the Brahmaputra and Barak basins play great havoc and cause untold misery in the affected areas because of loss of life, disruption of communications, dislocations of activities, damage of property, crop and health hazards they create. With about 32 lakh ha of flood prone area in the Brahmaputra and Barak basins, NE Region constitutes about 10% of the total flood prone area in India and flood damage of Assam in some of the years goes as high as 42 % of total damage in India in that year. The region is destined to go for only mega projects for effective management of its gigantic water resources problems and exploitation of the resource. Over the years it is seen clearance of the mega projects takes enormous time and in the process so much of complications arise that after incurring substantial amount of expenditures on feasibility investigation and submission of detailed project report (DPR), project authority has to sit idle for long long years awaiting clearance or in preparing quarry replies.

For clearance of multi purpose project as per prevailing practice, DPR is prepared and sent to Central Electricity Authority (CEA) or Central water Commission (CWC) for techno-economy clearance. The details of forest land required and other infrastructures necessary for execution of the project have to be sent to forest department of the state. With the recommendation of state energy and forest department, the DPR is sent to Government of India for approval. Essentially the proposal for environmental clearance is also to be sent to Ministry of Environment and Forest (MOEF), Government of India through State Government after taking up necessary environmental studies. Once the project is cleared by CEA/CWC and MOEF after revision taking into account of its comments, the Planning Commission finally approves it for inclusion of the project in the appropriate plan allocation. By the time there would be cost over-runs for the revision process to start. Still conflicting opinion keep on hunting the future prospect of the project due to inter-state dispute amongst the beneficiary states particularly in N-E region.

There are several factors that restrict clearance of projects. It has been widely expressed that besides resource crunch, the question marks put by the Ministry of Environment & Forest(MOEF) and other agencies in the name of sustainable and eco-friendly activity leads

Proceedings of the national workshop on 'RESERVOIR PLANNING AND OPERATION', (19th December, 2007) organized by Civil Engineering Department, Assam Engineering College, Guwahati-781013 Under the DST sponsored project 'Planning for Optimal Utilization of Water in Three Proposed Reservoirs in North-East India'.

Editor: Dr. Bibhash Sarma

---

International Journal of Innovative Technology & Adaptive Management (IJITAM)  
ISSN: 2347-3622, Volume-1, Issue-3, December 2013

---

to either delay or rejection of the projects. There is need to review the norms laid by the government agencies for project clearance in terms of environmental, forest and rehabilitation in view of unique nature of land use pattern and life style of the inhabitants of N-E region.

On the occasion of 14<sup>th</sup> Water Resources Day on June 03, 1999, Hon'ble Chief Minister, Assam said *"I repose full confidence in the capability of technical power of the state as well as the region. The Barapani Hydro Project, a marvel of science & technology, conceived at an elevation of 3500 ft. in the fifties and implemented by Assam Engineers in the early sixties in India bears testimony to this fact. ...I do understand that the key to our development and prosperity solely depends on the proper utilization of the bounty of 'Water Resources' of this region..."*.

## ENVIRONMENTAL ISSUES

Environmental aspects are inherent to the planning of a sustainable water resources development project and cannot be over looked at any point of time. Of late fear psychosis has been created about adverse environmental impacts of such projects, but it is instantly out weighed if tremendous benefits, these projects can provide to large section of the society, are duly considered. While undertaking a dam and reservoir project, there are some environmental degradation processes. These are broadly submergence of land area in the reservoir, displacement of population & its rehabilitation, deforestation, effects on wild life & vegetates, micro-climatic changes, soil erosion & reservoir sedimentation, reservoir induced seismicity etc.

These issues have been exhaustively debated upon by the prominent engineers of the country at the National Round Table Discussion convened by The Institution of Engineers (India) at Delhi during June 4-5, 1993 and expert opinions have been properly documented in its proceedings. One of the papers says that past experiences show that on completion of certain projects, rare species of birds flock in the reservoir and surrounding areas and wild life have also increased. This phenomenon of increase in birds and wildlife has been observed in many places which were previously barren lands. The river valley projects, as such, do not cause any erosion. In fact such projects itself act as a major check dams where excessive silt gets trapped and siltation downstream gets reduced. If water resources projects are not built, silt gets transported unchecked and gets deposited towards the sea, thereby, gradually flattening the slope of river in their lower reaches with consequent tendencies to diminish their flood discharging capacity.

The micro climatic changes due to reservoir are not very significant. Moderating changes take place in temperature and humidity which are mostly beneficial. The impact of the additional evaporation due to creation of reservoir on the water cycle of the atmosphere however, will be too small to effect any appreciable change in the precipitation in the area.

Recreational facilities like boating, rowing and other facilities for water sports may be created

Proceedings of the national workshop on 'RESERVOIR PLANNING AND OPERATION', (19th December, 2007) organized by Civil Engineering Department, Assam Engineering College, Guwahati-781013 Under the DST sponsored project 'Planning for Optimal Utilization of Water in Three Proposed Reservoirs in North-East India'.

Editor: Dr. Bibhash Sarma

---

International Journal of Innovative Technology & Adaptive Management (IJITAM)  
ISSN: 2347-3622, Volume-1, Issue-3, December 2013

---

in the river valley projects. These lead to improvements in social, cultural and economic status. Water resources projects provide dependable sources of drinking water. People from the nearby area may, therefore, enjoy better health and sanitation facilities, thus reducing the incidence of disease. In another paper, it has been put that in case of 260m high Tehri dam, the safety of the structure has been made an environmental issue, though it is basically a technical design problem. The highest level expert in India and abroad has assured its safety, yet the clamor continues from persons who have no understanding of the problem. Regarding other environmental impacts enough provisions are kept in the DPR after detailed studies.

These aspects must be seen in context of NE region. Since long past numerous tribes here traditionally resort to Jhum cultivation, which is slash and burn system. More than 60% of forest cover of the region have been depleted only because of jhum cultivation. An another study reveals that the extinction of some of the widely available animals, birds and reptiles are because of food habit of the people in N-E region. Loss of forestland needed and extinction of species for the development of reservoir projects, in this background, has therefore become of very little significance in this region. Very much relevant to N-E India as Sir Edmand Hillary said "*Environment problems begin with people as the cause and end with people as the victim*".

## FOREST CLEARANCE

The forest clearance proposal of dam projects is governed by the Forest Conservation Act, 1980 and subsequent amendment to it. This requires raising compensatory afforestation in an area equivalent to the forest land in non-forest land and in case non-forest land is not available compensatory afforestation should be taken up in twice the area being directed to the project. This has been objected by most of the hill states due to non-availability of land. **In the Hydro Centenary Celebration, 1997 on Hydropower Development : Issues, Challenges and Opportunities conducted by C.B.I.P. at Guwahati many states including Arunachal Pradesh expressed that for want of suitable land compensatory afforestation norm should be reviewed in the context of N-E Region.**

In almost all hilly states of the NE region, the ownership of the land does not rest with the cultivators. The land is either owned by village chiefs or district councils. They may offer permanent settlement or periodic lease of vacant land to individuals. A piece of land covered as reserved forest as per Government records have also been settled by respective village authority/ council by issuing periodic or permanent lease. Such practices develop discrepancies between the actual land use patterns and that as in Government records. This creates artificial scarcity of land because of unrealistic land use records on Government side and on other side put extra monetary burden on implementing agencies.

## LAND ACQUISITION PROBLEMS

Proceedings of the national workshop on 'RESERVOIR PLANNING AND OPERATION', (19th December, 2007) organized by Civil Engineering Department, Assam Engineering College, Guwahati-781013 Under the DST sponsored project 'Planning for Optimal Utilization of Water in Three Proposed Reservoirs in North-East India'.

Editor: Dr. Bibhash Sarma

---

---

International Journal of Innovative Technology & Adaptive Management (IJITAM)  
ISSN: 2347-3622, Volume-1, Issue-3, December 2013

---

---

Most of the project sites in NE region are located in remote hilly areas. These sites are almost inaccessible and also because of inadequate transport network virtually remain cut off from the main land. Even if the provision of better rehabilitation is made and upliftment in their social and economical life is ensured, due to lack of awareness and literacy the traditional hilly and tribal people are reluctant to shift to new locations. The non-availability and validity of data regarding actual land use practice and their ownership in the Government records induce a severe problem at the time of land acquisition. Now a days, it is reported that insurgency and law and order problem by militants outfits is adversely affecting the execution of many development project in the region. Remoteness of the project sites in the interior hilly areas, acute regionalism due to feelings of insecurity prevailing throughout the region comprising seven states of different socio-political set up is also stated to be the practical hurdle to acquire land for project.

### **REHABILITATION ASPECT**

The basic requirement of rehabilitation is to re-settle the affected population of the reservoir submergence area in a new place with all facilities and amenities even better than their old habitats. They should also feel that the new environment is good and congenial to continue their age old or even new occupations. The agony of displaced population who loose their homes and lands where they had their socio-cultural origin and who are to be rehabilitated at other location is very crucial. Hence, there must be human approach in dealing with their demands on part of the project authority on one hand and mass awareness program & education on part of social scientists and public representatives. For north eastern hill states village chiefs and autonomous district councils should also be involved from the conceptual stage of the project to avoid future uncertainties and complications on these aspects.

Regarding **human approach**, it can be cited from various reviews that in NE region most of the projects are located in hilly terrain with population density only of the order of 200 persons per sq.km. These project affected people may be shifted to nearest possible location having near similar ethnic, social and cultural environments. While giving importance to preserving tribal culture and way of life the rehabilitation benefit must also be given due consideration. Culture and way of life have two aspects; one concerning family customs and the other, the manner of earning livelihood. So far as the first is considered it can always be preserved subject always to inevitable changes which occur with time in all societies. Here it is to be remembered that hundreds of thousands of poverty stricken landless workers are forced to migrate each year and to lead a sub human existence on the pavements and in the slum of the cities. The tribals, also cannot remain fossilized in poverty by hunting, food gathering, collecting secondary forest produce or as low wage casual laborers. It would be highly desirable that this should be changed and they should have better education, health care and means of livelihood. That they should be left in their present deplorable state is, in fact, reminiscent of colonial attitude of mind towards native. There is ample evidence to show

Proceedings of the national workshop on 'RESERVOIR PLANNING AND OPERATION', (19th December, 2007) organized by Civil Engineering Department, Assam Engineering College, Guwahati-781013 Under the DST sponsored project 'Planning for Optimal Utilization of Water in Three Proposed Reservoirs in North-East India'.

Editor: Dr. Bibhash Sarma

---

**International Journal of Innovative Technology & Adaptive Management (IJTAM)**  
ISSN: 2347-3622, Volume-1, Issue-3, December 2013

---

that extension of irrigation and employment to an area through water resources development project significantly reduces migration, improves working days and wages.

Master Plan authority of the river basins of N-E Region recommends that the region has got sensitive ethnic groups of different tribes having a socio-economic culture of their own. It would therefore be necessary to have a socio-economic survey to find out their conduct, customs and reservations, so that proper atmosphere and surroundings can be provided in the new settlements.

### **SEISMIC EFFECTS**

Almost entire NE region falls in sever seismic zone. Therefore, serious concern has been shown about the safety of dams in the region due to seismic forces. M Ramamurthy & D S Ramamurthy(1993), after reviewing 13 reservoirs located in the Himalayan foot hills of historic seismicity, concluded that in any case, reservoir induced seismicity (RIS) events would be lesser than the levels contemplated to the naturally occurring earthquakes for which the dams are always designed to be structurally safe. RIS is thus considered as 'no problem' for Himalayan projects. There is also doubt on the hypothesis that impounding of water in large reservoirs induces seismicity. Nurec Dam of Russia, highest dam in the world (305m) is located in a high seismic region and has safely withstood earthquakes of more than 7 on the Richter scale. Now days dams are constructed using latest equipments and state of art technology. In fact, due to various factors associated with earth quake, rock fill dams with earth cores are the safest structures in seismic zones. Tehri dam section has been stated to be checked and found safe for the **Gazelli** earthquake, one of the most severe on record occurred in erstwhile USSR.

### **CONCLUDING REMARKS**

Pertinent to North East India scenario, it is rightly concluded that water resources projects play formidable role in employment generation and poverty alleviation. The benefits of the projects are so large that they significantly outweigh the costs of human and environmental disruption. The long term adverse effects of unutilized water resources would be more serious due to recurring floods and droughts. The adverse impact, if any, on the environment should be minimized and should be off-set by adequate compensatory measures with built in mechanism for emergency preparedness.

An overall review of the multipurpose projects to be undertaken unfolds the fact that while these projects have been investigated to tackle the persisting flood problems in the region, the major beneficiary will be power component which would bear the most of the project cost

### **REFERENCES**

1. Bahadur J. & Vats T.P., (1997), "Environment Impact Assessment - An Approach for

Proceedings of the national workshop on 'RESERVOIR PLANNING AND OPERATION', (19th December, 2007) organized by Civil Engineering Department, Assam Engineering College, Guwahati-781013 Under the DST sponsored project 'Planning for Optimal Utilization of Water in Three Proposed Reservoirs in North-East India'.

Editor: Dr. Bibhash Sarma

---

**International Journal of Innovative Technology & Adaptive Management (IJITAM)**  
ISSN: 2347-3622, Volume-1, Issue-3, December 2013

---

Appraisal" in proceedings of conference on "Hydro power Development - Issues, Challenges and Opportunities" held in April, 1997 at Guwahati, pp. 113-132.

2. Darlong V. T., (1997), "River Valley Projects Vis-a-Vis Environmental Management in North-East India : Problems and Prospects." Seminar on Water and water resource Management in NE Region, in May, 1997 , at Shillong.

3. Brahmaputra Board (1999), "Water Resources of North East at a Glance"

4. Das B., (1999), "Need for Development of Hydro Power In India With Special Reference to Eastern & North-Eastern Region" in Proc.of 14<sup>th</sup> Water Resources Day by Institution of Engineers(India), Assam State Centre, Guwahati on June 03, 1999.

5. Goel R. S. , Prasad K., (1993), "An overview of Environmental Impact of Indian Water Resources Projects" in the proceedings of The National Round Table Discussion" held in June, 1993 at New Delhi.

6. Sharma P., (1997), "Prospects of HE Projects in North Eastern Region of India" in CBIP proceedings of conference on "Hydro power Development - Issues, Challenges and Opportunities" held in April, 1997 at Guwahati, pp. 149-162

7. Singh Bharat (1993), "Environmental Problems in Harnessing Water Resources for National Benefit" in the proceedings of The National Round Table Discussion" on Environmental Impacts of Water Resources Development held in June, 1993 at New Delhi. pp.1-6.