

J-12011/34/2008-IA.I
Government of India
Ministry of Environment & Forests
(IA Division)

Paryavaran Bhawan, CGO Complex,
Lodhi Road, New Delhi – 110003

Dated : 26.3.2009

To

The Chief Engineer (Env.)
WAPCOS Ltd
76-C, Institutional Area
Sector-18
Gurgaon – 122 015 (Haryana)

Subject : Conducting the Lohit River Basin Study in Arunachal Pradesh by M/s. WAPCOS – TOR – regarding

Sir,

This has reference to your letter no. WAP/Env. /Lohit Basin/2009/1251 dated 17.2.2009 and 13.3.2009 on the above mentioned subject.

2. The proposal for Lohit river basin study was considered by the Expert Appraisal Committee at its meetings held on 16.7.2008, 16.12.2008, 22.1.2009 & 15.2.2009. The committee approved the TOR of the proposed study at a cost of Rs. 1.00 Crore and the study will be completed in 9 months. The cost of the study is to be borne by the project proponents of the projects which are coming-up on the Lohit river on pro-rata basis per MW . The break-up details of cost sharing by various developers in Lohit is given below:

Table-1: Cost Sharing

Project Developers	Power generation Capacity(MW)	% Share	Cost to be shared (Rs. in lakhs)*
Athena Demwe Power Pvt. Ltd (Upper & Lower Demwe)	3430	44	44.00
Mountain Fall India Pvt. Ltd (Kalai-I & Hutong-II)	2700	34	34.00
Hutong-I (developers to be decided by state government)	588	7	7.00
Kalai-II (developers to be decided by state government)	1200	15	15.00
Total	7918	100	100

* In addition service tax @ 12.3% will have to be borne by the developers

The basin study envisages providing optimum support for various natural processes and allowing sustainable activities undertaken by its inhabitants. The same is determined in terms of the following:

- Inventorisation and analysis of the existing resource base and its production, consumption and conservation levels.
- Determination of regional ecological fragility/sensitivity based on geo-physical, biological, socio-economic and cultural attributes.
- Review of existing and planned developments as per various developmental plans.
- Evaluation of impacts on various facets of environment due to existing and planned development.

3. The study should involve assessment of stress/load due to varied activities covering, e.g. exploitation of natural resources, industrial development, population growth which lead to varying degree of impacts on various facets of environment. The basin study should also envisage a broad framework of environmental action plan to mitigate the adverse impacts on environment which should be in the form of:

- preclusion of an activity
- infrastructure development
- modification in the planned activity
- implementation of set of measures for amelioration of adverse impacts.

The basin study is a step beyond the EIA, as it incorporates an integrated approach to assess the impacts due to various developmental projects.

4. STUDY AREA

The Study Area to be covered as a part of the Basin Study is for entire Lohit Basin. The study should be based on secondary as well as primary data collection.

5. PROJECTS ENVISAGED IN LOHIT BASIN

Six (6) projects are envisaged in the study area to be covered in the Lohit basin. The details are of the same is given below in Table.

Table-2: Projects Proposed on Lohit River (Cascade development)

Particulars	Unit	Demwe Lower	Demwe Upper	Hutong-II	Hutong-I	Kalai-II	Kalai-I
Catchment Area	Sq .km	22000	20560	18450	17968	17846	16610
FRL	m	425	584	714.5	779.8	904.8	1065.2
Elevation of River Bed	m	305	430	589.5	755.8	779.8	915.25
Height of dam (From Deepest Foundation)	m	145	185	161	29	161	186
Installed capacity	MW	1200	1800	1250	588	1200	1450
Distance from Lower Demwe	(Km)	0	25	49	64	75	86

5. DATA COLLECTION

In the present study emphasis should be laid on terrestrial and aquatic ecology. The estimation of supportive capacity of the basin should involve the preparation of the existing scenario i.e., the preparation of detailed database of the basin. This should be accomplished through the steps outlined in following sections.

5.1 Meteorology

The information on various meteorological aspects are to be collected from India Meteorological Department (IMD) for meteorological stations located within the basin area or in vicinity to the basin boundary. The information on various aspects such as rainfall, temperature, wind, humidity, etc. will be collected.

5.2 Water Resources

The information on following aspects should be collected:

- Review of drainage characteristics of the basin, including various surface water bodies like rivers and lakes.
- Data collection and review of past studies/reports/data etc.
- Review of existing water sharing agreements for meeting various need-based existing and future demands viz. municipal, irrigation, power generation and industrial.
- Analysis of all past assessment of the water availability and assessing the water availability, as per updated data for the system as a whole and at existing ongoing/proposed project locations on annual/monsoon/non-monsoon and monthly basis.
- Estimation of sediment load at various points in the basin based on available secondary data.
- Identification of perennial sources of water and their designated usages

5.3 Water Quality

As a part of the Studies, secondary data is to be collected for water quality in the study area. In addition to above, information on human settlement, sewage generated and mode of collection, conveyance, treatment and disposal of sewage should also be collected.

The water quality monitoring should be conducted at 30 locations in the study area. The frequency of sampling should be once/per month for 6 months. The various parameters include pH, Dissolved Oxygen (DO), Electrical Conductivity (EC), Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Total Alkalinity, Total Hardness, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Nitrates, Chlorides, Sulphates, Phosphates, Sodium, Calcium, Magnesium, Potassium, Iron, Manganese, Zinc, Cadmium, Lead, Copper, Mercury, Total Chromium, Total Coliform.

5.4 Flora

The following data should be collected from various secondary sources for river Lohit and its tributaries in the basin area:

- Characterization of forest types in the study area and extent of each forest type.
- Information on general vegetation pattern and floral diversity

- Presence of economically important species in the basin area.
- Presence of Rare, Endangered and Threatened floral species as per the categorization Botanical Survey of India's Red Data list in the basin area.
- Presence of endemic floral species found in the basin area, if any should be assessed as a part of the basin study.
- Location of wild life sanctuaries, national parks, biosphere reserves if any, in the study area

The field studies should be conducted for sampling at 30 locations to collect primary data on terrestrial ecology in the study area. The monitoring should be conducted for 2 seasons (one should be rainy season). The following should be covered as a part of the EIA Study:

- Identification of forest type and density, bio-diversity in the study area.
- Preparation of comprehensive checklist of flora (Angiosperms, Gymnosperms, Lichens, Pteridophytes, Bryophytes, Fungi, Algae etc;) with Botanical and local name.
- Importance Value Index of the dominant vegetation at various sampling locations
- Frequency, Abundance and density of each species of Trees, Shrubs and Herbs at representative sampling sites should be estimated.
- Identification and listing of Rare/Endangered species.
- Identification and listing of plants of genetically, biologically, economical and medicinal importance.
- Major forest produce, if any, and dependence of locals on the same in the forests observed in the study area.

In addition, based on the published literature including various research papers, the information on forest types, presence of various species, biological diversity, etc. should be collected for the study area.

5.6 Fauna

The following data be collected from various secondary sources for the study area:

- Inventory of Birds (resident, migratory), land animals including mammals, reptiles, amphibians, fishes, etc. reported & surveyed in the basin area should be prepared.
- Presence of RET faunal species as per the categorization of IUCN Red Data list and as per different schedules of Indian Wildlife Protection Act, 1972 in the basin area.
- Presence of endemic faunal species found in the basin area, if any should be assessed as a part of the Basin Study.
- Existence of barriers and corridors for wild animals, if any in the basin area should be covered as a part of the study.
- Identification of threats to wildlife in the region
- Presence of National Park, Sanctuary, Biosphere, Reserve Forest etc. in the basin area should be assessed.

During ecological survey, identification of faunal species should be carried out simultaneously. Indirect observations of mammals should be carried out by identification of tracks, droppings (scal), claw marks and calls, etc. The listing of faunal species by direct observation techniques should be carried out. The detailed list of faunal species should be formulated based on forest records and published literature.

5.7 Aquatic flora and fauna

The following data should be collected from various secondary sources for river Lohit and its tributaries in the basin area:

- Presence of major fish species
- Inventory of migratory fish species & migratory routes of various fish species
- Presence of major breeding and spawning sites.

The field studies should be conducted for sampling at 30 locations to collect primary data on aquatic ecology & fisheries in the study area. The density and diversity of phytoplankton, zooplankton should be estimated. In addition, primary productivity should be monitored at various locations to be covered as a part of the study.

The diversion of water for hydropower generation leads to reduction in flow downstream of the dam site up to disposal of tail race outfall. This leads to adverse impacts on riverine ecology. The dam could also act as a barrier for migration of fishes. The data on prevailing fish species should be collected from the Fisheries Department. To augment the existing data, a fisheries survey should be conducted at 30 locations in the study area. The survey should be conducted once per month for six months. The details of the monitoring work should be carried out as per the following:

- Assessment of biotic resources with special reference to primary productivity, zooplanktons, phytoplanktons, benthos, macrophytes, macro-invertebrates and fishes in the study area.
- Population densities and diversities of phytoplanktons, zooplanktons benthos, macrophytes, macro-invertebrates and fish shall be estimated. Diversity indices of these ecological groups should also be calculated separately.
- fish composition
- migratory route of migratory fishes
- Spawning & breeding grounds of fish species, if any, should be identified

6. IMPACTS DUE TO HYDROPOWER DEVELOPMENT

The impacts on terrestrial and aquatic ecology should be studied. The scenario to be considered for assessment in the present study should be based on the hydropower projects presented in Table. The key aspects to be covered are listed as below:

- Modification in hydrologic regime due to diversion of water for hydropower generation.
- Depth of water available in river stretches during lean season and its assessment of its adequacy vis-à-vis various fish species.
- Length of river stretches with normal flow due to commissioning of various hydroelectric projects due to diversion of flow for hydropower generation.
- Impacts on discharge in river stretches during monsoon and lean seasons due to diversion of flow for hydropower generation.
- Impacts on water users in terms of water availability and quality
- Impacts on aquatic ecology including riverine fisheries as a result of diversion of flow for hydropower generation.

- Assessment of maintaining minimum releases of water during lean season to sustain riverine ecology, maintain water quality and meet water requirements of downstream users.
- Impacts due to loss of forests
- Impacts on RET species & impacts on economically important plant species
- Impacts due to increased human interferences
- Impacts due to agricultural practices.

6. OUTCOME OF THE STUDY

The key outcomes of the study should be to :

- Provide sustainable and optimal ways of hydropower development of Lohit river, keeping in view of the environmental setting of the basin.
- Assess requirement of environmental flow during lean season with actual flow, depth and velocity at different level.

7. BUDGET

Table-3: Break-up of mode of Payment for Lohit Basin Study

Milestone	Percentage of Total payment (%)
Advance	10
On completion of field studies for the first & second months	20
On completion of field studies for the third & fourth months	20
On completion of field studies for the fifth & six months	20
On submission of Draft Report	20
On submission of Final Report after incorporating comments on Draft Report	10
Total	100%

8. An interim report on the study should be submitted after 3 months for review. The Expert Appraisal Committee after examining the same would suggest, mid-course corrections, if any. The final draft report would be submitted to Ministry within the stipulated period of the study. The study should be completed within the time-frame of 9 months.

Yours faithfully,

(Dr. S. Bhowmik)
Additional Director

Copy to:-

1. Secretary, Ministry of Power, Shram Shakti Bhawan, Rafi Marg, New Delhi -1.
2. Secretary (Power) Govt. of Arunachal Pradesh, Secretariat, Itanagar - 791111.
3. Secretary (Environment & Forest) Govt. of Arunachal Pradesh, Secretariat, Itanagar - 791111, Arunachal Pradesh.
4. The Chief Engineer, Project Appraisal Directorate, Central Electricity Authority, Sewa Bhawan, R.K. Puram, New Delhi - 110066.
5. Shri. K. Seethayya, President, M/s. Athena Demwe Power Pvt. Ltd., 1st Floor, NBCC Tower, 15-Bhikaji Cama Place, New Delhi – 110 066.
6. The Senior Vice-President (Hydro), M/s. Mountain Fall India Pvt. Ltd., A-97-98, Lajpat Nagar, Part-I, New Delhi – 110 024.
7. Regional Office, MOEF, Shillong.
8. Guard File.

(Dr. S. Bhowmik)
Additional Director