

CHAPTER - 6

PREDICTION OF IMPACTS

6.1 INTRODUCTION

Prediction is essentially a process to forecast the future environmental conditions of the project area that might be expected to occur because of implementation of the project. The present chapter outlines the impact on water resources and aquatic ecology on account of construction of the proposed Dibang Multipurpose Project.

6.2 IMPACTS ON RIVER LENGTH WITH NORMAL FLOW

The key impact on hydrologic regime due to construction of the proposed Dibang Multipurpose project is on account of change in the free flowing condition of the river. With the construction of the proposed project, a reservoir length of 43 km length, with an area of 40.09 km² (4009 ha) and gross storage capacity of 3748.21 Mm³ (at FRL) will be formed.

The river which in the present stage (pre-project scenario) is flowing freely over a stretch of 43 km, will get converted into a reservoir. The conversion of free flowing river into reservoirs will have certain positive and negative impacts on riverine ecology.

Normally, under such circumstances, adverse impacts on water quality are anticipated on account of increase in the residence time in the reservoir. However, in the catchment area of the proposed Dibang Multipurpose project, pollution loading is virtually negligible, on account of low population density, low cropping intensity with minimal use of agro-chemicals and absence of industrialization in the area. Thus, the pollution loading is low, and as a result no major impact on reservoir water quality is anticipated.

6.3 IMPACTS ON FLOOD MODERATION

The storage of the order of 563 Mcum and 340 Mcum has been estimated for moderation of 100 year and 25-year flood respectively after considering a safe release of 3000 cumec. A reservoir rule curve has been developed in such a way that

1. The flood storage available in first 10-daily of June to second 10-daily of August would be adequate to absorb the train of flood waves of 100 year flood preceded and succeeded by 25 year flood.
2. Third 10-daily of August would be used to increase the reservoir level from EL 508 to 528 m and would be adequate to absorb 100 year flood.
3. In the month of September reservoir level is being maintained at EL 528 m and storage would be adequate to absorb 100-year flood.
4. First 10-daily of October would be used to increase the reservoir level from EL 528 to 545 m.

Reservoir levels and Flood Storage for different monsoon months are given in **Table 6.4**.

TABLE 6.4
FRL=545 m, MDDL = 490 m

| Months (Monsoon) | Reservoir Level at end of period (m) | Flood Storage (Mcum) | Result |
|------------------|--------------------------------------|----------------------|-----------------------------|
| May-III | 508 | 1259.3 | |
| Jun-I | 508 | 1259.3 | 25+100+25 yr Flood can pass |
| Jun-II | 508 | 1259.3 | 25+100+25 yr Flood can pass |
| Jun-III | 508 | 1259.3 | 25+100+25 yr Flood can pass |
| Jul-I | 508 | 1259.3 | 25+100+25 yr Flood can pass |
| Jul-II | 508 | 1259.3 | 25+100+25 yr Flood can pass |
| Jul-III | 508 | 1259.3 | 25+100+25 yr Flood can pass |
| Aug-I | 508 | 1259.3 | 25+100+25 yr Flood can pass |
| Aug-II | 508 | 1259.3 | 25+100+25 yr Flood can pass |
| Aug-III | 528 | 578.6 | 100 yr Flood can pass |
| Sep-I | 528 | 578.6 | 100 yr Flood can pass |
| Sep-II | 528 | 578.6 | 100 yr Flood can pass |
| Sep-III | 533 | 578.6 | 100 yr Flood can pass |
| Oct-I | 533 | 0 | |

The construction of the dam would lead to absorption of peak flood due to storage in the dam. The peak flow of 12756.6 cumec and 9575.4 cumec will get attenuated due

to storage in the dam. The peak flows will get attenuated to 3000 cumec. As a result, there will be reduction in water levels and areas affected by the attenuated flood. The reduction in flood at 60 km downstream of the dam site for various values of manning's coefficient is given in **Table 6.5**.

TABLE 6.5
Impacts of flood 60 km downstream of dam site

| Return period | Discharge (cumec) | n=0.03 | n=0.04 | n=0.05 |
|------------------------|-------------------|--------|--------|--------|
| 1 in 100 years | 12756.6 | 3.96 | 4.40 | 4.75 |
| 1 in 25 years | 9575.4 | 3.57 | 3.97 | 4.29 |
| Outflow from reservoir | 3000 | 2.37 | 2.63 | 2.84 |

6.4 IMPACTS ON AQUATIC ECOLOGY DUE TO MODIFICATION OF FLOW REGIME

As mentioned earlier in section 6.3, the commissioning of a hydroelectric project, significantly affects the hydrologic regime. The proposed Dibang Multipurpose Project too will have similar impact on hydrologic regime, with a corresponding impact on riverine ecology including fisheries.

The free flowing water regime will be completely disturbed over a stretch of about 43 km, upstream of the dam site. The dams will store water to enable peaking power generation. As a result, barring for a period from June to August, river Dibang will have dry periods from few hours to up to few days for generation of peaking power. This storage period will result in drying up of the river, downstream of the dam site. The dry period will be followed by a wet or flow period with uniform flow corresponding to the number of units/turbines generating hydropower. Thus, the riverine ecology will be affected on account of modification in hydrologic regime. This change can have significant impact on the riverine fisheries affecting physiological readiness to migrate, mature and spawn.

The dry phase in the river stretch will result in stranding of fish in temporary pools. Similarly, drying of the river bed will lead to exposure of spawning substrates

resulting in exposure and desiccation of fish eggs as well. The increased discharge especially in the lean season on account of flow of rated discharge will sweep the larvae past their suitable habitat.

On completion of the proposed Dibang Multipurpose project in the basin, would render river Dibang as highly modified, on account of:

- Hydrograph getting completely modified
- Modification of floods including suppression and alteration of flood peaks.
- Conversion of free flowing stretch of river into a reservoir.

However, no major impact on water quality is anticipated on account of modification in hydrologic regime, as there are no major sources of water pollution in the study area.

The modification of downstream river flow characteristics (regime) by an impoundment could lead to adverse impacts on riverine fisheries. These include:

- loss of stimuli for migration
- loss of migration routes and spawning grounds
- decreased survival of eggs and juveniles
- diminished food production.

Regulation of stream flow during the migratory period can alter the seasonal and daily dynamics of migration. Regulation of a river can lead to a sharp decrease in a migratory population, or even to its complete elimination.

6.5 IMPACTS ON FISH MIGRATION

Fish populations are highly dependent upon the characteristics of the aquatic habitat which supports all their biological functions. This dependence is most marked in migratory fish which require discrete environments for the main phases of their life cycle which are reproduction, production of juveniles, growth and sexual maturation.

The species has to move from one environment to another in order to survive. The fish composition in the project area are represented by potamodromous species i.e. the species which occur only in freshwater system and their reproduction and feeding zones are separated by distances that could vary from few meters to hundreds of kilometers.

The building of a dam generally has a major impact on fish populations: migrations and other fish movements can be stopped or delayed, the quality, quantity and accessibility of their habitat, which plays an important role in population sustainability. One of the major effects of the construction of a dam on fish populations is the decline of migratory fish species. The dam prevents migration between feeding and breeding zones. The commissioning of the proposed hydroelectric project would seriously impede the migratory route of fisheries. The migration characteristics of various fish species observed in the study area is given in **Table 6.6**.

TABLE 6.6

Migration distance, spawning season and spawning substrate of some of the fish species

| Family | Species | Migration distance | Spawning season |
|------------|----------------------------------|--------------------|-----------------|
| Cyprinidae | <i>Schizothorax richardsonii</i> | Short to Mid | Aug-Sep |
| Cyprinidae | <i>Tor putitora</i> | Long | Sep -Oct |
| Cyprinidae | <i>Tor tor</i> | Long | Sep -Oct |

The migratory fish species (for breeding purpose) observed in the study area are listed as below:

- *Schizothorax richardsonii*
- *Tor putitora*
- *Tor tor*
- *Chagunius chagunio*

The species *Schizothorax richardsonii* migrate from lower elevation to higher elevation in summer months and return to lower elevation in winter months.

The dam of Dibang Multipurpose Project would block the upward migratory movement of various fish species in winter season. It is likely that the migration of fish species namely, *Schizothorax richardsonii* would be severely affected on account of construction of the proposed Dibang Multipurpose Project.

The fish species such as *Tor putitora*, *Tor tor* migrate to lower elevation in summer months and undertake the reverse journey in winter months.

The construction of the Dibang Multipurpose Project would impede the migratory movement of *Tor tor* and *Tor putitora*. Likewise, migration of fish species from tributaries to river Dibang, would be affected on account of creation of reservoirs due to construction of proposed hydroelectric project. Thus, the dam would act as a barrier to the migratory movement of these fish species. This would result in significant decrease in their numbers.

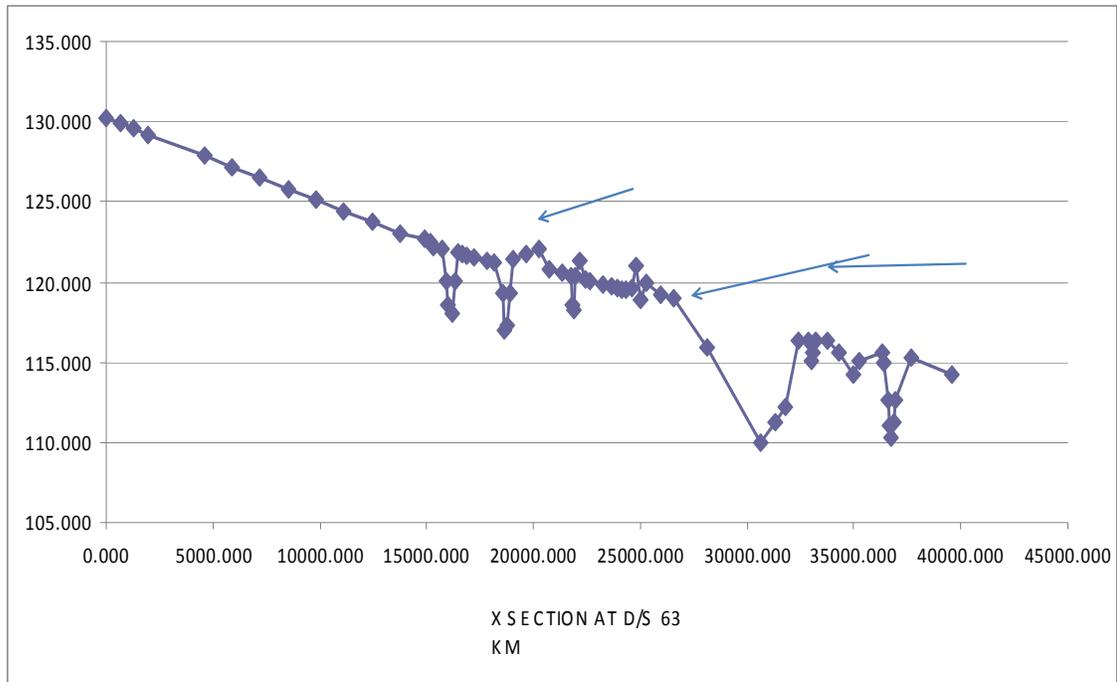
For the conservation and development of migratory fish population in river Dibang, Fish Management Plan has already been proposed in the EMP report of Dibang Multipurpose Project.

6.6 IMPACTS ON DOWNSTREAM WATER USERS

The proposed project is located in an area with low population density. The population density of the catchment area has been considered as 30 persons/sq. km. As per the EIA/EMP report, the CAT plan has been prepared for an area of 59811.88 ha or approx. 600 km². Thus, the maximum population in the catchment area is of the order of 18000. Considering per capita water requirements as 70 lpcd, the total water requirement works out to 1260m³/day or 0.0146 cumec. The major source of water for meeting irrigation and drinking requirements in the project area are rivers or nallahs which flow adjacent to the habitations. The water is conveyed to the point of consumption. Thus, no water is abstracted from river Dibang.

6.7 IMPACTS ON WILDLIFE

The Dibru-Saikhwa National Park is located about 63 km downstream of the dam site. The river cross-section at this site is given as below:



The elevations of the left and right banks are 130.00 m and 114.20 m respectively. The water level is at a depth of about 10 m and 1.5 m from the river on left and right banks respectively. The reduction in discharge in lean season shall affect the water requirements of wildlife. Hence, it is recommended to release the Environmental flows for sustenance of riverine ecology at downstream. The details of Environmental flows are given in Chapter 7 of this report.

Further, Dibru-Saikhowa National Park is subjected to three to four waves of flood every year. These recurring floods often change the course of Lohit and Brahmaputra rivers itself, causing both soil erosion and siltation, and playing a significant role in modifying the habitat of the Park. Deposits of silt carried down by the rivers from upstream mountainous area are shrinking the existing wetlands considerable besides changing the course of rivers, streams and nallahs with concomitant changes in the landscapes. Heavy siltation adversely affects the natural regeneration of local plant species. The waves of flood during the breeding season have a detrimental effect on the amphibian species inhabiting the park. The Indian Skipping Frog and Bhamo Frog are the two most dominant species due to their ability to survive high flood conditions. In addition, heavy siltation leads to desiccation of the soil environment, reducing its water retention capacity and

supporting only scarce vegetation, which is unfavourable for the amphibians. In these respects, flood moderation due to Dibang Multipurpose Project will be beneficial for flora and fauna.