

# Environmental Impact Assessment on River Jhelum for Inland Water Transportation

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**Abstract** – To know the existing condition of river Jhelum for feasibility of Inland Water Transportation, Environmental Impact Assessment was conducted on River Jhelum. The environmental baseline data was obtained from various available sources. Majority of data on physiography, vegetation, fauna, fisheries, air, noise and water quality was collected during field studies. Data was also collected from various reports and by interacting with individuals and organizations. In order to assess the impact due to the project, extensive field visits were undertaken to generate baseline data. In addition, enquires were conducted with Government and Non Government Organizations. The noise levels in the area may vary during day and night as 52 dB and 40 dB respectively. The studies carried out in past have reported the geology from prehistoric to recent unconsolidated alluvial deposits comprising of silt, sand and clay and their mixture in different proportions. The current assessment revealed the water quality of river Jhelum can be further improved by diverting sewerage effluent outlets to treatment plants, which at present discharge, untreated effluent into the river Jhelum.

**Key Words:** Inland Water Transportation, Hydrographic survey, River Jhelum, Vessel Design, Dredging, River drainage system,

## 1. Environmental Regulations

In pursuance of the global goals of nature conservation and protection, to which India is committed since its participation in Stockholm Conference, State Governments have initiated plans, schemes and actions to implement various legislations and regulations. In J&K, there is an increasing pressure on its resources. This has resulted in depletion and degradation of natural resources owing to the rapidly growing population. However, there is a growing awareness among policy makers and the public about effects of environmental degradation. Following Acts, Regulations and Documents were consulted for the preparation of this chapter:

- Water (Prevention and control of pollution) Act 1974. Amended in 1978 and 1988.
- Air (Prevention and control of pollution) Act 1981 Amended 1988.
- J&K Forest (Conservation) Act 1990.

- J&K Wildlife Act (1978).
- Forestry (Conservation) Act 1980, Amended in 1988.
- Environment Protection Act (1986).
- Guidelines for rail/road/highway project, MOEF, Govt. of India (1989) the latest being the Environmental (Protection) Act 1986 of the Ministry of Environmental and Forest (MOEF).

With rapid strides in economic development the need for rationalizing the transport system becomes imperative. In the process of development, there has been an intensive use of the natural resources which has adversely affected the environment, leading to ecological imbalances. The importance of conserving and enhancing the environmental assets has assumed urgency. It is in this context that Initial Environmental Examination (IEE) of a navigable river is planned as per Environmental Protection Act (1986). This chapter has following sections:

- Environmental baseline data,
- Environmental Impacts,
- Environmental Management Plans. and Environmental Monitoring Program.

## 2. Baseline Environmental Data

The environmental baseline data was obtained from various available sources. Majority of data on physiography, vegetation, fauna, fisheries, air, noise and water quality was collected during field studies. Data was also collected from various reports and by interacting with individuals and organizations. In order to assess the impact due to the project, extensive field visits were undertaken to generate baseline data. In addition, enquires were conducted with Government and Non Government Organizations.

### 2.1 Physiography and Meteorology

The project is situated in Kashmir Valley. The entire route of IWT passes through main stream of Jhelum River. The total length between Pampore to Chattabal Weir is about 27.6

kms (Zero chainage taken as centre line of Kadlabal).

Extreme variation in climate is observed in project area, owing to its location and topography. The climatic conditions in the project area are characterized by three seasons as:

**Rainy season** April to November

**Winter season** November- March

**Summer season** April-August

Meteorological data recorded at nearby stations of Srinagar has indicated variation during the year. The mean annual rainfall in the area varies from 500 mm to 1150 mm. The highest temperature recorded is about 34.6°C and lowest - 7.8°C. Relative humidity varies from 71 to 88 percent. The meteorological data has been utilized to compute air quality in the area.

### 2.2 Geology and Soils

The studies carried out in past have reported the geology from prehistoric to recent unconsolidated alluvial deposits comprising of silt, sand and clay and their mixture in different proportions. The sediments are overlain by boulders/ pebbles of upper Shiwalik formations. The soil mainly consists of sand, silt and clay. The texture is sandy clay.

S.no.	Texture	Value range (%)
1.	Sand	41.2-56.1
2.	Silt	19.5-20.1
3.	Clay	23.8-39.3

### 2.3 Flora and Fauna

J&K is known for its flora and fauna. There is no National Park or Wildlife Reserve in the vicinity of the study area. 80% of the stretch is inhabited while about 20% stretch has tree/vegetation. Thus, no loss of forest area is anticipated by this project. The main vegetation species observed in this area are Chinar and Willow.

About 10,015 tonnes of fish production is reported in Kashmir valley and 6000 fishermen are engaged in this activity.

### 2.4 Noise

Noise too is responsible for adverse impact on physical and mental health of the people. The other impacts are:

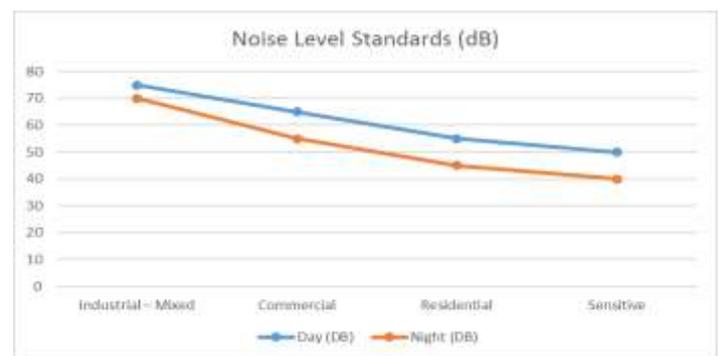
- hearing impairment,
- communication interference,

- sleep disruption, and migration of wildlife

The noise levels in the area may vary during day and night as 52 dB and 40 dB respectively. These values are below the prescribed International Standards.

### NOISE LEVEL STANDARDS

Location	Noise levels (dB)	
	Day	Night
<b>Industrial - Mixed</b>	75	70
<b>Commercial</b>	65	55
<b>Residential</b>	55	45
<b>Sensitive</b>	50	40



Graph 1. Noise Level Standards (dB)

### 3 Environmental Impacts

Based on project particulars and existing environmental conditions, potential negative impacts have been identified and wherever possible these have been quantified. Negative impacts likely to result from the proposed development have been discussed in this section:

- Impacts due to project location.
- Impacts due to project construction and operation.

#### 3.1 Impact due to Project Location

Those impacts, which are likely to take place due to the layout of the project, have been assessed. The project will not pose any displacement of the people (in case there is any, suitable rehabilitation facilities will be provided), loss to cultural monuments and religious structures. The anticipated impacts are:

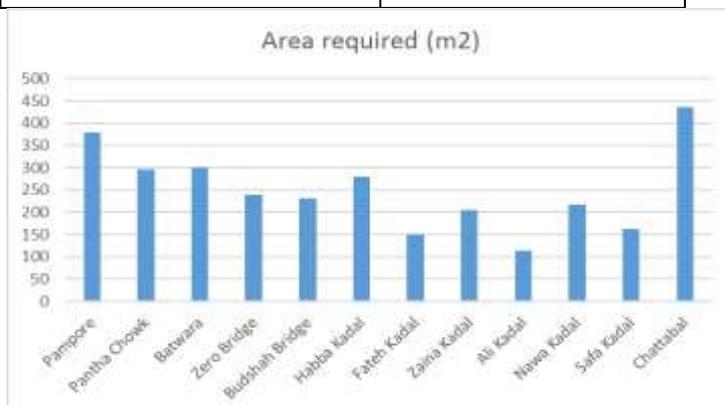
- a) Change in land use.
- b) Drainage and utilities problems.

- c) Jetty inlets and outlets,
- d) Lighting, and
- e) Terminal refuses.

a) **Change in Land use:** The route is planned through the Jhelum River. The traffic would consist mainly of cargo and passengers. Terminals will have landing structure, waiting shed, toilet blocks, parking space and cargo storage area. The land required at different terminals is reported in the table below:

LAND REQUIRED AT TERMINALS

S.No.	Terminals	Area required (m2)
1	Pampore	378.5
2	Pantha Chowk	295.0
3	Batwara	300.0
4	Zero Bridge	240.0
5	Budshah Bridge	231.0
6	Habba Kadal	279.0
7	Fateh Kadal	150.0
8	Zaina Kadal	204.0
9	Ali Kadal	113.0
10	Nawa Kadal	216.0
11	Safa Kadal	162.0
12	Chattabal	436.5
<b>Total</b>		<b>3005.0 m2</b>



Graph 2. Area required for terminals

In all, about 0.3 ha of land is likely to be utilized to accommodate terminal buildings and other infrastructure. The area to be acquired will partly fall in agricultural land. The utilization of above land is negligible in comparison to available land and hence won't have any adverse effect.

b) **Drainage and Utilities Problems:** The main drainage in the catchment area is through rivers. The addition of transport vessels will not change the drainage pattern of the area nor will it create any hindrance in utilities available in the area.

c) **Jetty-Inlets and Outlets:** In the Project Report, 20 to 40 m long and 3 m wide steel jetty is envisaged. To accommodate the passengers and cargo, a 3 m wide passage will be appropriate. About 300 - 400 Sqm land area is estimated for operational and service requirements on each station.

In normal operating conditions, the jetty areas are designed to accommodate 2 to 3 persons per Sqm. The designed facilities are adequate. From these, it can be concluded that all the jetties have necessary provisions for space to accommodate people in normal as well as emergency conditions. Hence no hazard is anticipated due to proposed sizes of inlets and outlets.

d) **Lighting:** The jetty and approach areas both on ground and in water will have adequate and uniform fluorescent lighting to provide pleasant and cheerful environment. Where electricity is not available the illumination shall be by solar lights. The ferry boats will be fitted with extra lamps to light up the landing pontoon.

e) **Terminal Refuse:** The collection and removal of refuse in a sanitary manner from jetty/terminal stations are of importance for effective vector control, aesthetic improvement and nuisance and water pollution abatement. The refuse from terminals/jetty includes:

- Garbage,
- Rubbish, and
- Floor Sweeping.

Due to non-availability of solid waste data for such facilities, it is assumed that about 20 gm per person per day will be generated. About 100 people per terminal are likely to visit/work. The total refuse generated at all terminals will thus be about 2 tonnes/year.

### 3.2 Impacts due to Project Construction and Operations

Although environmental hazards related to construction works are mostly of temporary nature, this does not mean that these should not be considered. The main issues which need attention are soil erosion, pollution and health risk. Runoff from unprotected excavated areas can result in excessive soil erosion, especially when the erodability of soil is high. Mitigation measures include careful planning, timing of cut-and-fill operations and revegetation.

Health risks include disease hazards to people from lack of sanitation (water supply, human waste disposal) and insect-vector disease hazards to the local population. Mitigation measures should include proper water supply, sanitation, drainage, health care and human waste disposal facilities. In addition to these, efforts need to be made to avoid water spills and adopt disease control measures.

The project may cause the following negative impacts due to the construction and operation:

- a) Oil Pollution,
  - b) Noise,
  - c) Accidental Hazards,
  - d) Water Demands,
  - e) Dredging,
  - f) Water Quality,
  - g) Impact on Aquatic Ecology, and
  - h) Impact on Rare and Endangered Species.
- a) Oil Pollution: Vessels will need workshops for their maintenance. Oil is spilled during change of lubricating oil, cleaning and repair processes. Moreover, cleaning of vessels will generate wastewater and solid wastes at such sites. The problems could be serious in case of accidents. The oil spills and its spread on water may lead to decrease in dissolved oxygen in water as low as 3 mg/l. This may cause a total depletion of oxygen, which may cause odour problems, and killing of aquatic life even in a short duration. The spilled oil will need to be trapped at source. In case of spills on water, attempt need to be made to recover it from water surfaces.
- b) Noise: Noise from the engines of the vessels and ships plying on the IWT must be kept under acceptable level both for the safety and health of the crew and also due to the sensitivity of the area. The acceptable level in silence zone is 50 dB. During field study, the maximum noise level at 50 m distance from the vessel has been worked out as 42 dB. This level is well within the standards.

However, with the increase of traffic/vessels, the noise level will be about 46 dB.

In addition it is proposed to use:

- Engine which produces less noise.
- Muffler at engine exhaust.
- No-horn zone in core area.

- c) Accidental Hazards: In view of the hazards involved due to failure and accidents, it is necessary to formulate and implement an emergency action plan. Accidental Risk involved in such projects has indicated accidents as 0.9 people per million per year. Hazardous materials/chemicals that are planned to be transported through Waterway routes are fertilizers (Ammonium Nitrate) Chemicals. The quantity of transport and storage shall meet International norms / standards.
- d) Water Supply and Sanitation: The public health facilities, such as water supply, sanitation and toilets are much needed at the stations. About 50 liters of water per day per person at the terminals will be sufficient enough to cater the demands. All the terminals lie in the city area. Water demand on each terminal will be catered by municipal water supply.
- e) Dredging: Dredging is the principal practice used worldwide to improve the navigability of Inland Waterways. It has been estimated that the total quantity of earthwork in dredging is 1523512.854 m<sup>3</sup> on the entire stretch.
- f) Water Pollution: Water pollution problems will mainly be due to dredging. About 1.16 m<sup>3</sup>/m length of waterway soil will be dredged. It is estimated that about 1 kg of soil/m length/day will be dredged. On an average about 88 tonnes of soil will be taken out every day. The water flow changes throughout the year will facilitate the particulate matter to settle down. The available literature has indicated that suspended particulate matter concentrations and turbidity decreases with increase in distance downstream. More or less the dredging will be carried out throughout the length of the proposed passage. The concentration in immediate vicinity of dredging site will be as high as 100 gm/m<sup>3</sup>. This short term impact on water quality and biological life are considered acceptable, however on continuous basis, these are unacceptable.

### 4 Positive Impacts

Based on project particulars and existing environmental conditions, potential positive impacts have been identified. The introduction of Waterways in Jhelum will also yield benefits from non-tangible parameters such as savings due to equivalent reduction in road construction and

maintenance, vehicle operating costs and socio economic benefits of travel time, better accessibility, better comfort and quality of life. Positive impacts have been listed under the following headings:

- Employment opportunity,
- Enhancement of economy,
- Less Energy Consumption and Lesser Pollution.

#### 4.1 Employment Opportunities

The project is likely to be completed in a period of 3 years. During this period manpower will be needed to take part in various project activities. About 500 people are likely to work during peak period of activity. In post construction phase about 100 people will be employed for operation and maintenance of the system. Thus, the project will provide direct and indirect employment opportunities.

#### 4.2 Enhancement of Economy

The inland water transport facility will help rural population to transport their goods cheaply along the proposed route in the interiors of the city. With the development of IWT, it is likely that more people will be involved in trade, commerce and allied services.

#### 4.3 Less Energy Consumption and Pollution

Inland water transport is a low energy transport mode. Moreover water routes are shorter than land routes. IWT is comparatively more efficient than road transport.

### 5 Environmental Management Plan

The Inland Water Transport project will provide employment opportunities, enhancement in career opportunities, enhancement of mobility, easy Inter-State movement and reduced energy consumption on one hand, but will create problems of soil disposal due to dredging, problems for marine habitat and water pollution, on the other. The environmental issues likely to develop during project construction and operation phases could be minimized by making necessary provisions in project design and adopting Environmental Management Plan (EMP).

The most reliable way to ensure that the Environment Management Plan is integrated into the overall project planning and implementation is to establish the plan as a component of the project. This will ensure that the plan will receive funding and supervision along with the other investment components. For optimal integration of EMP into the project, these should be linked for:

- Funding,

- Management and Training,
- Monitoring.

The purpose of the first is to ensure that proposed actions are adequately financed. The second link helps in imparting training, technical assistance; staffing and other institutional strengthening items needed to implement the mitigation measures in the overall management plan. The third link is necessary to provide a critical patch for implementation and, to enable sponsors and the funding agency to evaluate the success of mitigation as part of project supervision and as a means to improve future project.

Environment management plans have been developed for the following negative impacts:

- Change of land use,
- Spills of Oil and Grease,
- Refuse and Waste,
- Disposal of Dredged Material,
- Noise Pollution,
- Protection of Habitat and Ecology.

#### 5.1 Change in land use

Land has to be acquired for construction of terminal stations along the proposed route. This will cause a change in the land use pattern. Compensation has to be paid to the people for loss of their land.

#### 5.2 Spills of Oil and Grease

Oil and grease may spill from engines and pollute the river water. So their proper maintenance and service is essential. Leaks, if any, should be resealed. Discharge of lubricating oil and grease including their packages into the surface water must be prohibited. Water entering into the bilge of the ship should not be contaminated with the oil. The oil and grease from workshop could join the drainage system. It is therefore proposed to install oil and grease removal traps. After skimming the oil and grease, it needs to be burned or disposed off in a scientific manner. Studies have indicated that water transport accidents are mostly related with the transportation of oils and chemicals. In such cases efforts need to be made to stop the movement of oil by spreading boom in the area.

#### 5.3 Refuse and Waste

The vessels must be provided with storage capacity on board for storing solid waste. The maintenance of adequate sanitary facilities for temporarily storing refuse on the premises is considered a responsibility of the project

authorities. The storage containers for this purpose need to be designed. However, it is suggested that the capacity of these containers should not exceed 120 liters and these should be equipped with side handles to facilitate handling. The cans especially for garbage storage should not exceed 50 liters and should preferably be equipped with lockable cover. To avoid unpleasant odours and the accumulation of flies, the garbage containers should be washed at frequent intervals.

#### 5.4 Disposal of Dredged Material

It has been estimated that about 32300 cum. of soil will be dredged. In addition annual maintenance will also be required. The dredged material is proposed to be deposited on the banks of the river to strengthen the banks and also to prevent any interference into the hinterland. Since there is no industrial unit in the vicinity of the waterway route, the dredged material is not expected to be toxic.

Beneficial uses of dredged material have been practiced for many years; the aim should be to have proper height of bunds formed by dredged material, and to explore possibility of providing multipurpose habitats for encouraging species abundance and diversity.

The important uses of dredged material include its use in wetland restoration and protection and provide fishery benefits.

The problem of increased short term turbidity at dredging site can be tackled by efficient use of less intrusive dredging equipment, by providing silt curtains and by dredging during low flow periods.

#### 5.5 Control of Noise

Noise from the engines of the vessels and ships plying on the IWT must be kept under acceptable level both for the safety and health of the crew and also due to the sensitivity of the area. The acceptable level in silence zone is 50 dB. During field study, the maximum noise level at 50 m distance from the vessel has been worked out as 42 dB. This level is well within the standards. However, with the increase of traffic/vessels, the noise level will be about 46 dB.

In addition it is proposed to use:

- Engine which produces less noise.
- Muffler at engine exhaust.
- No-horn zone in core area.

#### 6. Protection of Aquatic Habitat

A wide variety of aquatic habitats are found all along the IWT route, which has already been documented. This habitat is susceptible to pollution. Following recommendations need

to be adopted to protect these habitats:

- In immediate vicinity of existing habitat, new habitat needs to be developed.
- Plans need to be initiated to develop aquatic farms for development of species in the area.
- New habitats, so developed should be protected from soil erosion and floods.
- Avoiding pollution of river/stream, and
- Construction of river training works.

If such precautions are taken, then danger to aquatic habitat could be reduced. However a detailed study on long term basis on ecological parameters will be essential.

#### 6 Environmental Monitoring Program

Environmental Monitoring Program is a vital process in management plan of a navigation project. This helps in highlighting the potential problems which could result from the proposed project and also helps in prompt implementation of effective corrective measures. The environmental monitoring will be required during construction and operational phases. The following parameters need to be monitored:

- Water Quality and Public Health
- Soil Conservation Measures,
- Soil Disposal,
- Habitat Management, and
- Air & Noise pollution.

#### 7 CONCLUSIONS

The water quality of river Jhelum can be further improved by diverting sewerage effluent outlets to treatment plants, which at present discharge, untreated effluent into the river Jhelum. In addition, the solid waste generated from domestic sources is also directly dumped into the river.

A large section of the route is having settlements on both sides of river banks. These need to be rehabilitated.

Based on project description, environmental baseline data and impacts assessment, it could be concluded that the project will not have any significant impact on environment due to its implementation. However, it is recommended to take up a detailed aquatic study to assess the density and diversity of aquatic species along with detailed engineering project report. More detailed work on habitat of aquatic

species, their migration of path etc. needs to be studied on a long term basis.

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