

**Allain Duhangan Hydroelectric
Project: Tehsil Manali, District
Kullu, Himachal Pradesh
Environmental & Social Impact
Assessment**



**Rajasthan Spinning &
Weaving Mills Limited**

Non-Technical Executive Summary (Revised)

December 2003

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December 2003

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For and on behalf of
Environmental Resources Management

Approved by: *Dr. T.K. Moulik*

Signed: _____



Position: *CEO & Vice Chairman*

Date: *15 December 2003*

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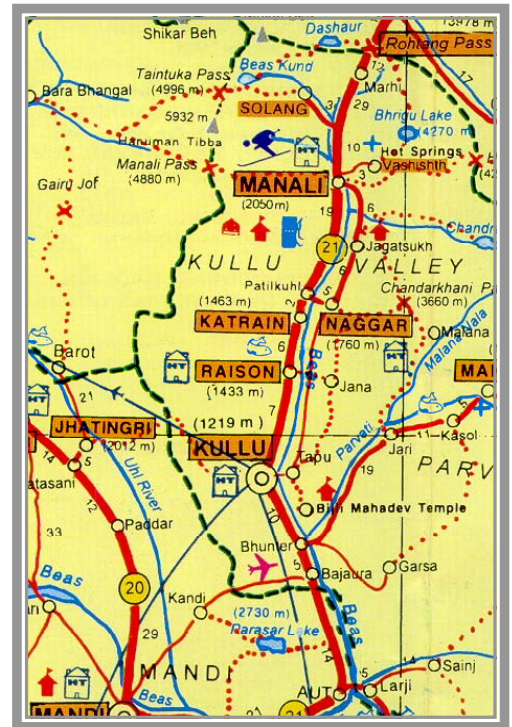
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1.1

**ALLAIN DUHANGAN HYDROELECTRIC PROJECT:
AN OVERVIEW**

Rajasthan Spinning and Weaving Mills Limited (RSWML), a private limited company incorporated in India, proposes to set up Allain - Duhangan Hydroelectric Project (ADHEP) of 2 x 96 MW (192 MW hydropower generation facility on Allain and Duhangan tributaries of Beas river) in Tehsil Manali, District Kullu, Himachal Pradesh in India. The project is located near village Prini, approximately 3 km SE of Manali town.

ADHEP has been contemplated as run-of-the-river scheme to utilise the combined discharge of Allain and Duhangan streams, which are tributaries of river Beas in the Kullu district of Himachal Pradesh. The proposed hydroelectric project is expected to be completed by end of year 2008 AD. A 220 kV power transmission line (of approximately 185-km) will evacuate the power to the northern grid at Nalagarh in the district Solan, Himachal Pradesh.



The Allain Duhangan Hydroelectric Project

The proposed ADHEP has an estimated capital cost of 9220 million Indian Rupees. Its construction is expected to take about 66 months with a maximum of about 1500 people working at site. The project will employ 100 people during the operation phase.

Hydroelectric Power facility

The proposed project will consist of high head underground power plant that would utilise flows from a combination of glacial snow melt and monsoon rains to supply peaking reservoirs via tunnels from catchment basins of the Allain and Duhangan rivers. The setting for the project is the steep terrain of the Himalayas with the diversion structures on the two rivers and an intermediate storage reservoir. From Allain structure, a reservoir will be fed through D-shaped concrete lined headrace tunnels (HRTs) of 3506m. The HRTs from Allain barrage will be provided with 157 m and 235 m long adits while HRTs from Duhangan weir will be provided of 246m and 700m long adits. The combined flows of the two rivers via a 1.69km long pressure shaft will feed a single powerhouse with 2 units each of 96 MW capacity to be located in a rock cavern. The water from the powerhouse will be led back to Allain stream through a tailrace tunnel followed by an open channel. The water will be fed to a Pelton Turbine Powerhouse.

The hydroelectric power facility will require around 77 ha of land over the life of the project. The impoundment areas will be at Allain and Duhangan diversion structures while submergence area will be at "live storages" in the Allain Barrage and Intermediate reservoir (relatively small of 12.5 ha-m and 19.5 ha-m respectively), consistent with project's run-of-the-river scheme.

Transmission System

RSWML has not yet finalised the route for the transmission line. However, as per the existing plans a 220 kV switchyard on the Northern bank of the Allain stream adjacent to the proposed underground power house will be built. Thereafter, a new 220 kV transmission line of approximately 185-km from the switchyard to an existing substation at Nalagarh, Southwest of the project site will be constructed. The present ESIA study has proposed only a framework for addressing environmental and social impacts due to the transmission line. A detailed environmental and social assessment will be undertaken following finalisation of route for power transmission.

RSWML is seeking partial financing from the International Finance Corporation (IFC) for the project. To fulfil the requirements of IFC's Environmental and Social Review of the project the present ESIA documentation has been prepared by Environmental Resource Management (ERM), one of the world's leading providers of environmental consultancy services.

1.1.1

Impact Assessment Process

The environmental and social impacts of the Allain Duhangan hydroelectric project have been studied in detail. The ESIA documentation provides the details of the work carried out and recommends necessary project actions and commitments to minimise, mitigate and monitor potential impacts. These are summarised in this Non Technical Summary. Essential considerations in doing the EIA work were:

- Complying with legal requirements; and
- Public Consultation & Disclosure of Information.

ESIA Compliance

The original documentation for the Allain Duhangan hydroelectric project were designed to meet the regulatory requirements of the Ministry of Environment & Forests (MoEF), Government of India. It has now been re-written to meet the requirements of the International Finance Corporation (IFC) and to comply with the procedural requirements of the MoEF, Govt. of India. The original environmental study for this project was conducted during the year 1997, on the basis of which it received environmental clearance from MoEF in December 2000 and Clearance for diversion of forestland from Forest Conservation Division of MoEF in October 2002.

The present ESIA incorporates, updates and expands available documentation and is responsive to the requirements of IFC. This ESIA

is based on updating of the environmental baseline data, carrying out of fresh ecological and social surveys, consultations, impact identification and evaluation and suggestions on environmental and social mitigation and management measures & monitoring plan. In addition, a reconnaissance survey along the proposed transmission line route was conducted for a preliminary environmental and social assessment.

Structure of ESIA Report

The ESIA report is presented in three volumes along with an executive summary. There is:

- Non-technical Executive Summary (this volume);
- *Volume I*: The main Environmental and Social Impact Assessment (ESIA) Report that consolidates earlier and fresh information. The format of the main report is in accordance with outlines given in IFC's document *Annex B* to OP 4.10.
- *Volume II* - Environment and Social Mitigation Management Plan (ESMMP) that specifies a number of action plans proposed to address the key issues and impacts identified.
- *Volume III* - A Compendium of Specialised Studies comprising of Social Impact Assessment & draft Resettlement Action Plan, Public Consultation and Disclosure Plan, Forestry & Watershed Management, Fisheries Study and Reconnaissance Survey for proposed power transmission line.

Public Consultation & Disclosure of Information

Following the public consultation on the draft ESIA, information on sponsors responses to concerns raised by the various stakeholders and details of measures taken to incorporate these concerns into project design and implementation has been incorporated in the ESIA documentation. RSWML will continue to consult with relevant stakeholders throughout the project construction and operation, as necessary, to address ESIA related and other issues that affect them. It will also report on ongoing consultations as part of its annual reporting requirements to IFC. In addition, as a part of its commitment to meet IFC's public consultation and disclosure framework, RSWML has made copies of the ESIA documentation available locally and through the World Bank Info shop as per the following structure of the Documentation.

Key Project Impacts

The project will have some adverse impacts and will also accrue some benefits. The ESIA documentation identifies “key project issues” that RSWML need to address and resolve in the project’s planning and implementation. These include:

- Resettlement and compensation for private land (36.56 ha) that has direct impacts on the asset and livelihood base of approximately 140 families. Some of these families would require focussed rehabilitation support;
- Effects on cultural resources, tourism and protected areas;
- Changes in Landuse and Effects on Topography, Soil Erosion/Sedimentation;
- Effects on Water Resources & Quality - Hydrology, Hydrogology and Surface & Groundwater Quality;
- Effects on Ambient Air, Noise Quality and Ground Vibrations;
- Effects on Ecology - Forests, Terrestrial wildlife, Aquatic Biology and Fisheries;
- Effects on Health & Sanitation;
- Safety and Increase in Traffic & associated issues on Road Safety;
- Effects of Natural Hazards - Flood, Cloudburst, Forest Fire, Earthquake, Landslides/ Avalanche.

Key Project Benefits

The Allain Duhangan Hydroelectric Project will provide some benefits at the national, regional and community levels. In addition to the rehabilitation and compensation package that each directly affected person will receive, RSWML is committed to providing community and developmental benefits in a sustainable manner. The key macro-economic benefits anticipated from the project are:

- Increased electricity availability, especially peaking power capacity
- Increased investment and national income;
- Increased employment opportunities to the local people during project construction.
- Improved health care and educational facilities in the near-by villages.
- Improved market facilities in villages adjacent to the hydroelectric power facility.
- Increased tourism potential of the area, leading to more income-generating opportunities.

RSWML will be responsible for implementing the higher-level, project-related mitigation measures such as the resettlement action plan and the community development plan, and for operations-related mitigation measures. The contractors selected for the project construction will be responsible for implementing day-to-day, construction-related environmental mitigation and monitoring measures



Public Consultation at Village Prini

specified in the ESMMP. RSWML is committed to executing its responsibilities in an environmentally and socially responsible manner and in compliance with all applicable environmental laws, regulations and guidelines. RSWML will also stipulate such requirements in all the legal agreements with the contractors, suppliers and agents. Besides, it will also ensure that appropriate corporate resource, personnel, reporting and accountability systems are in place for the successful implementation of the ESMMP.

The scheme of development of hydro-electric potential envisages utilisation of flows from two streams viz., Allain and Duhangan by means of separate water conductor system – one each from Allain and Duhangan leading to a common pooling point, the surge shaft from where a pressure shaft takes off leading to the powerhouse and thereafter discharging through a tailrace tunnel to a suitable location in the downstream reach of Allain stream. The project will also have an intermediate reservoir to be fed through headrace tunnel from Allain diversion barrage. The water conductor from Allain stream is proposed to be located on its left bank whereas the water conductor from Duhangan on its right bank so that they could be conveniently led to the common surge shaft. A comparatively flat terrace was chosen for the headrace tunnels, intermediate reservoir, pressure-shaft and underground powerhouse and tailrace tunnel. An over ground switchyard has also been suitably located. The layout was evolved after in-depth studies.

2.1 BARRAGE, WEIR & HEADRACE

The Allain head regulator, the desilting basins and the barrage has been proposed to be located across the streambed downstream of an existing narrow section of the Allain stream. The head works set up at Duhangan was selected in view of the steepness of the stream. An upstream location was selected for the trench weir due to logistical problems in approach, topographical considerations and the presence of landslide prone bank of the stream in the reaches downstream. Due to the presence of comparatively steep banks at the location of desilting basin, an underground chamber has been preferred for desilting. The alignment of head race tunnels from Allain and Duhangan has been evolved aiming the shortest straight traverse to the common surge shaft. This tunnel has been provided with a bend downstream of the desilting basin and another small bend near the surge shaft to provide for a radial entry. In the case of head race tunnel from Duhangan, an additional bend had to be introduced because of the traversing of the tunnel under Pahali stream, where it had to be deviated and taken upstream to ensure necessary rock cover.

2.2 INTERMEDIATE RESERVOIR & PRESSURE SHAFT

Discharge from the two head race tunnels from Allain and Duhangan is proposed to be conveyed into a common pooling point, the surge shaft located near a relatively flat hill terrace near Hamta village. A diversion from Allain is also proposed to feed an intermediate reservoir. In-depth studies were carried out to optimise the size of reservoir. The junction shaft into which the two tunnels empty out and the pressure shaft take-off point is to be founded in rock to ensure its complete stability. Water from the surge shaft would then be conducted to an underground powerhouse through an underground pressure shaft. The pressure shaft alignment was fixed on the basis of a study of the general terrain of the area of the pressure shaft and powerhouse complex.

2.3 POWER HOUSE & TAILRACE

An underground powerhouse was preferred to a surface powerhouse since the later would require deep excavation and involve extensive stabilisation of steep slopes. The tailrace tunnel would discharge at a location in the downstream reach of the Allain stream with a 75m long open channel. This alignment and location for discharge from the Pelton wheels of the power house was selected after favourable comparison with another alternative as it had optimum construction work involvement and head for power generation. Optimisation studies were carried out for evolving a suitable location for the surface switchyard. The location on the left bank of Allain stream has been selected since it involves

least excavation in comparison with other alternatives and is located in a stable area and is easily approachable from the nearest project road.

2.4 *ROADS, COLONY & OTHER ANCILLARY WORKS*

Roads to approach various project components and colonies for accommodation of the workforce are also proposed as a part of the project. Besides, associated infrastructure for water supply, communication, waste management etc, are also proposed

2.5 *CONSTRUCTION OF THE HYDROELECTRIC POWER FACILITY*

For convenience in construction management, the infrastructure and civil works of the project would be divided into various packages as under:

1. Access roads, bridges, slope stabilization and cross drainage works, permanent and temporary buildings, water supply, electrification of colonies, communication systems, workshops and stores etc;
2. Allain barrage, head regulator, de-silting arrangement & intake structure and Allain head race tunnel (HRT).
3. Duhangan weir, head regulator, de-silting arrangement & intake structure and Duhangan head race tunnel (HRT).
4. Intermediate reservoir, surge shaft and associated works.
5. Pressure shaft and associated works.
6. Powerhouse complex and its associated works including tail race tunnel / channel and switchyard.

The construction works are to be executed by civil contractors who will be allotted work under various packages. The project has been planned for completion in 66 months. During peak construction period, there will be approximately 1500 workers at site.

A map showing location of various project structures and the landuse around them is enclosed.

2.6 *TRANSMISSION LINE*

A 220 kV switchyard will be built on the Northern bank of the Allain stream adjacent to the proposed underground power house. To evacuate power from the project, a new 220 kV power transmission line (of approximately 185km length) will be constructed from the switchyard to south-west of the project site linking with an existing substation at Nalagarh, from where it will be feeding the National Grid. The proposed transmission line would traverse through four districts of *Himachal Pradesh* namely *Kullu, Mandi, Bilaspur* and *Solan*. The line starts from Prini village of *Manali Tehsil* at a height of 1987 m above mean sea level(amsl).