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**Project brief**

# **PAKISTAN'S HEEDLESS HYDROPOWER DEVELOPMENT**

*A Case Study of Neelum Jhelum Hydropower Project*

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## PAKISTAN'S HEEDLESS HYDROPOWER DEVELOPMENT

### A Case Study of Neelum Jhelum Hydropower Project

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## Introduction

Neelum Jhelum Hydropower Project (NJHP) is the fourth largest hydropower project in Pakistan, with a generation capacity of 969 MW. It has been installed on river Jhelum by diverting water from river Neelum as a run-of-river power plant. The project is located in the Muzaffarabad district, Azad Jammu & Kashmir (AJ&K). It started commercial operations in 2018, after over 30 years of gestation period. However, recently, only after 4 years of its operations, the project has encountered a technical fault, resulting in a complete shutdown until the issue is fixed. [9]

The odds of the NJHP becoming operational in few months are also oblique. According to some news sources, the construction contractors who were engaged to fix the technical issue, have abandoned the site on security reservations in the area and the local protests. [3] Water and Power Development Authority (WAPDA), however, has refuted any such news as fabricated, baseless and misleading. WAPDA has claimed that the repair works are progressing without interruptions and are expected to be completed by February 2023. [15]

Nonetheless, appearance of a technical issue and closure of a mega project of this nature, which was completed after an extensive time period and cost overruns, is nothing short of a disaster. This is an alarming situation because the locals are already bearing the environmental and socioeconomic damages from the construction of this project, while the impacts on downstream are not even evaluated.

The project was curated under WAPDA, which has so far not even made the environmental impact assessment of the project public. The concerns become even more grave, as a total of six hydropower projects are planned on river Jhelum. [1] The 1124MW Kohala hydropower project and 700 MW Azad Pattan hydropower project on river Jhelum are expected to come online by 2028 and 2029 respectively.

There has been an extensive focus on hydropower development in Pakistan's long-term energy planning. As per the Indicative Generation Capacity Expansion Plan (IGCEP) submitted by National Transmission and Dispatch Company (NTDC) in 2021, 40% of the 2030 energy demand will be met by hydropower. Hydropower is a renewable energy resource, but the massive investments required for their deployment, extensive delays in projects, and the environmental and socioeconomic impacts of its development hamper their feasibility.

Furthermore, projects that are paced on the basis of their strategic nature while skipping the necessary prerequisites, such as evaluation of their economic, social, and environmental feasibility, do more damage. NJHP is an example of such a project. The construction works on NJHP were expediated in order to obtain water use rights before India could, as India also planned a run-of-river hydropower project upstream on river Neelum (known as "Kishenganga" in India, which would impact river flow downstream.

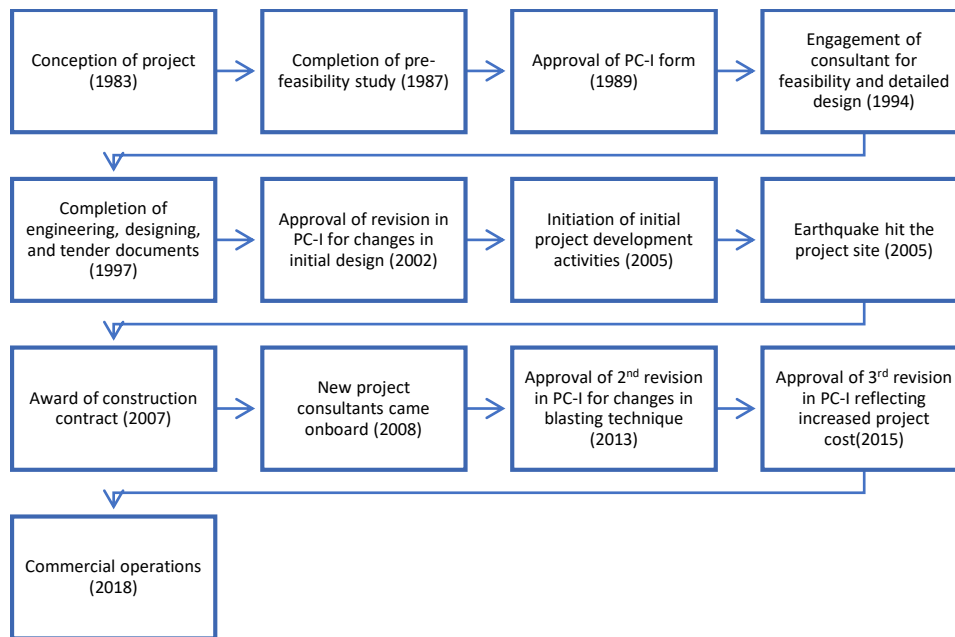
As a result, the impact assessments of the project were not duly carried out and even the mitigation measures have not been implemented to preserve the sanctity of the valley and socioeconomic welfare of the local communities.

This project brief highlights and discusses the environmental and socioeconomic impacts of NJHP on the local communities and river ecology. In order to carry out this analysis, a combination of primary and secondary research has been conducted. People from affected villages of Nauseri, Majhoi, Chatter Kalas, and Muzaffarabad city were interviewed for primary data collection.

## Project Details

The plan for NJHP was conceived in 1983 as Neelum Jhelum Kohala Hydro Complex. As part of the plan, the river Neelum was to be diverted to Jhelum river through 20KM long tunnel with installation of a 500 MW powerhouse along the way. Then in second phase, the water from both these rivers was to be used for 1000 MW power generation unit at lower end of river Jhelum. Based on this plan, a pre-feasibility study was conducted and PC-I was approved in 1987. However, later the project was redesigned to be a single powerhouse with generation capacity of 969 MW and PC-I was then revised accordingly.

During the development of the project, it went through major technical changes twice. The cost estimates were revised more than twice resulting in an increase in the project cost from PKR 15.012 billion to over PKR 506.81 billion. Figure 1 below represents timeline of events until the commercial operations of the project in 2018.



**FIGURE 1: PROJECT TIMELINE UNTIL COMMERCIAL OPERATIONS OF 969 MW HYDROPOWER PROJECT**

## Generation Capacity

The power plant has an installed capacity of 969MW with annual unit production of 5.15 billion kWh.

## Location

The project is located in the district of Muzaffarabad in AJ&K. A diversion dam has been constructed at Nauseri, which is 41KM northeast of Muzaffarabad. The powerhouse is located at Chatter Kalas, which is 22KM south of Muzaffarabad.

## Project Land

The land requirement for the project stood at 4,675 kanals, of which 3,455 kanals of land has been acquired through transfer of ownership and remaining 1,220 kanals have been acquired on lease. [6] The process of land acquisition was carried out by the government of AJ&K through Land Acquisition Collectors (LACs) Muzaffarabad. NJHP and WAPDA were not directly involved in the process, so the funds were provided to AJ&K to enable the acquisitions. A total of PKR 1500 million were spent on land acquisition. [6]

## Project Design

The project has a 160m long and 60m high concrete gravity dam created at the diversion of river Neelum. It has a reservoir capacity of 8 million cubic meter with gross head of 420m.

The power house is located near river Jhelum and built underground at the site of Chatter Kalas. It consists of four turbine generators, each having a generation capacity of 242.25 MW. The water reaches from dam to the power house through 28.54KM long tunnel - 19.6KM twin tunnels from Nauseri converging to a single 8.94KM single tunnel before entering power house.

Water from the power house is discharged into river Jhelum through a 3KM long tail race tunnel. The project is connected to Rawat Grid Station through a 500KV double circuit transmission line.

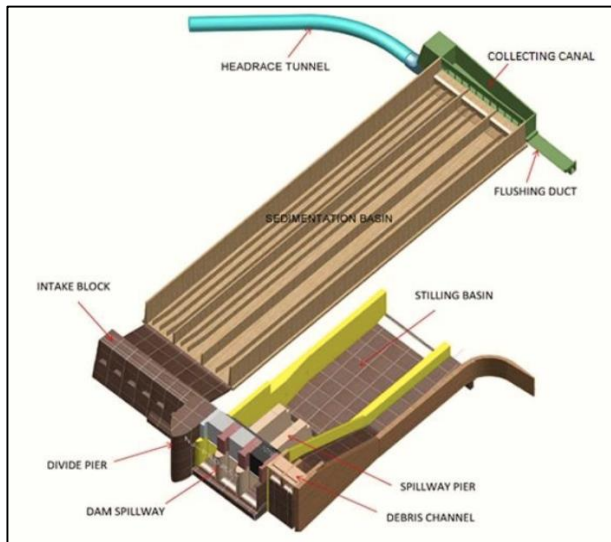


FIGURE 2: DAM DESIGN AT NAUSERI

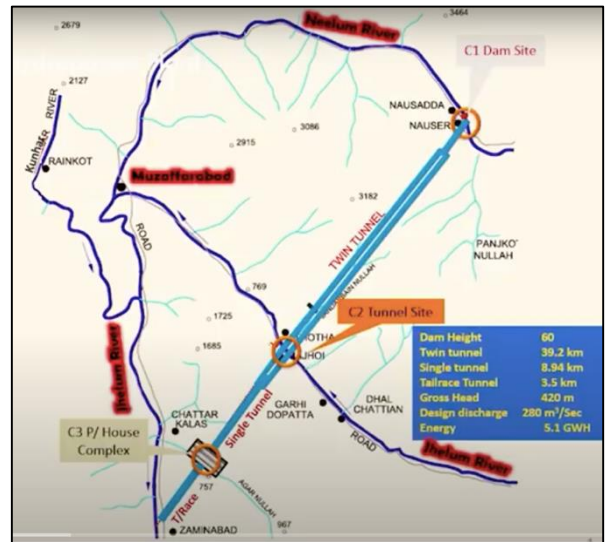


FIGURE 3: PROJECT SCHEME OF NJHP

## Project Geology

The project is located in a tectonically active seismic zone. According to the seismic hazard map of Pakistan, Muzaffarabad and adjacent areas in AJ&K are prone to high peak ground acceleration. The project has been constructed under extremely challenging geological and geotechnical environment, with two branches of main boundary thrust tectonic fault<sup>1</sup> lying underneath. [11] A fault lays under the site of dam and another along the headrace tunnels. [11]

The geological nature of the site should have been taken into consideration since the beginning of the project. According to a performance audit report on the project issued by the Auditor General of Pakistan, the project design was not revised even after the project site was hit by severe earthquake in 2005. Even so, the Engineering Procurement and Construction (EPC) contractor was given notice to proceed based on the pre-earthquake design in 2007, whereas the consultant (owner's engineer) on the project was mobilized in 2008. The changes in design were then made through variation orders by the owner's engineers, resulting in delays and cost overruns.

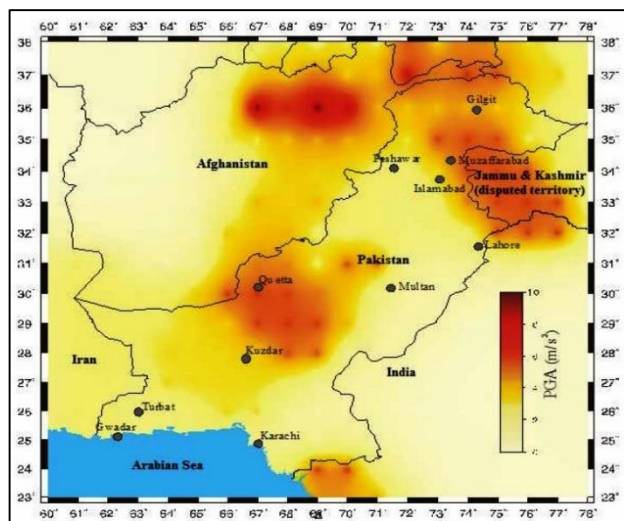


FIGURE 4: SEISMIC HAZARD MAP OF PAKISTAN  
SOURCE: [HTTPS://SEISMIC.PMD.GOV.PK/HAZARD-MAP.PHP](https://seismic.pmd.gov.pk/hazard-map.php)

<sup>1</sup> A fault is a fracture or zone of fractures between two blocks of rock. Faults allow the blocks to move relative to each other. <https://www.usgs.gov/faqs/what-fault-and-what-are-different-types>

## Project Cost and Financing

The financing for NJHP has been very challenging due to the exorbitant cost of the project. The inflation of project costs over the years of development has attracted controversies as well. Certain costs were incurred to cover up for the time delays. The procurement of a tunnel boring machine at a cost of PKR 29 billion is one such example. Then further costs were incurred to assemble the machine, following which there was an additional cost to repair the machine when a rock busted at the site and damaged the machine.

A safer technique of drill and blast was recommended by the owner's engineers but the suggestions were not considered by WAPDA. [2] More such decisions and management inefficiencies have resulted in the increase of project costs. So much so, that compared to the initial cost estimate of PKR 15.012 billion, the project has been completed at a cost of over a whopping PKR 500 billion. According to tariff determination by National Electric Power Regulatory Authority (NEPRA) the project cost is stated to be PKR 506.579 billion. [5]

The funds for the project have been arranged through a combination of debt, equity, and grant. As per the breakup of financing sources, 77% is arranged by debt, 9.3% by equity, and 13.7% by Neelum Jhelum Surcharge (NJS)<sup>2</sup> that is treated as a grant. The breakup of financing and financing sources is as following:

**TABLE 1: NJHP FINANCING ARRANGEMENT**

Amount	Nature	Source of finance
PKR 100 billion	Sukuk (Islamic Bond)	A consortium of 16 banks led by the National Bank of Pakistan
PKR 20.77 billion	Local debt	Cash development loan by Government of Pakistan
PKR 69.306 billion	Grant	NJS in electricity bills @ PKR 0.1/kWh
PKR 46.963 billion	Equity	WAPDA
USD 358 million	Foreign relent debt	Islamic Development Bank
USD 181 million	Foreign relent debt	Saudi Fund for Development
USD 81 million	Foreign relent debt	OPEC Fund for International Development
USD 74 million	Foreign relent debt	Kuwait Fund for Arabic Economic Development
USD 1024 million	Foreign relent debt	China Exim Bank

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<sup>2</sup> The Government of Pakistan imposed Neelum Jhelum Surcharge in 2008 @ 10 paisa per kWh through the electricity bills on the general public up till December 2015. [2]



### Project Consultants (Owner’s Engineers)

A joint venture of international and local firms served as owner’s engineers for the project. The consultants included US-based firm Montgomery Watson Harza, Norway-based consultancy NORPALAN, Int., and Pakistan-based firms National Engineering Services, National Development Consultants, and Associated Consulting Engineers.

### EPC Contractor

The Engineering Procurement and Construction (EPC) contract for the project was awarded to a consortium of China Gezhouba Group Corporation (CGGC) and China Machinery Engineering Corporation (CMEC) in 2007.

### Project Delays

The project has run into frequent delays throughout its development. As compared to envisaged timeline of 90 months of construction post PC-I approval in 1989, the construction on project began in 2008 and it achieved its commercial operations in April 2018. During this period, the date for commercial operations was revised multiple times due to the ongoing frequent technological, financial, and operational delays. The technical changes were made through variation orders. During the construction phase a total of 119 variation orders with the base cost of Rs106.383 billion were issued by the project consultants. [6]

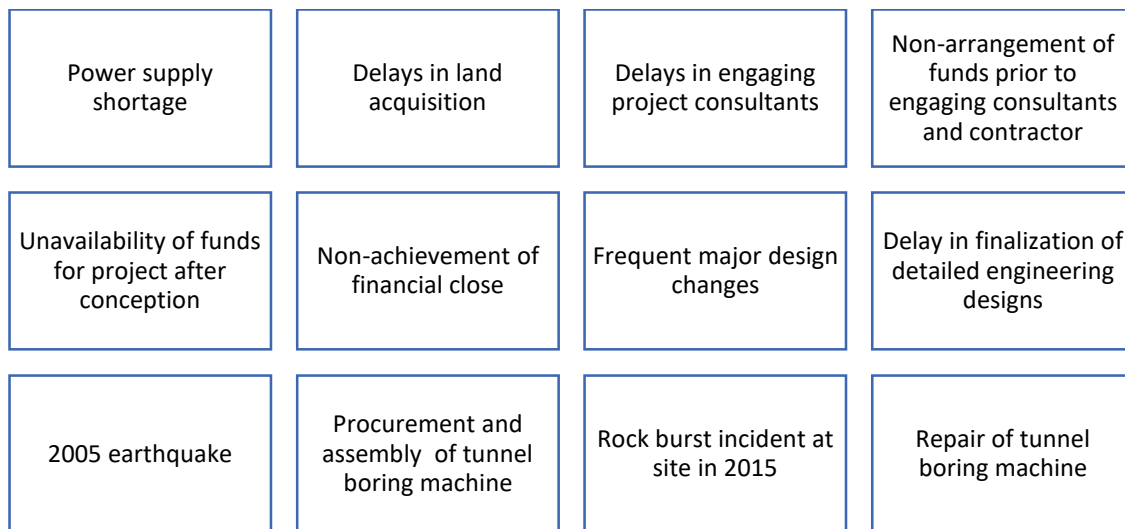


FIGURE 5: MAJOR CAUSES OF DELAYS IN THE PROJECT

### No Transparency in Project Environmental Reporting

The transparency of environmental and socioeconomic impacts of the project has been compromised since the inception of the project. No initial environmental examination was conducted at the time of project conception. An environmental impact assessment (EIA) study was conducted in 1997, which is not publicly available.



In 2009, the Environmental Protection Agency of AJ&K required WAPDA to submit the project's EIA study after the project construction began, to meet the mandatory provision of the AJK Environmental Protection Act 2000. WAPDA was issued a show cause notice on January 21, 2009 to explain their negligence. [7] WAPDA maintained that they were not aware of such requirement and that they had conducted an EIA study and were satisfied with its outcome. [7] Afterwards, copies of the EIA study were submitted to the Environmental Protection Agency to obtain a No Objection Certificate (NOC). But to date, the EIA study is not publicly available.

Some details on environmental and socioeconomic impacts based on the 2011 EIA study and environmental management plan by WAPDA are found in 'watered down' report<sup>3</sup> issued by International Rivers in 2019. The report mentions that the EPC contractor on the project agreed to begin work at the site without having an EIA or a social impact study in place. The report also states that the EPC contractor deflected responsibility for conducting EIA study on project curator i.e. WAPDA.

As per international standards, the affected communities need to be taken into loop from the very beginning of the project with a bi-directional consultation process in place and transparent dissemination of information. But in case of NJHP, earmarking it as a project of strategic nature and the concerns of local communities have been ignored altogether. From the project curator to its consultants and construction contractors, no entity has given due consideration or conducted due-diligence on part of social and environmental impacts of the project.

Even the studies that are said to be conducted and submitted to the relevant Environmental Protection Agency are deficient. As per the International Rivers report, the Environmental Management Plan in EIA study (copies of which they obtained from WAPDA) mostly only states the laws and regulations on drainage, emissions, air quality, noise, and drinking water etc., but no plan or mitigation measures for their treatment. Furthermore, the EIA study does not reflect on impacts such as soil erosion and siltation issues. [14]

Even the conditions set forth in the conditional NOC issued to NJHP have not been fulfilled. No public evidence to date exists that they were met by CGGC/WAPDA. Environmental Protection Agency of AJ&K asked NJHP to file for 'Written Confirmation of Compliance' of conditions in NOC as well as mitigatory measures in EIA report and Environmental Management Plan. [10] However, even after issuance of such notice, NJHP did not file for this mandatory confirmation of compliance and began project operations in violation of existing laws. [10]

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<sup>3</sup> The report discusses social and environmental policies of hydropower projects, and presents NJHP as one of the case studies. The case study has been produced after visit of the project site and adjacent localities by their team in 2016.[14]

## Socioeconomic and Environmental Impacts of NJHP

### Impacts of Land Acquisition

The land acquired for NJHP included residential, commercial, and agricultural land. The land in the areas of Chatter Kalas and Nauseri was bought, whereas the land at Majhoi was rented for a specific period of time to assist in the construction work. The process of land acquisition was carried out through Land Acquisition Collectors (LACs) of the district administration of AJ&K.

Initially, a three-year agreement was done to rent the land in Majhoi. It was then renewed after regular intervals. But even after the construction work concluded in 2018, the land has not been returned to the locals, with no rents being paid to them since 2021. The land in Majhoi was used mainly for agricultural purposes with no residential settlements in the area. As per locals, they used to crop rice and graze their cattle in that area. But they were signed into an unfair contract, which set trivial rental compensation at a rate of PKR 25,000/kanal/year. They protested for better compensation and changes were made in the rental documents that the rents will be increased by 25% on annual basis. However, as per locals, in reality the agreements were not upheld.

The land in the areas of Nauseri and Chatter Kalas was used for residential, agricultural, and commercial purposes. Rice, wheat, and maize were the major crops grown on the land. Fruit trees were in abundance which included apple, apricot, walnuts and plum trees. Beside these, vegetables were also grown for domestic as well as commercial purposes. Village markets including hotels were part of that area. The land in Nauseri and Chatter Kalas was bought by the administration at the rate of PKR 200,000 – PKR 300,000 rupees per kanal. Considering the good productivity of the land, the locals were not fairly compensated and forced into selling their lands. Some cases are still pending in High Court and Supreme Court of AJ&K related to land compensation.

People in the affected villages were not highly educated and mainly depended on agriculture, livestock, small businesses, and fishing before the construction of the power plant. Almost 75% of the locals relied on these sources of income for sustaining their livelihoods. The forced acquisition of land and that too with unjust compensation has deprived the locals of their sustainable sources of income.

### Resettlement of Affected Households

The local people were forced to leave their houses. People who were living in Nauseri at that time said that the police force (not less than 500 in number) attacked the residents one night and vacated the whole area. They were moved to plots of 2.5 marla to be shared by two to three families each. The locals added that it was a long time ago and at that time, they somehow adjusted in such a small space. But now after 14 to 15 years, their families have grown in numbers and it is extremely difficult to continue to live like that. Furthermore, because of a blow on their livelihoods, they are not left with enough capital to build their own houses. Even the allotted 2.5 marla plots have not been officially transferred in their names and no proper documentation exists to such effect.

The affected households were not properly resettled either. No consideration had been given to how they will sustain in the long run when the trivial compensation they received for their lands will be completely consumed.

As per an expert, there is no law in place that addresses resettlement of affected households and the compensations they receive are as per the Land Acquisition Act, which sets very low compensation rates. The Land Acquisition Act 1894 (“Act”) section 11, empowers the Land Acquisition Collector (LAC) to ascertain measurements, value, claims, and award of the land. The decision of the amount of compensation rests on the ‘opinion’ of LAC. [13] Even the process set by this Act to evaluate value of the land is not fully objective. There is no third-party land valuation or analysis in place that determines the future value of the land based on potential productive uses of the land by the end of project life. The Act refers to prospective land sellers as “interested persons”. But how the people recall is that the land was forcefully acquired from them.

### Impact on Livelihood

The local communities were dependent on agriculture, fishing, sand, gravel mining, and small businesses for income generation. For people who were dependent on agriculture for living, they lost their source of income after their land was acquired or rented.

Locals were dependent on fishing as a source of income mostly in the summers. During summers, the fish gather at the shallow banks of the river for feeding. Fish carries commercial importance for locals, as the tourists going to Neelum valley pass through Muzaffarabad and often consume fish during their short stays. So, it is sold to the hotels and local markets.

However, after the project construction began, the contamination of river water with poisonous chemicals has affected the fish population in the river. Although fishing is not a continuous source of income throughout the year, the reduced population is impacting the disposable annual income available to local communities engaged in fishing.

Sand and gravel mining<sup>4</sup> is another prevalent source of income generation for local communities. This income generation activity is usually carried out during the months of October to March, as it is easier to mine sand along the exposed beds during low flows. [8] These materials are used for construction of houses and other buildings. Particularly, the people of a village Chella Bandi and adjacent villages used to gather sand and gravel at river bank and sell them to people for construction purposes. With construction of dam at Nauseri, sand and gravel flow downstream has been affected in addition to the decreased water flow. Thus, this source of income has also been negatively impacted.

Besides this, local small-scale flour mills were using watermills to grind grains. Small water diversions from river used to drive the watermills. However, after the project construction began, a boundary wall was

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<sup>4</sup> The mining techniques mainly sand dredging is crude: The sand is mined using shovels and spades before being loaded onto a trolley cart and transported to the roadside. [8]

built to cover the project structures along the river. Thus, this source of income was also impacted as well as the people who were dependent on these mills for their flour requirements.

Small businesses in Chatter Kalas and Nauseri were also demolished and people working there became completely jobless. They were compensated for removing their businesses from the land required for the project but the compensation was not enough to give them a head start elsewhere. Rather, the money got consumed in their daily sustenance.

The employment opportunities created during the project construction were also short-lived. At the time of project construction, affected local community members were employed as labor. More than 1,000 people got jobs and were getting paid up to their expectations. But as soon as the construction phase got completed, their jobs were terminated. The promises were made to the locals that they will be employed on permanent basis for at least up to grade 4 employees. However, when those work posts were filled, preferences were given to people from Punjab and Sindh. Even the Imam of the mosque is also hired from Khyber Pakhtunkhwa.

Markets in Majhoi also flourished during the construction phase, as manpower was high at that time and especially day to day usable items were in high demand. Vehicles were also rented from locals at good rates. But these benefits only lasted during the project construction phase.

Moreover, during the floods, the trees and logs flow downstream along river Neelum, which locals used to collect and sell the wood in the market. This was an additional source of income for them, which they could no longer benefit from because of the diversion due to the dam.

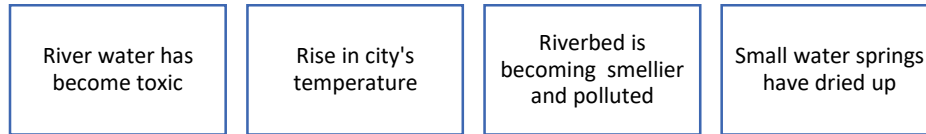
Muzaffarabad city is a well-known tourist attraction spot. A number of locals living in the area were dependent on the river water as they had created small picnic spots on the bank of river Neelum for the tourists. The cool weather and the aesthetic views of along the river made these popular spots for tourists, where the locals had set up small sitting areas and food stalls. All this contributed towards their living and generating income. But with diversion of river Neelum due to the dam, those tourist spots have lost the charm, which is why the tourists no longer prefer them.

### Impacts of Decreased River Flow

From construction of multiple hydropower projects, the flow rates in the combined Neelum and Jhelum rivers are predicted to drop from around 650 cubic meters per second to less than 100 cubic meters per second. [8] This will reduce the water necessary for dilution of industrial, municipal, or domestic waste by over six-fold. [8]

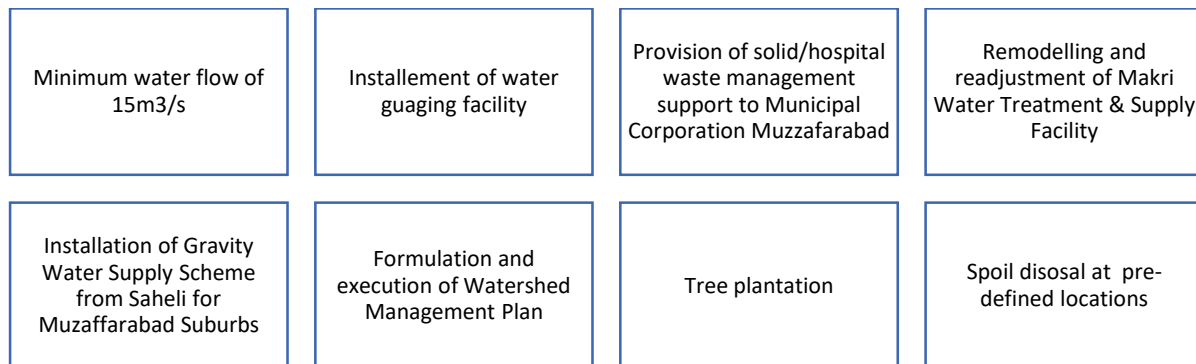
Particularly in the case of NJHP, the consultants who were engaged before the project initiation recommended the river flow of a minimum 20 cumecs for drinking and sustainable ecological system to minimize the impacts on communities living in the areas from Nauseri to Domail. The results were drawn on basis of population estimate of about 600,000 residents in the city of Muzaffarabad by 2050. This did not take into account the influx of non-residents. The population in the city rose to around 300,000 only in 2018 and the river flow to the city is even lower than the minimum requirements, thus, creating challenges for a healthy living.

No mitigatory measures have been put in place either to address the impacts of the decreasing river flow. Locals using the water for drinking purposes are getting stomach and skin diseases from using the river water. This is because the water has become toxic from release of chemicals in the river. Some animals have also died after drinking the river water.



**FIGURE 6: IMPACTS OF DECREASING RIVER FLOW**

While the river flow has decreased, the solid waste and sewage disposal in the river is still happening without any treatment, leaving the riverbed more polluted, smellier, and rendering vicinities unhygienic and susceptible to various diseases. There are 16 different outlets for sewage disposal, where the treatment plants should have been installed as the EPA set this requirement as a precondition in its conditional No Objection Certificate (NOC). But no such conditions have been met by the project company/WAPDA. Figure 7 shows below the relevant conditions set forth in the conditional NOC.



**FIGURE 7: CONDITIONS OF NOC ISSUED BY EPA AJ&K TO NJHP**

### Impact on Aquatic Life

Hydropower projects impact the aquatic life more significantly than the terrestrial flora and fauna. [8] The construction of reservoirs and the plant operations, in which flow of water is varied in the river according to seasonal patterns, have many impacts on the river fish that are often overlooked. Particularly, when multiple hydropower projects are planned on a river, the vulnerability of aquatic life grows considerably.

The confluence of river Neelum and river Jhelum provides natural habitat to various fish species like Bhed catfish, flathead catfish, Nalbant's loach, Arif's loach, Sattar's snow trout, Chirruh snow trout, Kunar snow trout, Kashmir hill stream loach, Pakistani baril, Himalayan catfish, Kashmir latia, ticto barb (Puntius ticto), spotfin swamp barb (Puntius sophore), Pakistani Labeo, Reba carp, sucker head, and Indus garua, which have been found in these rivers. [8] Most of these fish species have commercial importance and some are more vulnerable than the others.

This fish population zone at the confluence of river Neelum and river Jhelum at Muzaffarabad is moderately sensitive to hydropower development. Given their role in the lives of local communities as a

source of energy and a source of economic wellbeing, their population should be conserved and a conducive environment shall be maintained for their breeding. However, people in the local communities have shared that the fish population is declining because of degraded water quality. The sedimentation erosion is also one of the causes for their declining numbers as the reservoirs build for power generation limits the amount of sediments available to the river downstream. Mostly the sediments get trapped in the reservoirs, unless they are flushed downstream frequently and regularly.

### Impact on Natural Environment

Before the inception of the project, the area under consideration for construction of the project was lush green comprising green fields, trees, fresh water streams, clean water, and fresh air. The picturesque area also offered a healthy environment for the residents.

But when the project was installed on this green mountainous terrain, thousands of trees were unrooted, lush green fields were wiped off such that the natural environment turned into a concrete jungle. Authorities vowed to plant as many trees as possible to restore the natural beauty of the area but they were all false promises. It's almost four years since the plant is in working phase. Yet till today no plantation activity has started, which is quite alarming.

As a result, the overall temperature of the city and the adjacent villages has also risen by 4-5° Celsius. [12] The respondents from Chatter Kalas also observed a significant change in temperature in the area due to installation of large number of air conditioners in the colony constructed by project authorities.

Populations living along riverside including Chella Bandi used to visit river for various day to day activities or just to relish the beauty of the flowing river in the backdrop of the majestic Himalayas mountain range. Now the water is not enough to carry out day to day activities. The villages have also become more congested and noisier, as the people are migrating to central city and suburbs in search of employment and pollution has also increased because of increased traffic.

The respondents from Majhoi also stated that soil quality has been affected due to the contamination of soil with poisonous chemicals during project construction activities. They say this from their observation of the leased land where since many years now no vegetation or herbs grow naturally. They are afraid that when land will be returned to them, it will not be capable of agricultural activities.

### Law and Litigation Situation

Since the commencement of project development activities, several protests have happened and litigation cases are in court. They are related to land compensation issues, resettlement issues, employment quotas, and release of water at appropriate flow downstream from Nauseri. Release of minimum recommended water flow downstream from Nauseri was one of the pressing demands of the affected local communities as their day to day activities were being impacted. But only after they held continuous protests, the high court of AJ&K directed NJHP to increase the basic necessary water flow to the city.

A campaign also began on "Save River Save Muzaffarabad" in 2018 which set forth demands for upholding the mitigation measures in the conditional NOC given to NJHP and release of 60% of water in river from Nauseri to restore the beauty and aesthetic value of Muzaffarabad. Some protests happened to preserve

the cultural sanctity of the affected areas. At Chatter Kalas, people protested against moving a graveyard and a mosque and they succeeded. They also filed their resettlement disputes in the high court, but those cases are still unresolved. [14]

## Impact on Physical Mobility

The mobility issues existed especially during the construction of NJHP. The area of Chatter Kalas is a plain valley surrounded by mountains. Before the inception of project, the people used to easily move from mountain to mountain and nearby villages via valley following short routes. Now after the construction of power plant and protection wall, their movement is totally disturbed.

A respondent mentioned that the government school is situated on the opposite side to their residential area. Before occupation of the area by authorities, they could freely move to the valley and took their kids to the schools. Now the mobility is restricted due to protection wall and they have to follow main roads which has increased their distance. They have to arrange conveyance for their kids to reach school, which costs them Rs.4000/child. As the people are already hand to mouth there, it is indeed a highly frustrating situation for them. No small village markets are available now and people have to travel long distance than before to the nearby village markets to meet their daily needs.

Meanwhile, people at Majhoi were quite dependent on livestock. Animals including cows, buffaloes, sheep, and goats were their source of living. People used to take their animals to meadows for grazing and then to the river for water consumption as there was no water system at their houses to meet the needs of their animals. Now the land of meadows is occupied by NJHP and they have covered the area by constructing a boundary wall. Hence, the grazing routes of the livestock has been blocked. As a result, some people managed to take long routes to reach waterbody but most of the people sold or slaughtered their animals who couldn't bear the difficulty.

The routes of women collecting water for their domestic needs have also increased. They used to collect water from fresh water streams for drinking and domestic purposes. But the fresh water springs dried up due to tunnel construction and now the local women travel more than 3KM distance to fetch water. [4] The people at Chatter Kalas especially highlighted that they have to even purchase water from a village approximately 8KM away.



## Key Takeaways

There are many lessons that can be learned from NJHP — the do's and don'ts. The project was built after extensive cost and time overruns that the performance audit report by the Auditor General of Pakistan attributed to frequent managerial inefficiencies. There was no compliance with the stated laws and the planning on part of remedying impacts from the project towards the local communities, natural environment, and river life was also negligible. In fact, there was no basin wide planning process or cumulative impact assessment done by WAPDA, or the project EPC contractor.

The assertions made to benefit the local communities were not brought to reality either. After four years of project commercial operations, there are no vocational training schools built, no water supply systems have been improved, and no wastewater treatment plants have been installed. Local communities expected that this project might bring them prosperity as it happened to the people in the Mirpur district when Mangla Dam was constructed. But, only to their disappointment, the people today are struggling more than before the construction of NJHP. They no longer own the land they used to, they sold their livestock, and the compensations they received were not adequate to earn them a secure and sustainable livelihood after displacement.

It is imperative that the concerns of local communities be heard and resolved before such projects get green light. In the case of NJHP, it became apparent that the EIA studies were not done timely, and not with adaptive tendency. The flexibility to modify design, location, other parameters, or not pursuing the project should be there as the results of an objective environmental and cumulative impact assessments unfold. These mega projects, which have the potential to impact lives of the masses, should be carried out with complete prerequisite assessments in place, whether strategic or not. Local communities should be involved in the project with complete transparency and sharing of information in a language that they can understand.

After the NJHP, the processes have been amended as such that now the Private Power Infrastructure Board require an Environmental and Social Impact Assessment Study to be carried out along with feasibility study of the project, and making strong linkages between the two. [8] The institutions standing should be strong to impose penalties in case of non-compliance with laws of the state, as well as measures should be taken for strict compliance monitoring. The responsibility for conducting environmental impact assessments and required mitigatory measures should be on all key parties to the project to the extent of their scope, so that no can absolve from the implications or can defer liability on others for adverse impacts. Since hydropower development is an integral part of Pakistan's energy mix, it should be ensured that it is not prospering at the expense of local communities or disruption of natural ecosystems.

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