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**The Devastating Impact of Ghazi-
Barotha Project on Downstream
Water Resources**

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The Devastating Impact of Ghazi-Barotha Project on Downstream Water Resources

Dr Mohammad Zubair Khan¹

Abstract

The Ghazi-Barotha Project as currently planned will cut off almost the entire downstream water below the proposed barrage for seven months during the year, reducing the flow to less than three per cent of the current flow in the river during the low-flow season. This will have devastating effect on the economic, social and environmental life of the region with severe social and political repercussions. The Project will completely destroy a 120 square kilometre pristine natural wilderness downstream of the barrage and upset the ecosystem along the Indus. With only minor modifications in the operational design of the project and a marginal impact on the power generating capacity, large gains can be achieved in downstream environmental, natural resource and social objectives. The modifications will require that the minimum assured water releases from the barrage during the low-flow season do not fall below 425 cumecs on average during any 10-day period (the lowest current flow in January) and contain some additional water in the dry and hot months of the low-flow season.

Introduction

The Indus river between Ghazi and its confluence with the Kabul river is probably one of the cleanest stretches of river in the world at these latitudes and altitudes. It flows through a pristine, unviolated forest that stands threatened by a rectifiable flaw in the design of a hydropower project.

As currently planned, the Ghazi Barotha Project will cut off almost the entire downstream water flow below the proposed barrage for seven months during the year, reducing the flow of the river to less than 12 per cent of the current flow in the river during the low flow season. The environmental impact assessment in the project feasibility report, and the subsequent supplementary and additional studies conclude most unconvincingly that this drastic reduction in water flow will have no significant impact on the environmental, economic and social life of the downstream area. In contrast, this paper draws attention to the devastating effects of the project on downstream water resources, especially for residents of the right bank. The project, as it is now designed, will have serious environmental, economic and social consequences on the downstream area upto the confluence of the Indus and Kabul rivers. The political fallout too will inevitably be severely negative.

WAPDA has pushed the project as an example of its concern for the environment and related social issues. Moreover, according to the feasibility report, "this is probably the first project of its kind where engineers, economists and environmentalists have worked together as an integrated team....." ²In view of this, it is hoped that the issues raised in this paper will be appropriately addressed by the competent authority, and remedial action taken to modify the operational design and mitigate adverse effects. The time to address these issues is now.

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1. The author lives on the right bank of the Indus, downstream from the proposed barrage.
 2. Environmental Assessment, Vol. 7, Feasibility Report.

The feasibility report and supplementary studies of the Ghazi Barotha project are voluminous documents, recognizing the reduction in the downstream flow of water as a major consequence of the project. However, the reports underestimate the impact of the reduced flow on human consumptive and non-consumptive use of water, the effects on animals, natural vegetation, irrigation, fisheries and water quality. The reports also completely ignore the industrial area at Gadoon-Amazai and its related pollution of water resources on the right bank, and do not assess the impact on groundwater of the right bank. Above all, the reports ignore the impact of the project on one of the most beautiful and unviolated forests in Pakistan, about 120 square kilometres in size, lying between two densely populated areas in the districts of Swabi and Attock. Finally, the reports ignore the impact on the quality of life on the banks of a clean river.

In this paper, all data, descriptions and information about the project have been quoted from official reports and sources provided by the project.

The Area of Adverse Impact

The river reach between the barrage site and its confluence with the Kabul River, is about 41 kilometres long. The Indus river bed in this stretch is 2.2 km to 4.5 km wide, with channels meandering across it. The bed is composed of alluvial soil, coarse sand, gravel and cobblestones. The braided bed contains many permanent islands which support thick vegetation, trees, pasture, and some croplands. These islands are not inhabited by people and the proprietary rights belong to the villages located along the river banks. There are no significant permanent tributaries. The Badri River on the right bank discharges about 0.5 cumecs³ of permanent flow some 23 km downstream of the barrage site. There are also numerous nullahs that enter from the hills to the south-east. A significant nullah known as Topi Khawar, which drains the industrial area at Gadoon Amazai, also flows into the Indus on the right bank about 10 km downstream of the proposed barrage site. This nullah - although it appears in the maps attached to the Feasibility Report - has not been mentioned in the text.

The most striking feature of the riverbed area in this reach is its pristine natural beauty. The 120 square kilometre area is a unique stretch of natural wilderness lying in the middle of two densely populated areas. In the North is the district of Swabi, and to the South is Chach and the towns of Kamra, Mansar, etc. The chain of islands have remained untouched only due to their inaccessibility as a result of the river flow. The water is turquoise blue studded with lush green islands in the summer and golden grasses in the winter.

The endangered area is also notable for its biopool. It is home to many animals and birds including the river otter, turtles, jackal, wild boar, hare, porcupine and a variety of snakes. There are two types of otter found in the NWFP; both are on the list of internationally threatened mammals. The area is inhabited by grey and black partridges, quails and a host of aquatic birds. It provides a resting ground and a seasonal refuge to a large variety of migratory birds, including cranes, geese, ducks, raptors and passerines.⁴ Other winter visitors include sand grouse and some rare species from the uplands in winter as well as the orange bullfinch. The riverine area is a most suitable habitat for visiting white-headed ducks and sociable plover - both of which are also on the list of internationally threatened birds.

3. cubic metres per second

4. Environmental Profile NWFP, May 1994.

With the destruction of natural habitat on both sides of the river due to population encroachment, the area provides the last refuge for scores of bird species that nest on the islands while feeding in the fields on both sides of the river. The aquatic life in the river is principally fish, although fresh water turtles and the river otter can still be found. There are 39 species of fish found in this reach of the Indus river, the most popular of which are Masher, Chiana and Mallah. Among the other species which thrive here, the fresh water eel is prominent. There is uncontrolled fishing along the river and the use of dynamite sticks in pools of quiet water whenever the river flow has been stopped at Tarbela for a short period of time, is common. Yet there are abundant fish in the river. Fish in the village markets along the banks constitute a regular part of the diet in the region. The natural vegetation in the area includes thorn forest, including various species of Acacia, Shisham and Ber and a proliferation of reed grass. Fluctuations in the underground water table have limited the growth of forest to under 10 metres.

The life of the people of the area is inextricably tied to the river. They utilise the water for drinking, washing and irrigation purposes; they derive income or subsistence from fishing; they depend on fuelwood from the forest on the islands; they use the grasses for thatched roofs and the riverain area for recreation and camping. But above all they relish the sheer pleasure of living on the banks of a large clean river in the manner of their ancestors. The Indus river in this reach is an irreplaceable asset of the people of the region, and of all the people in Pakistan who have yet to discover its pristine beauty.

The Ghazi Barotha Project

The Ghazi Barotha Project intends to utilize the fall of the Indus river between the tail-race of Tarbela Dam and the confluence of the Indus and Haro rivers to produce electricity. The Project will comprise of three basic components: a diversion barrage on the Indus river seven km downstream of Tarbela dam, a power channel about 52 km long, and a 1,425 megawatt (MW) power-generating complex on the left bank of the Indus river downstream of the Attock gorge. The barrage will be located just upstream of the left bank village of Ghazi and it will impound a pond. Water from the barrage pond will pass through a regulating headworks structure into an open power channel with a design capacity of 1,600 cumecs. The power channel will terminate in a bay near the village of Barotha, from which water will flow through penstocks to a powerhouse and thence through a tail-race channel, 2 km long, discharging into the Indus river.

The inflow to the barrage pond will consist almost entirely of releases from the Tarbela Dam. The releases from the Tarbela reservoir are governed by the requirements of the downstream irrigation system, and determined on a ten-day pattern. Reflecting this and variations in the natural inflow into Tarbela, there is a strong seasonal fluctuation in the flow of the river downstream of Tarbela. In general, there is a cycle of low-flow and high-flow periods during the year. The low-flow period normally extends from mid-October to April, with the lowest flow occurring during the month of January. There being no significant tributary in the river reach between Tarbela and the confluence with the Kabul River, the low flow in the Indus is essentially what is released from the Tarbela reservoir through the irrigation and power tunnels.

The Project is designed to divert most of the low flow into the power channel via the barrage. From mid-October through mid-May some surface flows are expected to remain in the river reach between the barrage and the Kabul river. These will include sporadic small releases, seepage from the barrage pond, leakage at the barrage gate, groundwater outflow from the left bank and flow from Badri Khawar, a tributary on the right bank. During the lowest flow two ten-day periods in January, these are estimated to

add up to about 28 cumecs downstream of the barrage. Currently, the average flow during the same two ten-day periods is 425 cumecs.

The planned average water release during the leanest 130 days⁵ from the barrage at Ghazi Barotha in the low-flow period will be about 60 cumecs or 7 per cent of the existing average flow of 830 cumecs during the same period. Over the 230-day low-flow season from mid-October to mid-May, proposed releases are less than 12 per cent of the existing flow downstream of Tarbela.

Effects of the Project

This note focuses only on the direct impact of the Project on water resources in the downstream area upto the confluence of the Indus and Kabul rivers. The barrage at Ghazi will drastically reduce the flow of water in the river during the low-flow season from mid-October to mid-May. During the high-flow season, the river downstream of the barrage will receive the majority of the flow from Tarbela.

The political and social implications of access to water resources have been acknowledged by the project: "Control over local water resources has always had important political and social implications, and any alteration in supply, access, or quality can have reverberations throughout the local society, town or indeed, the region. The Indus river and its village waterfronts have always been "socially neutral" areas, providing unrestricted access to the river stream for transportation, for water and all its uses, and for social intercourse". In recognition of this, it is inevitable that a drastic reduction in water flow below the historical low, will have severe political and social repercussions. The concerns of the local population may not be visibly tied to economic considerations, but rather stem from their historical access to the river throughout the year.

Even though the effects of the changed pattern of river flow on the social and ecological conditions are discussed extensively in various reports, they have been underestimated or not fully recognized:

Effects on Groundwater

The effect on groundwater on the right bank has been totally omitted in the reports. This will need to be investigated before work on the Project commences. Considering the gradient in the region, it is feared that the water table will recede during the seven months to below the lowest existing level, drying up all wells along the river. It will also have a severe impact on the moisture content in the soil as the area is mostly sandy alluvial. The impact on cultivated land and forest is inevitable.

Effects on Local Population

The Project's impact on human consumptive and non-consumptive use of water has been dismissed in the reports since many of the villages on the right bank are located some distance from the low-flow water. This summary treatment of the subject is unjustified. The location of these villages is a reflection of the previous flood capacity of the river, and not of the irrelevance of the river water to the lives of the people.

5. December 10 to April 20.

The people of the area have lived along the river for centuries. They depend on it for drinking, washing and irrigation. They come to the river for recreation, fishing and social gatherings. The people who frequent the river regularly come from villages within ten kilometres of the river. Their dependence on the river cannot be overstated.

Effects on Biopool

The effects on animal life will be felt most strongly through the Project's impact on water quality, vegetation and habitat. Reduced flow will have a very severe impact on aquatic life. The few otters and turtles that still survive in the river are likely to be the immediate targets. Fish will not survive one season of a seven-month water cut-off, which will turn the river into a string of pools. Netting and dynamiting of pools will annihilate the entire fish population, if not the concentration of pollutants from industrial and sewage run-offs. The decline in the water table will leave no moisture in the sandy alluvial soils of the islands in the riverbed, drying out the existing vegetation, especially in the dry months of early summer April-May. Most importantly, the existing natural wilderness which has remained intact only due to the limited access provided by the flowing river, will be invaded by people from the dense populations on both banks of the river. The impact on the ecosystem will be devastating: the natural habitat of all the animals and birds in the 120 square kilometres will be threatened and destroyed in a short period.

Effects on Water Quality

Project reports assert that the quality of river water is related to the volume of flow. This is true, but there are two aspects of the flow in the Indus at this point which require careful consideration. First, the braided nature of the riverbed in this reach makes theoretical calculations of the concentration of pollutants in the total flow of the river misleading, because the pollution may be causing more damage in the channel where it is being released, than in the rest of the river. Second, the sporadic release of water from Tarbela, and in the future from the Ghazi barrage, will allow pollution concentration to be periodically very high between water releases, causing severe ecological damage.

In addition to these considerations, the calculations of water quality carried out by the environmental studies are seriously flawed for two important reasons. First, these studies make no recognition of the existence of Gadoon-Amazai industrial area, where pollution recently has become so threatening that the Government of NWFP has commissioned a special study to assess it and curtail it. Interestingly the reports also fail to mention the Topi Khawar which drains the industrial area. Related to this, the water samples taken on the right bank were collected upstream of the Topi Khawar and hence failed to report industrial pollution in the river. There is urgent need to re-examine pollution in the river related to Gadoon-Amazai, especially since diseased fish have been observed in the river downstream of the confluence of Topi Khawar with the Indus. The Project's environmental impact assessment studies have also omitted the impact of numerous nullahs which flow into the river on the right bank carrying agricultural run-offs that are damaging to the river.

Second, notwithstanding the need for examining river pollution, the reports have faulted in calculating the water requirement by treating river water in the same manner as piped water and have estimated water needs by projecting population and their daily needs. The studies seem to imply that the last person downstream will draw the final bucket of water and leave the river dry!

Design Modification and Mitigating Measures

A theoretical estimation of the optimum water releases from the barrage to nullify the effects of the Project - such as the one given in the environmental impact assessment reports - is not possible. There are many non-quantifiable elements which defy precise measurement and there are numerous factors which have not been included. It is safer and better to begin with the objective that the Project should not adversely effect the economic, social and environmental life of the downstream area. Historically, the people, animal life and vegetation have learned to live with the January low-flow season. Any reduction below that level will impair their life in a way that cannot be recompensed. However, the lowest flow in January currently prevails for only one month and is offset by winter rains. The Project intends to reduce the flow for seven months, which include some very dry and hot periods. The water releases in those months would have to be over and above the January low to compensate for weather conditions. Water releases should thus not be, on average, below 425 cumecs in any ten-day period and an average of 500 cumecs during the seven-month low-flow season.

This is the minimum water release that will save the region from deterioration and be socially and politically acceptable to the people along the river. The Project would have to provide legal guarantees of the minimum assured water releases to set aside fears of policy reversals in the future.

This important mitigating action will require some operational redesigning of the Project and water releases from Tarbela. The impact on power-generating capacity at Barotha is unlikely to be significant since the generating plant is currently planned to operate much below capacity during the low-flow season. The minor loss in energy-generation can be more economically met through more efficient thermal generation, reduction in transmission losses and demand-side management measures in the rest of the country.

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