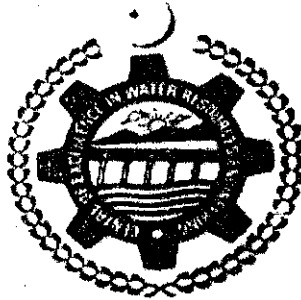


THESIS

**EVALUATION OF VARIOUS MANAGEMENT PLANS
TO MITIGATE WATER QUALITY EFFECTS IN INDUS
RIVER FLOOD PLAIN, DOWNSTREAM OF GHAZI**



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ABSTRACT

The Water and Power Development Authority (WAPDA) has recently implemented the Ghazi-Barotha Hydropower Project (GBHP) on the Indus River to utilize the hydraulic head for power generation that is available between the tailrace of the Tarbela Dam and the confluence of the Indus River with Haro River. In this reach the Indus River drops by 76 m in a distance of 63 km. This is solely a power generation project with an installed capacity of 1450 MW.

The GBHP Project has three main components, i.e. a barrage located about 7 km downstream of Tarbela dam forming a pond, a 52 km long concrete-lined power channel to divert the flow from barrage to a power complex, which is located near the confluence of Indus and Haro rivers. The inflow to the barrage pond will consist almost entirely of releases from Tarbela dam. During the low-flow period (from early October to mid-May), when Tarbela releases will be less than the channel capacity of 1,600 cumecs, a reduced flow of only 28 cumecs will be released D/S of the barrage.

The increase of contaminants concentration due to reduced flows may restrict the use of river water for aquatic life especially fish. This study was designed to model the behavior of contaminants transport in River Indus from D/S of the Ghazi to the confluence of Indus River with Kabul River (about 40 km stretch). For this purpose QUAL2K model developed by USEPA was used.

For simulation purposes three scenarios were developed to study the worse conditions of water quality in Indus River in the low flow period. Scenario-1 was run with the present conditions of wastewater quantity and quality. In Scenario-2, flow was the same but wastewater quantities were projected upto 2063 with same wastewater quality as in 2002. In case of Scenario-3, it was assumed that the wastewater quality will be further deteriorated to the extent that the BOD value will be in the range of 80 mg/l in the project life i.e. 2063. The river flow and wastewater quantities were kept same as in case of Scenario-2. The model results are showing that the DO and BOD will remain within the permissible limits (i.e. DO >4mg/l and BOD <8mg/l) in case of all three scenarios.

In case the BOD value of wastewater quality further increased above 80mg/l as at the time of feasibility study of the project it was above 400mg/l, the quality of the Indus River floodplain will deteriorate and it may endanger to the aquatic life. To keep the BOD value of wastewater in the range of 80 mg/l proper mitigations and management plans have been evaluated. These includes provision of Wastewater Treatment Facilities like Treatment Plants for Industrial Estates and big Towns/Cities along the drains/nullas and Oxidation Ponds for the relatively small towns/villages which are directly disposing off their wastes in the rivers. In case of villages/towns which are sufficiently away from the river and these are disposing off their sewages into the drains/nullas, to keep the BOD below 80mg/l, Reed-Bed Lagoons and Reed-Bed Channels are proposed in such places.

If the Sarhad Development Authority (SAD) developed Industrial Estate and even BOD value will keep in the range of 80 mg/l, the river water quality may be affected. In that case release of excessive water at D/S of the barrage is proposed as readily available mitigation measure.