

**PAKISTAN**  
**PUNJAB BARRAGE REHABILITATION & MODERNIZATION PROJECT**

**PROJECT INFORMATION DOCUMENT (PID)**  
**APPRAISAL STAGE**

Report No.: AB1133

<b>Project Name</b>	Punjab Barrage Rehabilitation & Modernization Project
<b>Region</b>	SOUTH ASIA
<b>Sector</b>	Irrigation and Drainage (60%); General Water Resources (40%)
<b>Project ID</b>	P088994
<b>Borrower(s)</b>	GOVERNMENT OF PAKISTAN
<b>Implementing Agency</b>	Irrigation and Power Department, Punjab Province
<b>Environment Category</b>	<input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> FI <input type="checkbox"/> TBD (to be determined)
<b>Safeguard Classification</b>	<input type="checkbox"/> S <sub>1</sub> <input checked="" type="checkbox"/> S <sub>2</sub> <input type="checkbox"/> S <sub>3</sub> <input type="checkbox"/> S <sub>F</sub> <input type="checkbox"/> TBD (to be determined)
<b>Date PID Prepared</b>	April 19, 2004 (Updated on August 26, 2004)
<b>Estimated Date of Appraisal Authorization</b>	August 26, 2004
<b>Estimated Date of Board Approval</b>	December 20, 2004

1. Key development issues and rationale for Bank involvement

*Background:* Agriculture is the backbone of Pakistan's economy and one of the key engines of economic growth. The sector contributes about 25% of GDP, employs nearly 50% of the rural labor force, and is responsible, directly or indirectly, for over 60% of exports. Around 80% of Pakistan's arable lands and 90% of agricultural output depend on irrigation. Over 18 million ha of land in Pakistan are irrigated from the Indus River and its tributaries.

Barrages in the Indus Basin are vital parts of Pakistan's irrigation network. Their main purpose is to divert water from the rivers into canals serving vast areas of irrigated land. Some of the newer barrages also divert water into link canals that join the main rivers of the Indus Basin, namely, the Indus, Jhelum, Chenab, Ravi and Sutlej. Barrages also serve as road and rail bridges and crossings for oil, gas, and power transmission lines. Many of the of the older barrages built 50 to 100 years ago in Punjab are in need of rehabilitation to take care of aging, design and construction defects, changes in hydrological conditions, and deferred maintenance. Some of them require urgent remedial measures to avoid severe economic and social impacts on the lives of millions of poor farm families through interruption of irrigation on millions of acres of irrigated land. The newer barrages built as a part of the Indus Basin Project in the 1960s are reported to be in good condition.

The main problem encountered in the older barrages is erosion at the downstream toe, due in part to changes in river hydrology. Another problem is the loss of integrity in the downstream floor leading to loss of soil from the foundation. Gates and hoists are also in most cases in need of renovation. River training works upstream of the barrages also need

some improvement. These problems are present in varying degrees of severity at all of the older barrages.

The Taunsa Barrage on the River Indus, completed in 1952, has been identified as the barrage with the highest priority for rehabilitation. The barrage diverts a part of the Indus flow to two large canal commands with an irrigated area of 2 million acres and to other large areas served by the Taunsa -Panjnad Link Canal. This link canal was built in the 1960's to transfer water from the Indus to areas served by two rivers, the Ravi and the Sutlej that became controlled by India under the terms of the 1959 Indus Waters Treaty.

At Taunsa, there is clear evidence of distress: erosion at the downstream toe and a loss of foundation material. In the event of a major flood, the downstream floor, that is already damaged, could be undermined and this would cause a part of the barrage to collapse. The barrage would not then be able to maintain the water at the level needed to supply the irrigation canals. Floods on the Indus occur during the main season for crop irrigation. The flow in the river would then be too high to allow a temporary earth and rock fill dam to be built as a temporary closure. Therefore, all irrigated crops would fail because the commanded area has very low rainfall.

*Government Strategy:* The government strategy is to carry out quick review and assessment of the safety conditions of all aged barrages and prioritize them according to the level of urgency and economic viability. The prioritization will be based on (i) the assessment of likelihood and risk of failure; and (ii) the economic and social consequences including costs of failure derived from feasibility studies. After having identified the high priority barrage, the government has basically two options. One is to wait for the barrage to fail and then carry out repairs or build a new barrage. The second is to begin immediately on the works needed to make the barrage a sound and durable structure. There is no way of telling when or how the Taunsa Barrage might fail. But the owner of the barrage and the consultants are of the view that the weaknesses are so serious that failure could conceivably occur in the near future. Therefore, the first option poses an unacceptable risk to the livelihoods of millions of farm families in the area served by the barrage.

*Rationale for Bank Involvement:* Bank involvement would ensure timely and adequate financing that might not otherwise be available to carry out an emergency project. Bank involvement would also be consistent with the current country assistance strategy for Pakistan that emphasizes improvements in rural infrastructures for poverty reduction and provision of reliable and safe water for domestic and productive purposes. The Bank has a long history of operations in Pakistan that began with its support for the Indus Basin Waters Treaty between Pakistan and India. The Bank had the leading role to secure finance and manage the Indus Basin Project (IBP). The IBP implemented a vast system of works to transfer water from the western rivers of the Basin to the areas in Pakistan supplied by the eastern rivers whose waters were allocated to India. Since then the Bank has financed numerous major water and power projects often in partnership with other lenders.

The Bank's involvement will help ensure that: (i) a systematic approach is adopted in the design of rehabilitation projects for the Taunsa Barrage and other barrages; (ii) any

environmental and social concerns are properly addressed; (iii) the project works and facilities are procured and constructed with good quality, within the budget, and on schedule; and (iv) the operation and maintenance will be upgraded and strengthened for safe and sustainable use of the critical barrages.

## 2. Proposed project development objective

The main objective of the project is to prevent the failure of the Taunsa Barrage that provides irrigation for 2 million acres and drinking water in the rural areas of Southern Punjab benefiting several million people. This objective would be achieved through: (i) rehabilitating and strengthening the Taunsa Barrage and associated structures; (ii) renovation of the electro-mechanical facilities; and (iii) improving operation and maintenance and emergency preparedness.

## 3. Preliminary project description

While the detailed project description is not yet to be finalized at appraisal, the project is to include the following three components.

### ***Component 1. Rehabilitation and Strengthening Works***

The main works include (a) a 4,300 ft long subsidiary weir located 1,500 feet downstream of the barrage to raise the tailwater level and ensure proper energy dissipation at high river flows; (b) repair of the barrage floor by removal of weak concrete and replacement with a new layer of concrete, and grouting to seal joints and fill voids in the foundation; (c) sediment mitigation measures for the D.G Khan canal at the right bank; and (d) installation of a safety monitoring system by placing some critical monitoring instruments in the barrage and its foundation. The output of this component will be a secure barrage structure with effective energy dissipation and restored design discharge capacity, and a functional monitoring system.

### ***Component 2. Renovation of Gates and Appurtenances for Barrage and Canal Headworks***

This component involves renovation of the barrage gates and hoists and improvement in the operating and control system including necessary O & M equipment and possibly upgrading of flow measurement equipment at Taunsa. This component will lead to upgrading of the operating facilities with higher level of automation and remote control.

### ***Component 3. Consulting Services and Implementation Support***

This component covers: (i) consultants for feasibility study, detailed design and construction supervision of Taunsa Barrage; (ii) consultants for detailed designs for rehabilitation of five other barrages, namely, Jinnah, Khanki, Suleimanki, Trimmu, Balloki and Islam; and (iii) an independent panel of experts for feasibility study, design, safety review and construction quality enhancement. (iv) support for the Project

Management Office including equipment and the appointment of specialist in project management, procurement and financial management.

4. Safeguard policies that might apply

This project is processed as an emergency intervention, and is classified as an environmental category B. However, an EIA has been prepared. The applicable safeguard policies include: (i) Environmental Assessment ([OP/BP/GP 4.01](#)); (ii) Natural Habitats ([OP/BP 4.04](#)); (iii) Safety of Dams ([OP/BP 4.37](#)); and (iv) Projects on International Waterways ([OP/BP 7.50](#)).

5. Tentative financing

Source:	(\$m.)
BORROWER/RECIPIENT	16
INTERNATIONAL DEVELOPMENT ASSOCIATION	112
Total	128

6. Contact point

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