

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

Report No.: PIDA22264

<b>Project Name</b>	PK-Sindh Barrages Improvement Project (P131324)
<b>Region</b>	SOUTH ASIA
<b>Country</b>	Pakistan
<b>Sector(s)</b>	General water, sanitation and flood protection sector (70%), Irrigation and drainage (30%)
<b>Theme(s)</b>	Water resource management (60%), Rural services and infrastructure (20%), Income Support for Old Age, Disability & Survivorship (10% ), Climate change (5%), Other environment and natural resources management (5%)
<b>Lending Instrument</b>	Investment Project Financing
<b>Project ID</b>	P131324
<b>Borrower(s)</b>	Economics Affairs Division, Government of Pakistan
<b>Implementing Agency</b>	Sindh Irrigation and Power Department
<b>Environmental Category</b>	A-Full Assessment
<b>Date PID Prepared/Updated</b>	21-Apr-2015
<b>Date PID Approved/Disclosed</b>	23-Apr-2015
<b>Estimated Date of Appraisal Completion</b>	14-Apr-2015
<b>Estimated Date of Board Approval</b>	22-Jun-2015
<b>Appraisal Review Decision (from Decision Note)</b>	

## I. Project Context

### Country Context

Pakistan has made progress in reducing poverty and improving shared prosperity over the last two decades. Progress, however, slowed between 2009 and 2011 due to two massive floods, conflict, and the global economic slowdown. A majority of the nation's poor people still live in rural areas.

Pakistan is becoming water-scarce with a growing gap between demand and supply. The future impacts of climate change will pose not just an environmental challenge but also a fundamental threat to economic development and the fight against poverty. Continuing business-as-usual is likely to contribute to Pakistan's economic woes. To close the gap between water supply and water demand, Pakistan is placing emphasis on modernizing its ageing hydraulic infrastructure and improving water resources management.

The water sector will remain a critical contributor to sustained economic development. The sector

plays an essential role in supporting the economy, particularly agriculture. The irrigation and drainage system has a total investment value estimated at around US\$300 billion at current prices. Nearly 43 percent of the population gains employment from this system, it accounts for approximately US\$16 billion or nearly 25 percent of the gross domestic product (GDP), and contributes to over 60 percent of the exports. Due to the country's arid/semi-arid climate and high susceptibility to droughts, agriculture in Pakistan is predominantly (90 percent) irrigated and adequate irrigation infrastructure is critical. Sindh Province, in particular, contributes 23 percent to the agriculture GDP, and has high potential for further productive development.

It is estimated that the cost of revamping the entire water sector will cost approximately US\$35–40 billion. This demonstrates a major deficit in infrastructure investment, which must be overcome to accelerate economic growth. Addressing this financial deficit, however represents a daunting challenge, especially in the face of constrained public resources and aid flows, and limited private sector involvement.

Sindh Province is home to over 52 million people or 24 percent of Pakistan's population, constitutes 18 percent of its land area, and has 14 percent of its total cropped area. About 30–35 percent of Sindh's population lives below the poverty line and a majority of the poor are rural. Sindh makes up a large portion (26 percent) of Pakistan's cultivated area and produces about a quarter (24 percent) of the major irrigated crops, such as cotton, rice, sugarcane, and wheat. The cultivable command area is about 5.1 million hectares. The actual irrigated area varies from year to year depending on the availability of canal water.

### **Sectoral and institutional Context**

**Water Resources.** Annual water availability is below 1,000 m<sup>3</sup> per capita, with a growing gap between water demand and water availability. Water demand is projected to rise as a result of population growth at an annual rate of 10 percent, reaching 338 billion cubic meters (BCM) by 2025. At the same time it is expected that water supply will remain at 236 BCM, resulting in a demand-supply gap of approximately 102 BCM.

**Climate Change.** The reliance on a single river basin system, the Indus, makes Pakistan's water resource base highly vulnerable to climate change. About 40–50 percent of the total average flow in the Indus system is fed by snow and glacial melt, with the remainder coming from monsoon rains over the plains. In the future, experts predict that temperature increases will be higher in the region, compared to global average increases. As a result, it is expected that intra-seasonal variability will increase the likelihood of extreme events such as droughts and floods. Given the implications of climate change on temperature and precipitation variations, Pakistan's water availability is projected to become more unreliable. Climate change, therefore, further confounds the challenge of dealing with variability of both excesses and scarcities and dealing with rapidly growing water demands (water for energy, agriculture, and people, and protection from floods) from a resource base that is likely to change substantially as the glaciers of the western Himalayas melt and monsoon patterns change.

**Irrigation and Drainage.** Pakistan relies on the Indus Basin Irrigation System for provision of water to all its sectors, including for irrigation purposes as it was intended. The system consists of the Indus River and its tributaries, three major multi-purpose storage reservoirs, 19 barrages, 12 inter-river link canals, and 45 major irrigation canals (covering over 14 million ha). The annual Indus

River volume is 177 BCM, of which about 128 BCM is diverted from the river system to canals. While public infrastructure has improved over the years, the existing irrigation and drainage infrastructure is rapidly ageing.

**Institutional Arrangements and Reforms.** Pakistan has a long and well-established tradition of water entitlements. The 1991 Provincial Water Accord established clear surface water entitlements for each province. Implicit in the accord is a set of water entitlements at the canal command level. In large areas of the system these entitlements serve as the basis for allocation of water among canal commands. There are also well-established rules for further distributing water to the distributary canals and canal outlets.

The water economy of Pakistan depends on the huge hydraulic infrastructure system. The major challenge which has to be addressed is the maintenance of what has been built. Many elements of the vast hydraulic system, such as the Guddu Barrage, are now reaching the end of their design lives and have to be rehabilitated. The Sindh Provincial Irrigation Department (ID) owns, controls, and operates the barrages, main canals, branch canals, distributaries, and minors. The farmers own and operate the lower tier, or the tertiary systems called water courses.

There are several other complementary Bank-funded projects in the irrigation and agriculture sector in Sindh province. The ongoing Sindh Water Sector Improvement Project (SWSIP) supports the reform program under which three Area Water Boards were established, encompassing about 1.8 million hectares of land or 31 percent of the total irrigated area of Sindh. In addition, over 350 farmer organizations have been formed in Sindh, and management transfer agreements have been signed with over 300 of them. The reforms are being addressed through the establishment of efficient and sustainable irrigation and drainage institutions.

Barrages are strategic assets of Sindh and millions of people depend on the water that is controlled, diverted, and managed by them. Their continued operation and management require very specific expertise, experience, decision making, and continuity. At present the three barrages in Sindh each have a Chief Engineer who performs two tasks: (a) barrage infrastructure management and operation; and (b) water flow monitoring and regulation to canals in respective command areas. However, given the importance of the barrages, and the increasing challenges of floods resulting from climate change, there is a need to further enhance institutional performance by ensuring availability of highly experienced staff with adequate budget, modern equipment, and latest technology. To meet this need it is proposed to establish a dedicated Barrage Management Organization (BMO) within the Irrigation Department. Key priorities of the BMO, beyond current activities, include development of an early warning system, barrage safety, environment and social impact mitigation, technical knowledge, and improved communications.

**Priorities for the Improvement of Barrages in Sindh**

Three large barrages were built between 1932 and 1962 on the Indus River in Sindh Province. The northern one, Guddu barrage, has developed major safety issues. The second one, Sukkur Barrage, is one of the oldest and serves about three million ha of agricultural land. Over the decades, it has also developed safety issues. Repairs on the Sukkur barrage are being carried out regularly. The last barrage (most southerly), the Kotri barrage, was rehabilitated in 2000. This project will finance rehabilitation of the Guddu Barrage.

Guddu barrage. The primary function of the gated Guddu barrage is to service the irrigation of over

one million ha of agricultural land by feeding the Beghari Sindh Feeder and the Desert Pat Feeder main canals on the right side of the river and the Ghotki Feeder on the left side. The barrage is also used for river control and flood management. It is also an important transport link across the Indus River and provides cooling water for the thermal power station at Guddu. Two major gas lines cross the barrage. The barrage was commissioned in 1962 and has now served for over 50 years. It consists of 65 gates. The gates, each weighing 55 tons, are of the ‘fixed wheel’ type and operate without counterweights.

Rehabilitation and modernization of Guddu. The Guddu barrage constitutes the most strategic component of the large Indus Basin Irrigation System. The effective operations and structural stability are important for agricultural production and for averting potential disaster during floods. Climate variability will further add risks by changing the frequency and intensity of extreme events such as floods and droughts. There are serious operational difficulties and safety issues. The most severe problems include: (a) up to 60 percent of the steel used for the 65 gates on the main barrage are badly rusted; and (b) the lifting mechanisms are badly corroded, with a strong possibility of failure. Since the rate of corrosion cannot be slowed it is considered likely that the gates will fail during normal operation. There is already a risk now that the gates may fail during a flood event that necessitates opening and closing. Such a failure will progressively affect water supplies to all the irrigated areas supplied by the barrage. Structural and operational interventions are therefore required to manage flows to the off-taking canals.

## II. Proposed Development Objectives

The PDO is to improve the reliability and safety of the Guddu barrage and strengthen the Sindh Irrigation Department’s capacity to operate and manage the barrage.

## III. Project Description

### Component Name

Component A: Rehabilitation of the Guddu Barrage

### Comments (optional)

### Component Name

Component B: Improved Barrage Operation

### Comments (optional)

### Component Name

Component C: Project Management, Monitoring, and Evaluation

### Comments (optional)

## IV. Financing (in USD Million)

Total Project Cost:	208.00	Total Bank Financing:	188.00
Financing Gap:	0.00		
<b>For Loans/Credits/Others</b>			<b>Amount</b>
BORROWER/RECIPIENT			20.00

International Development Association (IDA)	188.00
Total	208.00

## V. Implementation

The Project Management Office under the Irrigation Department will be the implementing agency, while the Project Coordination and Management Unit (PCMU) of the Planning and Development Department (PDD) shall provide coordination, monitoring of citizens' feedback, and evaluation.

## VI. Safeguard Policies (including public consultation)

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment OP/BP 4.01	x	
Natural Habitats OP/BP 4.04	x	
Forests OP/BP 4.36		x
Pest Management OP 4.09		x
Physical Cultural Resources OP/BP 4.11		x
Indigenous Peoples OP/BP 4.10		x
Involuntary Resettlement OP/BP 4.12	x	
Safety of Dams OP/BP 4.37	x	
Projects on International Waterways OP/BP 7.50	x	
Projects in Disputed Areas OP/BP 7.60		x

**Comments (optional)**

## VII. Contact point

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