1. Country and Sector Background

Pakistan has enjoyed good economic performance in recent years. After a decade of political instability, macroeconomic crisis, and limited economic and social progress in the 1990s, Pakistan has emerged as one of the fastest-growing economies in Asia, with rising per capita income and improved social indicators. With growth there has been an increase in demand for better infrastructure. However, Pakistan’s infrastructure platform needs significant investment in order to support Pakistan’s growth and service delivery goals. Infrastructure services including electricity, paved roads, municipal services, and telecommunications reach a relatively low proportion of the population. At the same time, improvements in basic infrastructure are critical to improving human development outcomes. Approximately 40 percent of the population lacks access to power and about 75 percent of all rural health, education and market facilities are accessible only by earth tracks. Similarly, water and sanitation services which are critical to achieving human development outcomes suffer from poor quality and limited availability. The water quality in rivers streams and canals has been deteriorating, leading to harmful impact on the public health.

2. The Pakistan Country Assistance Strategy (CAS) for FY10-14 will be implemented in a period of uncertainty with a focus both on immediate needs dictated, in part, by ongoing conflict and the return to macroeconomic stability; but also a medium term approach that supports growth, service delivery, improved institutional governance, human development and infrastructure investment through existing platforms. The aim of the CAS is sustained growth recovery and to enhance Pakistan’s resilience to shocks. The Strategic Objectives for the FY10-14 CAS are based on both selectivity and flexibility in a results framework that specifies desired outcomes and intermediate indicators, but also provides for unexpected challenges and evolving demands. The Strategic Objectives focus on three core areas:

- Restoring Stability and Maintaining Growth for Sustainable Development;
- Investing in Pakistan’s Human Development Resources and Protecting the Poor;
- Improving Governance and Service Delivery
3. These Strategic Objectives respond to Pakistan’s needs and the World Bank Group’s comparative advantages. They will build upon existing platforms, particularly in health, education, social protection, and infrastructure; while political, economic and social developments will influence specific opportunities and possibly constrain others. For first strategic objective, restoring stability and maintaining growth over the CAS period will require significant investment and continued policy reforms, particularly to address infrastructure deficits, improve competitiveness, and address cross cutting issues such as environmental management and urban planning. Among other things this requires investments in improved water management for agriculture productivity and growth. During the CAS period agricultural growth will provide a basic foundation for robust growth. A critical prerequisite will be an efficient and well run irrigation system, particularly in Sindh and Punjab provinces. While progress has been made, the irrigation and drainage system suffers from deteriorating infrastructure and weak governance. To reduce volatility to growth, Bank support will include rehabilitation of major assets such as barrages and continued capacity development at the regional and federal level for managing water resources.

Sector Background and Issues

4. **Agriculture is important:** Although share of agriculture in the economy is decreasing, it is still the backbone of Pakistan’s economy, employing over 50 percent of the labor force earning (directly or indirectly) 60 percent of the export revenues. The sector contributes about 25 percent of GDP.

5. **Water/Irrigation and Drainage Sector:** Pakistan’s agriculture is almost wholly dependent on irrigation –irrigated land supplies more than 90 percent of agriculture production. Agriculture in most areas is not possible without irrigation because the climate of Pakistan is arid to semi-arid with low and variable rainfall. Annual rainfall over much of the area is not more than 150 mm per annum, while evaporation is very high, ranging from 1,250 mm to 2,800 mm per annum. However, there are abundant surface water resources in the Indus Basin, which covering 566,000 km² (70 percent of the country) is the major source of Pakistan’s water.

6. **Indus Basin Irrigation System:** Pakistan relies on the largest contiguous irrigation system in the world, namely the Indus Basin Irrigation System (IBIS) for basic food security and supply of water for all sectors of the economy. Pakistan would have remained largely a desert without the development of the canal systems, dams and hydraulic structures that divert water from the Indus River and its tributaries. These canals, which are commonly referred to as irrigation canals, are in fact the country’s main waterways. They are the sole source of water supply supporting life and livelihoods in the areas that made the settlement of the population possible. In addition to providing water for irrigated agriculture, they led to the development of major cities, industrial and growth centers and civilization on the desert. The IBIS is the backbone of the country’s economy. The IBIS consists of the Indus River and its tributaries, three major storage reservoirs, 19 barrages, 12 inter-river link canals, 43 major irrigation canal commands (covering over 14 million hectares), and over 120,000 watercourses, delivering water to farms.

7. **Barrages are Strategic Assets:** The barrages are used to raise the water level in the river so that water can be diverted to the main canals by gravity. They also are used to divert water to inter-river link canals and as the whole system is interlinked. Therefore, operation of a barrage has a far reaching impact in the system often covering millions of acres locally as well as several hundreds of miles away. The Barrages have a characteristic of a “public good”, and they are strategic assets and would remain under public management even after the transformation of the irrigation system under the proposed reform program. They are used for river control and flood management, and source of water supply for all sectors of the economy. The barrages also provide links for the road networks working as bridges over the rivers and used for crossing utilities such as gas pipelines etc over the river. For example, the Jinnah
barrage provides a bridge over the Indus River for road linking the NWFP and the Punjab provinces. Deterioration of barrages cannot be afforded as even partial failure would be disastrous for all productive sectors, environment and cause of social upheaval in the country.

8. Many of the barrages built 50 to 100 years ago are in need of rehabilitation. Most of the problems identified stem from design and construction defects, as building barrages on alluvial river was a new experience at that time, aging and changes in hydrological conditions. 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 water supplies for millions of acres of irrigated land.

9. **Rehabilitation/Modernization Jinnah Barrage:** Failure of a regulatory structure in 1998 on Balloki Sulemanki (B-S) Link Canal was alarming for the country as it affected water supplies to over 2 million acres of land. After this event the Government of Punjab (GoPunjab) engaged consultants in June 1998 to assess the condition of all vital hydraulic structures in the system to evaluate their safety. The consultants and the Government’s evaluation team recommended rehabilitation and modernization of six barrages/ headworks including Jinnah Barrage. Accordingly, the GoPunjab embarked upon a program of rehabilitation and modernization of these six barrages/headworks during the period of 2003-2005 and engaged a group of consultants to carry out feasibility study for the rehabilitation of Taunsa, Jinnah, Islam and Balloki barrages.

10. GoPunjab has already completed the rehabilitation and modernization of Taunsa Barrage on Indus River in 2009 under a World Bank loan. Balloki, and Sulemanki barrages are being rehabilitated under the ADB Program and Khanki Barrages under the JICA assistance program. Jinnah Barrage on the Indus River is the next in the highest priority, improvement of which would be undertaken under the Project. The feasibility studies for the Jinnah Barrage were carried out in 2005 followed by the detailed design and bidding documents preparation under the ongoing Taunsa Barrage Project Loan. Given the current status of the Jinnah Barrage, rehabilitation/modernization is given the highest priority also because the barrage lies at the head of the system and all the flows of the Indus River passes through it. The barrage is subjected to acute and unregulated flows from the Indus, Kabul rivers and other tributaries joining below the Tarbela Dam.

11. **Improving Water/Irrigation Management:** Punjab covers major part of the IBIS (about 60 percent of command area of the system) and has a complex river and link canal system. Despite of this, water allocation and management in various parts of the system is carried out using hand calculations, including estimation of demands and pattern of releases from the reservoirs. Also there is no well established and integrated system of water accounting in various parts of the system i.e. at barrages, rivers, link canals, main/branch canals, and distributaries etc. Instrumentation used for measuring water, sediments, cross sections of the river and canals are outdated and in many cases hand held staff gauges are used. Punjab needs to modernize its water allocation and management system and water accounting system with modern simulation and optimization models and decision support system. The accounting system being initiated by the Punjab Monitoring and Implementation Unit (PMIU) needs further updating and development. The second part of the project (Component B) would help modernize the water management in Punjab’s irrigation system by providing new techniques, tools, equipment and training, and development of future projects.

2. **Objectives**

12. The overarching project objectives are to (i) strengthen and modernize Jinnah Barrage and affiliated works to enable reliable and uninterrupted supply of water for over 2.1 million acres of farmland benefitting about 600,000 farm families for irrigation and domestic water users; and (ii) build IPD’s capacity in improved water resources and irrigation system management.
13. The project would help support first strategic objective of the CAS and PRSP II of *Restoring Stability and Maintaining Growth for Sustainable Development*, support aim of the CAS of sustained growth recovery with enhanced resilience to shocks and volatility to growth. The CAS emphasizes the need to strengthen water sector governance. The barrages are strategic assets and their full or partial failure would result in economic and environmental disaster and social chaos. The project would help in avoid such shocks to the economy/society and help develop resilience for sustained growth and poverty reduction.

3. Rationale for Bank Involvement

14. The Bank has a long history of partnership and collaboration with Pakistan. In particular, the Bank is seen as a trusted partner in the water sector and a coordinator for international financial institutions and other development partners. The two largest provinces (Punjab and Sindh), which manage more than 85% of the IBIS, have embarked on far reaching irrigation reforms and have made significant progress on the reform agenda. Altogether, the Bank has supported more than 48 operations in irrigation, drainage and water resources development and the power sector so far. With the assistance of the Bank, the Government of Punjab has already completed the rehabilitation and modernization of the Taunsa Barrage located in the Indus River below the Jinnah Barrage.

15. Therefore, the Government of Punjab is seeking support from the World Bank for its knowledge, expertise, experience and it seeks a reliable partner in the sector, in addition to financing. More specifically, the Bank is expected to help ensure that: (i) a systematic approach is adopted in the design of rehabilitation of the barrages; (ii) thorough planning is carried out to minimize the interruptions to operation during construction along with a suitable communication strategy to bring on board major stakeholders; (iii) any environmental and social concerns are properly addressed; (iv) the project works and facilities are procured and constructed with good quality, within the budget, and on schedule; (v) the operation and maintenance will be upgraded and strengthened as a model for safe and sustainable use of other barrages; and (v) institutional capacity is strengthened in carrying out such operation and overall management of the water resources and the river system in the province through technical assistance and various components of the project.

4. Description

16. The Project consists of four components:

(a) **Component A: Rehabilitation and Modernization of Jinnah Barrage (US$112 Million).** This component will support rehabilitation and modernization of Jinnah barrage; the implementation of social and environmental management plans; and construction supervision and support for the project implementation. Jinnah barrage is the first major diversion structure on the Indus River. It is situated about 126 miles (203 km) downstream of the Tarbela Dam. Jinnah is one of the most important structures in Pakistan’s irrigation system, handling all the Indus River water. It provides water to the Thal Canal that covers an area of 2.1 million acres in arid/desert zone where crop production is only feasible with irrigation. About 5 million people in 5 districts inhabit the command area and their livelihoods depend directly or indirectly on the irrigation supplies of the canal. The barrage is facing the following hydraulic and structural problems: (a) retrogression on the downstream side undermining the structure; (b) improper approach of the river on the upstream side resulting in parallel flow to the Barrage; and (c) many of the barrage gates are not operating properly. With these safety issues, the barrage is now in a dilapidated...
condition and is threatened by further damage from retrogression of the river and requires urgent rehabilitation and modernization.

The rehabilitation measures to make the Jinnah Barrage safe would consist of: (A1) civil works, (A2) mechanical and electrical works, (A3) a Social Development Action Plan (SADP) and the Environmental Management Plan (EMP) in order to plan for any possible interruption of water supplies during construction period and deal with other environmental issues, and (A4) support for consulting services for construction supervision and project management.

(b) **Component B: Improvement and modernization of the irrigation and water management system (US$15 Million).** This component consists of improvements in irrigation and water management systems including capacity building for better water allocation and accounting, modernization of equipment and services used in water management. It will also support preparation of future irrigation and water management improvement projects in the province.

(c) **Component C: Monitoring and Evaluation of the Project Impact and Social and Environmental Management Plans (US$2.5 Million).** The monitoring and evaluation to provide continuous feedback about the progress and status of project implementation; performance, impacts and to supervise implementation of the overall social/resettlement and environmental management plans. An independent consultant will carry out the M&E activities under the project.

(d) **Component D: Project Management Coordination Technical Assistance and Training (US$6.5 Million).** This component will support the Government in implementing the project by coordinating all project related activities and provide technical assistance and training.

5. Financing

<table>
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<tr>
<td>Borrower</td>
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<tr>
<td>International Bank for Reconstruction and Development</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>155.0</strong></td>
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</tbody>
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6. Implementation

17. The Punjab Irrigation and Power Department (IPD) of the Government of Punjab shall be responsible for the execution and implementation of the Project through the Project Management Office (PMO). Parts of the SADP would be implemented by Punjab Rural Support Program (PRSP) and Public Health Engineering Department. The PMO has extensive experience in large scale construction and implementation of EMP and social action plans. PMO has also demonstrated its competence and gained further experience in Taunsa Barrage Rehabilitation Project. The PMO would be responsible for all aspects project implementation. The PMO will have a full time Director for Environment and Sociology who will be supported, Deputy Directors for environment, sociology, communication and development assistance. The PMO would be supported by two set of consultants, Project Implementation Consultants (PICs) who would help in construction management aspects of the project and independent M&E consultants who would help in monitoring the project impact as well as in supervision of the SDAP and EMP. The existing Project Steering Committee (PSC) chaired by the Chairman P&D will have representation of both government entities and local/district administration. The PSC will oversee this project, provide policy-level guidance and inter-agency coordination for the project and ensure smooth implementation of EMP and SDAP. The Punjab Irrigation and Power Department (IPD) of the Government of Punjab shall be responsible for the execution and implementation of the Project through the Project Management Office (PMO).
7. **Sustainability**

18. The rehabilitation and modernization has not been necessitated due to lack of operation and maintenance but rather natural aging, inherent design issues, and flow regime changes. Jinnah Barrage was constructed in 1943 (commissioned in 1946) and it was an innovation at the time in construction of barrages on alluvial rivers on such large rivers. In hindsight, and based on experience gained subsequently two aspects would be done differently if the barrages is constructed now: (a) the floor would be placed 10 feet lower than the current level that would allow better energy dissipation downstream and barrage would not be affected by retrogression of downstream; (b) radial gates would be used instead of the vertical gates (as was done for barrages constructed recently) which are more suitable, can handle hydraulic loading and require minimum moving parts needing maintenance. Also with the construction of Tarbela reservoir, flow regime has changed exacerbating the retrogression downstream of the barrage. The proposed rehabilitation project will eliminate possible sources of failure and give the structures a long life perhaps requiring another capital improvement in 50 years time. Instruments will be installed to monitor the performance of the barrage structures and its foundations. Under the technical assistance component, technical assistance would be provided to create adequate institutional capacity for operation and maintenance of the project facilities. The PMO transformed into BMO would provide capacity to oversee maintenance, rehabilitation and modernization of all the barrages in Punjab. Barrages being strategic assets, generally adequate funds are allocated for the O&M, perhaps on the expense of the rest of the irrigation system.

8. **Lessons Learned from Past Operations in the Country/Sector**

19. The project design draws on lessons learnt from rehabilitation of infrastructure projects both in and outside Pakistan, specifically the Taunsa Barrage in Pakistan. Bank-wide experience has shown that reconstruction of damaged infrastructure is imperative and that measures are needed to reduce the risk of any future disasters and to safeguard people and property at risk. Therefore, the underlying premise of the Project is to provide protection against failure of the Jinnah Barrage, which calls for rehabilitation and modernization of the existing facilities. Other lessons include: (i) project design is based on thorough hydrological and hydraulic analyses. In-depth studies have been undertaken, while using the latest techniques, including extensive hydraulic model studies in the Nandipur Hydraulic Laboratory, and a detailed study of flood frequencies and assessment floods with various return periods; (ii) completion of detailed design (and bidding documents) of key works prior to negotiations; (iii) detailed assessment and plans for social and environmental issues; (iv) extensive consultation with various; (v) proper construction planning to minimize the negative affects during construction and operation of the irrigation and river network during construction period without major interruptions; (vi) implementation of the project works through large civil contracts following the best contract management models; (vii) deal up front with any resettlement and land acquisition issues; (viii) contingencies planning based on the risk analysis; (ix) strong government leadership and properly staffed Project Management Office, indispensable to effective project preparation and implementation; (x) procurement needs to be flexible and procurement process should start early, and retroactive financing can be very helpful to ensure an early project start-up; and (xi) the speed of appraisal and implementation is critical to project success.

9. **Safeguard Policies (including public consultation)**

<table>
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<th>Safeguard Policies Triggered by the Project</th>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>Environmental Assessment (OP/BP 4.01)</td>
<td>[X]</td>
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20. **Environmental Assessment (EA OP/BP 4.01):** The project is rated category A. An ESIA and EMP have been prepared.

21. **Involuntary Resettlement (OP/BP 4.12):** Given the rehabilitation nature, the project is not expecting to have any land acquisition or resettlement. However, it is a large Project on an operational river and a resettlement policy framework (RPF) is prepared and agreed upfront to guide and manage resettlement planning in case any unexpected land acquisition or resettlement need emerges during project construction. A Social Development Action Plan (SDAP) has been prepared to mitigate impacts due to possible canal closure extension and also to maximize project benefits in local development. This is based on broad public consultations in the command areas. The measures include construction and rehabilitation of water supply schemes, free distribution of wheat seeds of early maturity and community facilities. A strategy has been developed to disseminate project implementation status to the public in the command areas. The total cost of the program is estimated at about US$8.9 million.

22. **Safety of Dams (OP/BP 4.37):** Although barrages are not dams, they are indeed major hydraulic structures on which millions of hectares of irrigated land and population are dependent. The dam safety policy is triggered and an independent panel of experts would review the project implementation and construction. The proposed designs for remedial works have already been reviewed by the panel.

23. **International Waterways (OP 7.50).** The project area is located on the Indus River which is an international waterway thus automatically triggering the international waterways safeguard under OP 7.50. However, the project essentially involves rehabilitation of existing barrage facilities. It does not involve works and activities that would exceed the original scheme, change its nature, or alter or expand its scope and extent to make it appear a new or different scheme. Therefore given the nature of works envisaged under the proposed project: (a) the project will not adversely affect the quality or quantity of water flows to other riparians; and (b) it will not be adversely affected by other riparians’ water use.

24. The project team has also reviewed Article VII of the Indus Waters Treaty of 1960 between India and Pakistan and concluded that a notification by Pakistan to India under paragraph (2) of the said Article VII is not required, as the project will not cause interference with the waters of any of the Rivers and will not affect the other riparians materially. Therefore, the Project falls within the exception to the notification requirements of OP 7.50, set forth in paragraph 7(a) of OP 7.50.

25. **Consultations and Disclosure:** The ESIP, SADP and RPF has been submitted to the Bank’s Infoshop on Dec 16, 2009. The summary was translated into Urdu and distributed during the consultation and disclosure sessions. Consultations and discussion with the people have been continuing since the feasibility studies in 2005. They were intensified more during the detailed design stage of Environmental

*By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas*
and Social Assessments. Brief descriptions of the consultations done are also presented. These consultations include the following villages: November 2007 Kacha Arain and Chandana (10 participants); February 2008 Jinnah Barrage (6 local fishermen); February 2009 Chianki Shumali (20 participants), Kurar (35 participants), Nali Janaubi (15 participants), Noorwana (15 participants), Tilokar Janaubi (12 participants), Rajar (19 participants) and March 2009 NameWali (6 participants). The participants ranged from councilors, farmers, livestock farmers, fishermen, village headmen and other from different sections of the society. In particular for preparation of SDAP, extensive consultations were carried out in 69 villages and in each village, several participants attended. Special attention was given to consultation and discussions with female participants to elicit their views. In 70 villages, more than 700 female participants attended these discussions. The formulation of EMP and SDAP is based on these discussions and consultations.

26. After formulation of the reports and EMP and SADP, two disclosures were carried out, from September 16-19 and on October 3, 2009 at the project site. The Punjab EPA held the public hearing meeting in the process of providing no objection to the project and its ESIA and SA reports. A large group of people and stakeholders attended the public hearing including NGOs, women, fishermen, farmers etc. Copies of the ESIA/SA reports were made available to public at the IPD office, Executive Engineers Office at Mianwali Colony Daudkhel, District Library of Mianwali and Khushab and at the Punjab EPA, Punjab Public Library, Lahore.

10. List of Factual Technical Documents

1. Reports Prior to Feasibility Study, between 1943 to 2001
2. Reports on Feasibility Study, 2005

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