

**TERMS OF REFERENCE (TOR)**  
**FOR**  
**PROJECT IMPLEMENTATION CONSULTANTS (PIC)**  
**FOR SUKKUR BARRAGE REHABILITATION AND MODERNIZATION PROJECT**  
**UNDER SINDH BARRAGES IMPROVEMENT PROJECT**

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### **1. INTRODUCTION**

The Government of Sindh has received a credit from International Development Association under Sindh Barrages Improvement Project Additional Financing to ensure safety of Sukkur Barrage, to enhance monitoring capability of three barrages in Sindh for improved barrage operation, conduct additional technical studies including River Basin and Riverine Area Management. The broad goal is to uplift the agro-based economy at provincial level thereby ensuring growth in national GDP by increased share of agricultural produce from Sindh.

The main objective of the Sukkur Barrage Rehabilitation and Modernization project is to extend the useable life of this 87 years old Monumental Structure to further 30-50 years, by increasing its flood handling capacity from 0.9 million cusecs (50 years return flood) to 1.3 million cusecs (100 years return flood).

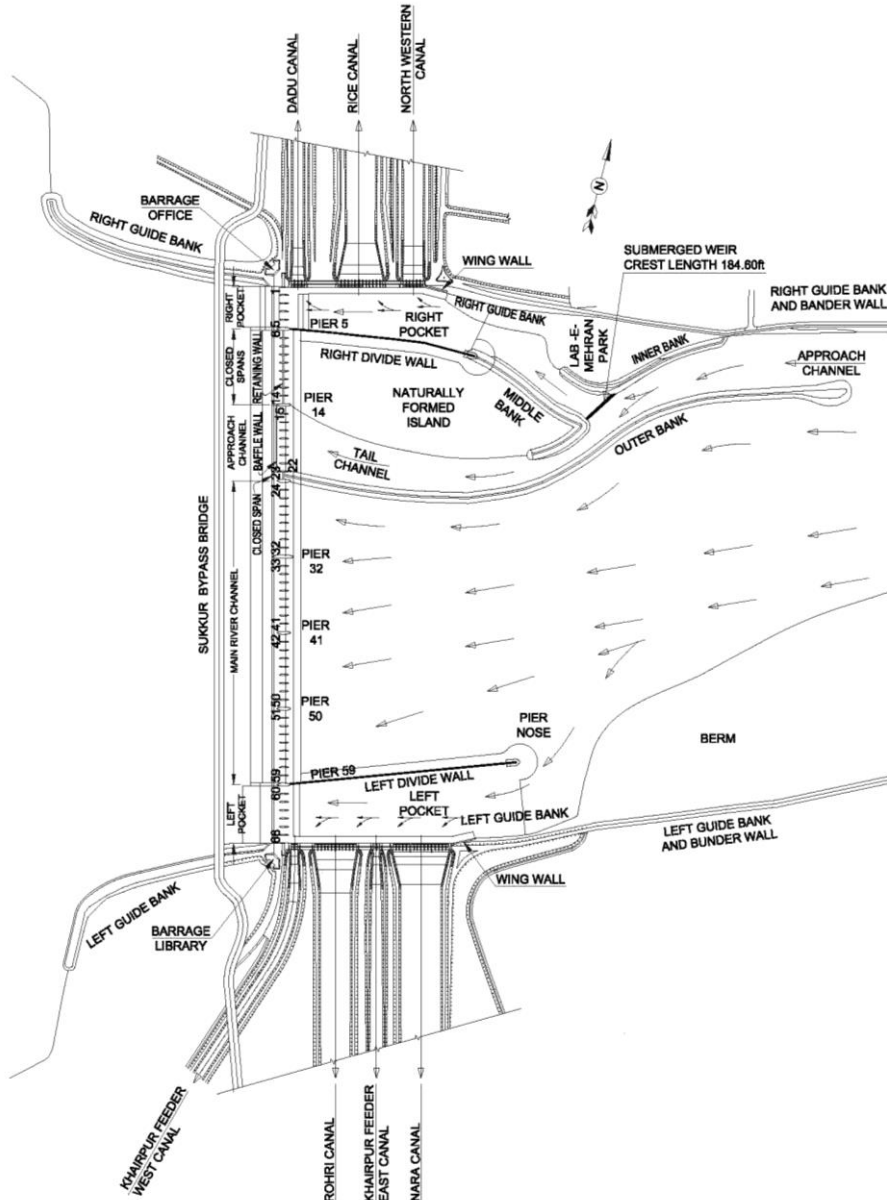
### **2. BACKGROUND**

2.1 The three Barrages, Kotri, Sukkur, and Guddu were constructed in 1958, 1932, and 1963 respectively. As these barrage are getting deteriorated, major rehabilitation works are underway. Kotri Barrage has undergone the major rehabilitation works in 2000, and similar comprehensive rehabilitation works are underway for Guddu Barrage under the World Bank financed Sindh Barrage Improvement Project (SBIP). As for Sukkur Barrage, after a few minor rehabilitation works carried out during the last 20 years, the Government of Sindh (GoSindh) has decided to embark on a similar comprehensive rehabilitation and requested the World Bank for financing through the additional financing to ongoing SBIP.

2.2 Sukkur Barrage is located about 225 miles north east of Karachi (68° 33'E, 27° 41'N) in the Sindh Province of Pakistan. It is located about 3 miles downstream of Lansdowne Railway Bridge and the twin cities of Sukkur and Rohri are located on the right and left banks of the river, respectively. The Barrage is situated 100 miles downstream of Guddu Barrage and about 300 miles upstream of Kotri Barrage. Sukkur Barrage was the first barrage constructed on the Indus River. The Sukkur Barrage and Canals Project were sanctioned in June 1923 and work on the construction started in July 1923. The project was completed in 1932 and is the World's largest single unified irrigation network. Total gross commanded area (GCA) served by the seven off-taking canals is 8.24 million acres are on both banks of the Indus River in Middle and Lower Sindh. Out of this 7.55 million acres are cultivable. The maximum abstraction by all the canals is 64,728 cusecs at present compared to the total designed capacity of 47,530 cusecs.

The original maximum design flood for the barrage was 1.5 million cusecs. The location of Sukkur Barrage is attached as **Appendix-I**.

### A. Lay Out Plan Sukkur Barrage



2.3 Sukkur Barrage comprises 66 bays each of 60ft clear span and is divided into three sections: (a) the right under sluices, (b) the main weir and (c) the left under sluices. The right and left under sluices have 5 and 7 bays, respectively, and are separated from the main weir by right and left divide walls on the upstream side. The main weir is divided into six sections of 9 spans each. The sections are separated from one another and from the under sluices by 25ft wide abutment piers. The piers between the spans are 10ft wide. After commissioning of the barrage in 1932, it was observed that the right bank canals were drawing excessive silt. This situation was investigated in model studies at Poona Laboratory in India during 1938. The recommendations based on the model tests included closing of ten barrage bays, development

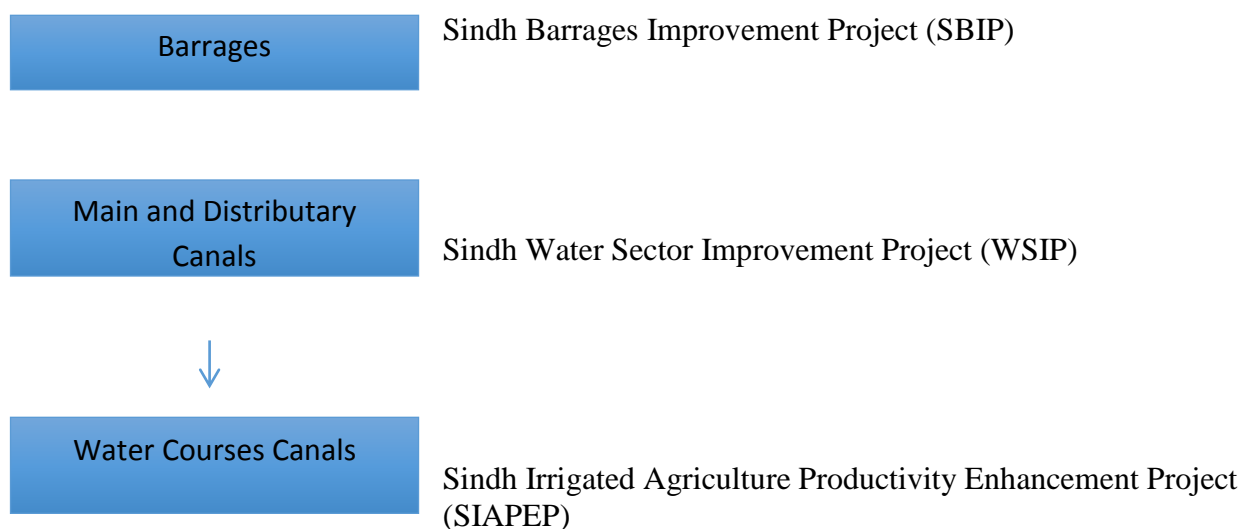
of an island upstream of the closed bays and introduction of river training works. After implementation of the recommendations, the maximum discharge capacity of the barrage was curtailed to 0.9 million cusecs. However, discharge over 1.0 million cusecs have been observed thereafter on several occasions. The maximum flood discharge observed was 1.2 million cusecs and passed the barrage in 1976. After operation for three quarters of century, the barrage faced a number of problems, partly due to a deficiency in the original design, partly due to ageing effects and partly due to its frequency of operation, which limits the time to carry out repairs and rehabilitation works in timely manner.

2.4 The problems have not only placed restrictions on its full utilization but even threatened its very existence. Major problems were experienced in the years 1947, 1985 and year 2004. In 2004 a large scour hole developed downstream of the first pile line in the first three spans of the right under sluices resulting in collapse and damage of the first pile line and the concrete slab in its vicinity. Cavities formed underneath the slab of the under sluices in front of the head regulator of Dadu Canal. Urgent emergency repairs were carried out by the Army Engineers to save this prominent and important structure from catastrophic failure.

2.5 Since its inception, the Barrage has been facing hydraulic, functional and structural problems over its life of 80 years. After 1973, a series of high floods exceeding 0.9 million cusecs (25,500 cumecs) up to a maximum of 1.2 million cusecs (34,000 cumecs) occurred causing serious threats to its stability and safety. Various measures were taken at different times to manage the performance of the barrage and to manage the flow in the seven canals off-taking from the Barrage.

2.6 The Government of Sindh has been closely working with the World Bank to systematically update and modernize the water distribution systems at main and distributary canals and water courses. The Figure 1 summarizes the support from on-going projects:

## **B. Bank Support for Sindh Water Distribution Systems**



2.7 The Feasibility Studies for Rehabilitation of Guddu Barrage and Rehabilitation of Sukkur Barrage were initiated and supported under Sindh Water Sector Improvement Project

(WSIP-1). Rehabilitation of Guddu Barrage Project is under implementation by Project Management Office, Sindh Barrages Improvement Project (SBIP), Irrigation Department through World Bank financial assistance. Detailed technical and environmental studies including; feasibility study, detailed design, bidding documents, environmental and social studies/documents for Rehabilitation and Modernization of Sukkur Barrage Project have been completed as part A of the project assignment. Considering the result of feasibility study and detailed design carried out through professional team of national and international reputed consultants, the following interventions for rehabilitation and modernization of Sukkur Barrage have been approved as additional financing of the on-going Sindh Barrages Improvement Project

## **Scope of Works**

The Scope of Supervision Works covered in Assignment-B includes but is not limited to:

### **A. Restoration and Upgradation of Barrage/Canal Head Regulators**

- Rehabilitation / Repair Works of Structure
- Inspection for the top of foundation and identification of repairs.
- Electrical Work
- Gates and Mechanical Work
- Automated Data Acquisition
- Embankment and Surface Protection work
- Building works and monumental work

### **B. Canal Desilting Works**

The works involve Canal Desilting, during canal closure:

- Rice Canal (80 RDs)
- NW Canal (80 RDs)

### **C. Barrage Dredging Works**

- Dredging from pocket and approach and tail channels (Upstream of the Barrage)
- Excavation from pocket and approach and tail channels Dredging Works (Upstream of the Barrage)

2.8 The Irrigation Department (ID) of Sindh is the executing agency for Sukkur Barrage Rehabilitation Project. It will execute the Project through the Project Directorate/Project Management Office (PMO) established for Sindh Barrages Improvement Project. Sindh Irrigation Department intends to appoint consultant services for Assignment B to implement construction supervision, contract management and support in project management for Rehabilitation and Modernization of Sukkur Barrage and Head Regulators of Off taking Canals. The Technical and Financial proposals of this part “B” consulting services will cover

for construction supervision, contract management and support in project management for recommended rehabilitation works identified and designed in Assignment A.

### **3. SCOPE OF CONSULTANCY SERVICES**

#### **3.1 General Scope of Services**

**Construction Supervision-**The tasks and activities of the consultancy contract for Construction Supervision include:

- (i) Supervise construction of the civil works assuming the role of the Engineer and undertake tasks as defined under FIDIC agreements;
- (ii) Prepare required design /working drawings during construction stage;
- (iii) Maintain detailed financial accounts and other project records, and prepare other documentation as may be required by the Client and project financiers;
- (iv) Make all reasonable efforts to ensure effective project management, implementation all works, including social management/resettlement programs and environmental management program and monitoring and evaluation, and implementation of the communication strategy and plan.
- (v) The consultants shall provide full technical and operational support to the Dam Safety Panel.
- (vi) The Consultants shall Finalize and support operationalization of the emergency preparedness plan during construction.

#### **3.2 Specific Scope of Services**

**Task. 1. Construction Supervision, Contract Managements, Administration and role as Engineer.**

The consultants will be responsible for all construction supervision contracts and in this context will carry out, but not limited to the following activities:

- (a) They will be designated as the Engineer in the civil works, goods, and equipment supply and installation contracts and will be responsible for inspection and supervision of the construction works, installation of equipment and testing of construction material, in order to ensure that the works are implemented and goods supplied in accordance with the deigns, specifications and terms and conditions of the relevant contracts and standards. As mentioned above, the consultants shall ensure that procurement of goods, services, civil

works contracts is in accordance with the World Bank Policies/Framework and guidelines, the contract are signed, and managed properly including any changes or variation orders during implementation.

- (b) In the context of contract management they will carry out, but not limited to the following activities
- Contract administration and management;
  - *Preparation of Working Drawings during construction stage:* The Consultants shall amplify where necessary the contract drawings and specifications by preparing working drawings, which shall be in sufficient detail to enable the appointed contractors to construct the civil, and mechanical and electrical works;
  - Working drawings shall be prepared to normal international standards and completed and issued to the contractors in accordance with the agreed program. The Consultants shall also check and approve all designs and working drawings prepared by the Contractors;
  - Approval of the Contractor's work program, staffing, equipment and materials;
  - Inspection of construction activities, including quality of works;
  - Testing of materials on site, off-site testing when needed, as necessary the in-factory testing and inspection of good and materials;
  - Review of the Contractor's submittals, verification of progress and interim payment requests;
  - Determination of final construction quantities;
  - Preparation of monthly and quarterly progress reports;
  - Measurement of work and maintenance of records;
  - Contract/works or goods acceptance and close of contract, issuance of completion certificates, and preparation of documents as required for acceptance of works/goods by the investor (Government of Sindh);
  - Preparation of operation, maintenance and management manuals for the facilities constructed under the project; and
  - The Consultants will carry out all obligations provided for 'the Engineer' in the Civil Works contracts. In the event of contractual dispute which may result in legal action, adjudication or arbitration, between the contract and the employer, on the instruction the Consultants will collate and prepare factual documentation which describes the circumstances of the dispute. If required the Consultants will attend hearings.

**Task. 2. Support in implementation of EMP, RAP and Communication Strategy**

- (a) The consultants would make all reasonable efforts to ensure the effective implementation of the EMP. The EMP activities would be incorporated in the main construction contracts to the extent possible. The EMP activities which cannot be included in the main construction contract would be implemented through additional construction contracts, management, institutional, or technical assistance. The consultants would carry out the designs of such program and help, monitor and supervise their implementation.
- (b) Make all reasonable efforts to ensure effective implementation of RAP activities during the project implementation, including support to purchase of properties, for that purpose, preparation of documentation to help in negotiations with the beneficiaries, in obtaining of local permits, etc. This may also include identification of alternative sites for resettling people and related assets and cultural properties, development of the sites for resettlement, including planning, infrastructure, utilities, and replacement houses etc.
- (c) The consultants would also make all reasonable efforts to ensure effective implementation of the Communication Strategy. This may include, but not limited to, implementation of communication plan, development of information base, messages, information to users, delivery of messages etc.

**Task. 3. Project Management Support**

- (a) The consultants will provide support to GOS in overall project management in activities such as preparation of project implementation plans, expenditure planning budgeting and financing forecast and plans, monthly, quarterly reports and annual reports or work programs as required by the Government of Sindh, Pakistan and financiers of the project. They will also help in development the procurement plans, contract management, financial management for which they will develop a system that can be linked with the Project Coordination Unit (PMU) responsible for over financial management of the project. The plans will be updated on a regular basis as required by client.
- (b) Support in obtaining site permits, construction permits, or any other permits or paper work which is necessary for the project and act on behalf of the investor as and when designated. The consultants will support client in procurement of works, goods and services under the project, preparation of bidding documents for such procurement, evaluation of bids, preparation of bid evaluation reports, contract management, and implementation of EIAs, EMPs, RAPs and day to day management issues.
- (c) The Consultant will prepare documents for the pre-qualification of the contractors and the pre-qualification criteria. The consultants will



also help Government in pre-qualification process such as invitation to pre-qualify, evaluation of the pre-qualification applications, preparation of pre-qualification reports etc.

- (d) **Bidding Documents.** The consultants would prepare bidding documents of works for which bidding documents are not prepared at design stage or works that are identified and/or added to be carried out during the project implementation period.
- (e) The consultants will write terms of reference for any additional work that have to be carried out under the project for which additional services will be required and identified during project implementation. The consultants will also provide technical assistance and training to the project staff and for that purpose prepare an overall training program for on-the-job training and possibly study tours based on the assessment of the training and technical assistance needs for client for implementation of the Project and other programs. The training programs are likely to cover: (a) on-the-job training as mentioned above; (b) project management, project planning, expenditures planning, budgeting; (c) preparation of detailed designs according to international standards, EIAs, RAPs; and (c) procurement and contract management.

#### **4. IMPLEMENTATION ARRANGEMENTS**

- 4.1 The Consultant will work closely with the Project Management Office, Sindh Barrages Improvement Project, Irrigation Department, Government of Sindh, to whom they will be reporting on a day to day basis and coordinate work with other relevant units of other agencies (such as WAPDA), local administration and relevant ministries and agencies.
- 4.2 After the inception stage the Consultants shall prepare a detailed schedule and task-flow diagram which depicts the interrelationship of various tasks in the assignment which lead to the completion works and mechanism of coordination with the client and other related entities. This will be kept update throughout the Project duration.
- 4.3 Project Director, PMO Barrages will be representative of the client and will coordinate all interfaces with the Consultants. Project Director, PMO Barrages will also assist the Consultants in resolving various administrative issues which may arise during the study duration. The Consultants' Project Manager will be the principal contact and will be expected to be readily available during project implementation.
- 4.4 The Consultants shall be responsible for all aspects of performance of services as set forth in the preceding sections of this TOR.

## 5. DURATION OF THE ASSIGNMENT.

Duration of the contract for Assignment will cover the Project Implementation period of about three years and about one year of the warranty period of the works to be implemented under the project. Last but not least is the undertaking of the consultants (standard) on obligatory responses to any technical related query arising from time to time after the implementation of the project but during the first year after closure (post warranty period).

## 6. DUTIES OF THE CLIENT

The following services, facilities and property are to be made available to the Consultant by the Client.

1. All volumes of Feasibility study, detailed design reports including Annexures will be provided in Hard copy and digital format through the Consultant of Assignment "A.
2. Relevant ordinances, legislations, regulations and administrative orders.
3. All available relevant documents in physical and / electronic form, clearances for access to project sites, assistance in contacting and liaising with government officials and agencies, suitable designated counterpart, or liaison staff, and support in obtaining working permits, or any other relevant government clearances, but no routine administrative support, office space, local transportation, equipment, data collection and processing, or other services.
4. Direct costs of advertising the Project (via newspaper, radio, TV etc) will be paid by the Client.
5. Any direct costs of training of Client's staff at external training institutes either in Pakistan or overseas, workshops, training facilities, accommodation, per diems, etc provided under the Project for IPD staff, contractors etc will be paid by the Client, unless otherwise agreed in writing with the Consultant.
6. The Client will arrange appropriate security provisions for the personnel of the Consultant during field visits.

## 7. REPORTING REQUIREMENTS

The schedule for various reports the consultants are likely to prepare is given below. The consultant will prepare reports in English and provide three copies of the key reports to the Client and the World Bank. Additional, reports may have to be prepared as needed by the project authorities mutually agreed.

<b>Reports</b>	<b>Months from Start of Assignment</b>	<b>Target date for submission</b>
1. Bid evaluation reports, pre-qualification reports, etc. as required	As determined by implementation schedule	

<b>Reports</b>	<b>Months from Start of Assignment</b>	<b>Target date for submission</b>
2. Monthly Progress Report	Regular basis	By 10 <sup>th</sup> of every month
3. Construction reports, quarterly reports, annual work plans	Quarterly and annual	Within 15 <sup>th</sup> day of completed quarter Within 30 days of completed year
4. Project implementation status reports quarterly, annual	Quarterly / annual	As above
5. Completion Reports of each contract packages	Completion of each contract	All reports should be submitted three months before expiry of the consultancy contract
6. Any other report related with project implementation as and when required by the client	As and when required by the client	As soon as possible

## 8. STAFFING REQUIREMENTS

The consultants are encouraged to use the expertise available in Pakistan to the extent possible. However, international experience and due account of Consultants' proposals to meet international standards will be considered in evaluation of proposals. The consultants are free to propose a staffing plan and skill mix necessary to meet the objectives and scope of services. If all the required skills are not available within the consulting firms, they are encouraged to make joint ventures with other firms. Following is an indicative list of skills required for carrying out the assignment:

	<b>Staff Skills</b>	<b>Key Staff</b>
1.	Team Leader/Project Manager	
3.	Structural/Civil Engineer	
4.	Design Engineer	
5.	Senior Hydrologist	
5.	Chief Resident Engineer	
6.	Contract Management Specialist	
6.	Mechanical Engineer/Hydraulic Gates Specialist	
7.	Electrical Engineer	
15.	Environmental Specialist	
16.	Sociologist / Resettlement Specialist	