



TECHNICAL DESIGN BRIEF

Activity 1.1.2

**SUB -ACTIVITIES 1.1.2.1, 1.1.2.2 AND 1.1.2.3:
FLOW PATH RESTORATION, DESILTING AND
REINFORCEMENT OF EMBANKMENTS OF BADRI POND,
DERA ISMAIL KHAN**

Recharge Pakistan
WWF-PAKISTAN



FP207 RECHARGE PAKISTAN: BUILDING PAKISTAN'S RESILIENCE TO CLIMATE CHANGE THROUGH ECOSYSTEM-BASED ADAPTATION (EBA) AND GREEN INFRASTRUCTURE FOR INTEGRATED FLOOD RISK MANAGEMENT

1. Introduction

Badri Pond is located near Burzwali Village in Dera Ismail Khan District, southern Khyber Pakhtunkhwa. The geographical coordinates of the site are 32°19'43" N latitude and 71°08'04" E longitude. The site lies approximately 25–30 km from D.I. Khan city, about 250 km south-southwest of Peshawar, and 120 km southeast of Bannu.

The pond serves as an important water resource for the local community and plays a key role in supporting water availability, groundwater recharge, and flood management in the area.

2. Project Objectives

Under the Recharge Pakistan Project, 03 sub-activities related to Badri Pond are included, the objective of which is to improve the pond's functionality, water storage capacity, and sustainability. The details of these sub-activities are given below.

Sub-Activity 1.1.2.1: Restoration of the Natural Flow paths

Over time, the natural channel carrying runoff to the pond became blocked with silt and debris, reducing water inflow and groundwater recharge. To address this, the project will implement:

- Mechanical excavation and de-siltation to restore the original channel profile
- Removal of obstructions and improvement of flow conditions

Sub-Activity 1.1.2.2: Enhancement of Water Storage Capacity

Approximately 2 hectares of the pond have silted up due to sedimentation, reducing depth and storage capacity while increasing flood risk. The intervention includes:

- De-siltation and restoration of the pond
- Increase in water storage capacity by approximately 20,000 m³

Sub-Activity 1.1.2.3: Strengthening of Embankments

To reduce flood risks and ensure long-term sustainability, the project will strengthen existing embankments through:

- Earth compaction and slope shaping
- Stone pitching at embankment toes
- Plantation of native vegetation for natural stabilization

These measures will help protect community assets, reduce sediment inflow, and ensure the pond remains functional during seasonal floods.

3. Hydrological Assessment and Design Considerations:

To ensure the long-term performance and functionality of the pond, a detailed hydrological study was conducted using 56 years of meteorological data (1970–2025) from the D.I. Khan Meteorological Station. Based on this data, the average annual rainfall in the area is estimated at 315.3 mm.

The catchment area of Badri Pond is about 0.22 square kilometers, and the average annual water availability is estimated at 2.75 acre-feet (AF). Due to the low rainfall and arid conditions of the area, the pond mainly receives water during heavy rainfall events.

Based on sediment load and characteristics, it is estimated that about 80% of the pond's storage will be filled with sediment in approximately 73 years, while full capacity may be reached in about 92 years under current conditions. After the proposed intervention, including de-siltation, the storage capacity of the pond will increase to 29,404 m³, which will also extend the overall life of the pond.

4. Key Issues and Proposed Solutions

During the detailed design phase, two primary issues were identified:

1. Erosion and downstream sediment deposition due to steep slopes
2. Scattering of flow at the catchment outlet due to the lack of a defined channel

To address these issues, the following green infrastructure-based solutions have been proposed:

- Installation of check dams (2–3 m in size) to reduce flow velocity
- Construction of an embankment to direct flow toward the pond
- Construction of a broad-crested spillway to safely pass excess floodwater

5. Project Targets:

Overall, the project will achieve:

- Rehabilitation of 415 m of flow paths.
- De-siltation of approximately 1 hectare of pond area.
- Strengthening and reinforcement of 211 m of embankments.

6. Project Impact:

Sr. No.	Indicator Description	Unit	Current Scenario (Baseline)	Post Implementation Scenario
1.	Flood Extent Reduction	Hectares	0.6	0*
2.	Water Storage/Retention	Cubic meters	9,405	29,404
3.	Ground water recharge / Water Replenishment	Million liters	1.35	2.16
4.	Water Quality**	Physical, Biological & Chemical	Turbidity: 14 NTU TDS:197 mg/L Total Coliform CFU/100ml: 168 Fecal Coliforms (CFU/100ml):74 E-Coli (CFU/100ml): 25	To be tested***

* The flood extent reduction has been estimated using hydraulic modeling of the project area. This estimate is based on a comparison of pre- and post-intervention inundation conditions using available topographic survey data.

** Water contamination is mainly caused by livestock waste entering the pond.

*** To address this issue, livestock access to the main pond will be restricted, and a separate designated area will be provided away from human water collection points. For this purpose, a small pond has been proposed on the southern side of the main pond, which will provide approximately 44,000 gallons of water for livestock use. In addition, bio-fencing will be installed around the main pond to prevent livestock from entering it. These measures are expected to significantly improve water quality, making it suitable for human consumption.